MODIS™ Ultra
User Manual

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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

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

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

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 equipment only as described in this manual.

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

Safety Message Conventions

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level.

⚠ 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 messages contain 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.

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.

SAVE THESE INSTRUCTIONS

Contents

Chapter 1 — Using This Manual

This manual contains tool usage instructions. Some of the illustrations shown in this manual may contain modules and optional equipment that are not included on your system. Contact your sales representative for availability of other modules and optional equipment.

1.1 Conventions

The following conventions are used.

1.1.1 Bold Text

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

Example:

- Press the **OK** button.

1.1.2 Symbols

Different types of arrows are used.

The "greater than" arrow (>) indicates an abbreviated set of selection instructions.

Example:

- Select **Tools > Connect-to-PC**.

The example statement abbreviates the following procedure:

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 referring to the four directions of the directional arrow keys.

Example:

- Press the down ▼ arrow.

1.1.3 Terminology

The term "select" means tapping an item on the touch screen, or highlighting a button or menu item and pressing the **Accept**, **OK**, **Yes, or other similar** button to confirm the selection.

Example:

- Select **Brightness**.

The above statement abbreviates the following procedure:

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

1.1.4 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 Scanner is communicating with the ECM.

1.1.5 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 tool!

1.1.6 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.

Introduction

The MODIS Ultra is a multi-function tool that combines a scan tool with a two-channel lab scope, graphing multimeter, and the exclusive Snap-on Component Test database into a single unit.

This chapter describes the construction of the diagnostic tool and addresses the use of the basic hardware controls and features in the following sections:

- Functional Description
- Technical Specifications, on page 8
- Control Keys, on page 9
- Power Sources, on page 10
- The Stand, on page 11

2.1 Functional Description

1— N/X key (No, Cancel, or Return)
2— Y/✓ key (Yes, Accept, or Continue)
3— Directional key; left (◄), right (►), up (▲), down (▼)
4— Shortcut key
5— Power key

Figure 2-1 *Front view*
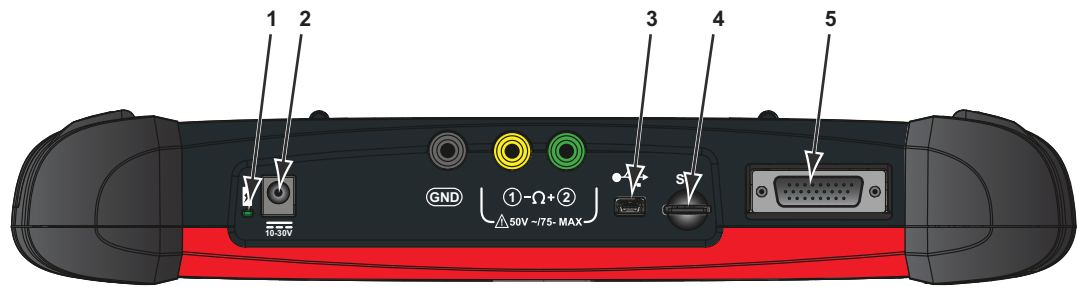
1— **Battery Status Indicator LED (light emitting diode)**
2— **DC Power Supply Input Port**
3— **Mini USB Client Port**
4— **Micro secure digital (microSD) Card Port**
5— **Data Cable Port**

Figure 2-2 *Top view*

1— **Collapsible Stand (closed)**
2— **Battery Compartment Cover**

Figure 2-3 *Back view*

2.2 Technical Specifications

Touch Screen
Resistive Touch Panel

Display:
8.0 inch diagonal, Color LCD
800 x 480 resolution SWVGA

Battery:
Rechargeable lithium-ion battery pack
Approximately 3 hour run time
Approximately 5 hour charge time

DC Jack Operating Voltage
10V and 28V DC

Dimensions:
Width:
    11.2 inches
    285.0 mm
Height:
    5.98 inches
    151.8 mm
Depth:
    2.0 inches
    50.9 mm

Weight (including battery):
    2.6 lbs.
    1.18 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

Environmental Conditions:
This product is intended for indoor use only
This product is rated for Pollution Degree 2 (normal conditions)
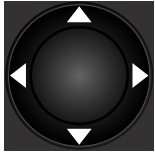
Power Supply:
Supply Rating; 15 VDC, 2A

2.3 Control Keys

There are five control keys located on the right side of the unit near the handgrip:

Key	Icon	Description
Accept, Yes		Selects a menu or program, advances to the next screen, or provides a yes answer to a question on the screen.
Directional, Arrows		Moves the highlight on the display screen up, down, left, and right, as indicated by the arrows.
Cancel, No		Exits a menu or program, returns to the previous screen, or provides a no answer to a question on the screen.
Shortcut		A function key that can be programmed to provide a shortcut for performing a variety of routine tasks.
Power, On/Off		Turns the unit on and off. Also, press and hold for 5 seconds for emergency shutdown.

All other tool operations are controlled through the touch screen.

2.3.1 Accept (Y/✓) Key

The **Y/✓** key is used to do the following:

- 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.

2.3.2 Directional Keys

The directional, or arrow, keys move the cursor or highlight in their respective direction:

- Up (▲)
- Down (▼)
- Left (◄)
- Right (►)

2.3.3 Cancel (N/X) Key

The **N/X** key is used to do the following:

- To exit a menu or program.
- To close an open list and return to the previous menu.
- To answer "No" when a yes or no choice is given.

2.3.4 S (Shortcut) Key

Use the **Shortcut** key to quickly perform routine tasks, such as capturing an image of the current screen, with a single press. The Shortcut, or S, key can be programmed to perform a number of different functions. Refer to Configure Shortcut Key, on page 74 for additional information.

2.3.5 Power Key

The **Power** key powers up the tool, and turns it off.

2.4 Power Sources

Your Display Device can receive power from any of the following sources:

- Internal Battery
- AC/DC Power Supply
- Vehicle Power

2.4.1 Internal Battery

The tool can be powered from the internal rechargeable battery. A fully charged standard battery provides sufficient power for about 3 hours of continuous operation.

An LED on top of the unit (Figure 2-2) illuminates to indicate DC power is being supplied to the tool. The internal battery is recharged whenever an outside power source is provided. Either connecting the Data Cable to a powered data link connector (DLC) on a vehicle, or connecting the AC/DC Power Supply to a power outlet charges the internal battery.

2.4.2 AC/DC Power Supply

The diagnostic tool can be powered from a standard wall socket using the AC/DC power supply and power adapter. The jack on the output cable of the AC/DC power supply attaches to the DC power supply input port on top of the diagnostic tool. Use only the AC/DC power supply provided.

2.4.3 Vehicle Power

The tool receives power from the test vehicle when it is connected to a powered data link connector (DLC) with the data cable. All OBD-II/EOBD compliant vehicles are required to have battery power available on the DLC. If the diagnostic tool does not power on when connected to an OBD-II/EOBD DLC, there may be a circuit problem on the vehicle. Check the green LED on the data cable (see Cables, on page 26 for additional information). If the LED is not illuminated, suspect a problem on the DLC power circuit. Refer to a wiring diagram to troubleshoot any circuit problems on the vehicle.

Certain vehicles do not provide vehicle power on the DLC. For these applications, a separate cable adapter and power cable are needed to power the unit. Optional data cable adapters are available for a number of vehicle manufacturers. Contact your sales representative for availability. The power cable connects to a port on the cable adapter.

IMPORTANT:
Never connect the optional power cable or the AC/DC power supply to the DC power supply input on top of the unit when the diagnostic tool is communicating with a vehicle.

2.5 The Stand

The built-in stand extends from the back of the unit to allow hands-free viewing. The stand clips into the unit for storage and pivots out so the display is at an angle when in use.

Getting Started

Make sure the diagnostic tool has a charged battery pack, is connected to a powered vehicle data link connector (DLC), or is connected to an AC power supply.

3.1 Powering Up

The unit should automatically power on and open the Home screen (Figure 3-1) when ever power is supplied through the data cable or by the AC/DC Power Supply. If not, press the **Power** key on the front of the unit to switch the tool on.

3.2 Home Screen

The main body of the Home screen has six selectable buttons, one for each of the primary diagnostic tool functions. These are explained briefly in the next section and discussed in detail in the Navigation chapter.

1— **Titlebar**
2— **Main Body**

Figure 3-1 *Sample Home screen*

3.2.1 Title Bar

The title bar at the top of the screen provides basic information about current tool operating conditions. Title bar options vary depending upon vehicle make and model, what module is being used, 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 module is currently active.
- The source and status of the power being supplied to the tool.
- The current time.

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

An icon at the right-hand edge of the Title bar depicts the power supply and status:

Table 3-1 *Power supply icons*

Icon	Definition
	Indicates power is being supplied by the internal battery pack. A fully charged battery is shown. The horizontal bars on the icon diminish as the battery discharges.
	Indicates the internal battery pack is weak and needs to be recharged immediately. A warning message will also display on the screen when the battery gets this low.
	Indicates power is being supplied by an external source, which could be either through a data cable connection to a vehicle or by the AC/DC Power Supply.

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 module to set the clock and format how time is displayed. See Clock Settings, on page 79 for additional information.

A communication icon displays between the clock and the power supply icon whenever the diagnostic tool is actively communicating with a vehicle or a personal computer:

Table 3-2 *Communication icons*

Icon	Definition
	Indicates the Scanner module is actively communicating with a vehicle.
	Indicates the diagnostic tool is actively communicating with a personal computer.

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

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

3.2.2 Home Screen Buttons

The Home screen, which the diagnostic tool automatically opens to whenever power is supplied to the unit, allows you to select which of the primary tool functions, or modules to use. Each available module is represented by a button on the home screen. Tap a module button to load and open that tool function. The table below gives brief descriptions of the button operations.

Table 3-3 *Home screen buttons*

Name	Button	Description
Scanner		Opens a list of vehicle manufacturers to begin the process of establishing a communications link to a test vehicle. See Scanner Operations, on page 23 for details.
OBD-II/EOBD		Performs generic OBD-II/EOBD system tests without first identifying a test vehicle. See OBD-II/EOBD Operations, on page 40 for details.
Component Test		Opens a diagnostic database of specific tests for the identified vehicle. See Component Test Operations, on page 49.
Scope Multimeter		Configures the unit to operate as a lab scope, graphing multimeter, or digital multimeter. See Scope Multimeter Operations, on page 56.
Previous Vehicle & Data		Use to connect to a recently tested vehicle, or to access saved data files. See Previous Vehicles and Data, on page 70 for details.
Tools		Select to adjust tool settings to your personal preferences, to access operating system information, and perform other special functions. See Tools, on page 73 for details.

Select from the Home screen buttons to begin testing by tapping directly on the button. You can also use the keypad and **Y/✓** key to activate a module, a yellow border around the button indicates it is highlighted, or in focus. Use the Directional arrows (◄ ► ▲ ▼) to highlight the desired module and press **Y/✓** to select it. A "please wait" message may display briefly, then automatically clear once the module is loaded and ready for use.

3.2.3 The Demonstration Program

A Scanner demonstration program allows you to become familiar with many of the test capabilities of the Scanner module without actually connecting to a vehicle. The demonstration contains actual data captured while driving a 2001 Chevrolet Tahoe.

▶ **To start the demonstration program:**

1. From the Home screen, tap the **Scanner** icon.

   The manufacturer menu, which lists all of the makes available for testing, displays.

2. Tap the **Demonstration** button, which is included on the manufacturer menu.

3. A screen advising you are in simulation mode displays, select **Continue**.

IMPORTANT:
Do not connect a vehicle to the diagnostic tool while in the Demonstration mode.

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4. Follow the on-screen instructions and select as needed until the confirmation screen displays.

5. Select **OK** on the confirmation screen to load the demonstration database.

6. Select **OK** from the Demo mode message screen.

   A systems menu, which shows all of the systems available for testing, displays.

7. Select from any of the systems listed, then select from the submenus.

3.3 Powering Down

Use the **Power** key to turn the diagnostic tool off.

IMPORTANT:
All vehicle communication must be terminated before shutting down the diagnostic tool. A warning message displays if you attempt to shut down while the Scanner is communicating with the vehicle. Forcing a shut down while communicating may lead to ECM problems on some vehicles.

▶ **To power off the unit:**

1. Press **N/X** or **Back** until you reach the Home screen.

   A "stopping communication" message appears briefly before the Home screen displays.

2. Disconnect the Scanner Data Cable from the vehicle test connector.

3. Press the **Power** key.

   The Turn off dialog box displays.

4. Press **Y/✓** or **OK** to turn the power off, or press **N/X** or **Cancel** to test a different vehicle.

3.3.1 Emergency Shutdown

In case of emergency, press and hold the Power key for five seconds to force a shutdown.

Chapter 4   # Navigation

This chapter describes the screen layout, how to navigate the interface, and how to make selections using screen menus, buttons, and keys. It also explains the various types of messages that display while using the tool. The chapter is divided into the following sections:

4.1 Screen Messages

There are four types of on-screen message:

- Loading and connecting
- Confirmation
- Warning
- Error

4.1.1 Loading and Connecting Messages

Loading and connecting messages display when the diagnostic tool is performing an internal operation, such as loading a database, initiating a test, or establishing communications with the vehicle. The message automatically clears once the internal operation is complete.

4.1.2 Confirmation Messages

Confirmation messages inform you when you are about to perform an action that cannot be reversed or when an action that requires your confirmation to continue has been initiated.

When a response is not required, the message displays briefly, then disappears.

4.1.3 Warning Messages

Warning messages inform you when completing the selected action may result in an irreversible change or loss of data. Warning messages require a response in order to continue.

4.1.4 Error Messages

Error messages inform you when a system or procedural error has occurred.

Examples of possible errors include:

- A cable is disconnected.
- A peripheral, such as a printer is powered off.

4.2 Scanner Navigation

Navigation applies to using both the Scanner and the OBD-II/EOBD modules.

4.2.1 Screen Layout
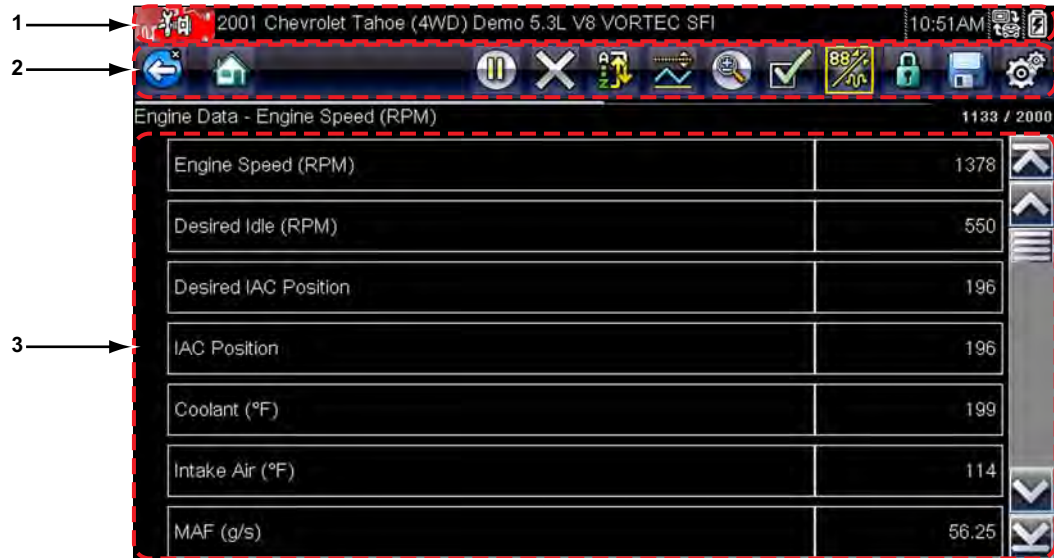
1— Title bar—shows test and tool status
2— Toolbar—contains test controls
3— Main body—displays menus and test data

Figure 4-1 *Sample scan tool screen*

The Title bar appears for all modules and displays information only, there are no selectable items. Refer to Title Bar, on page 12 for details.

Toolbar

The toolbar, located under the title bar, contains a number of selectable tool control buttons. What buttons appear on the toolbar varies, as only buttons that are active or available for the current screen and test mode display. Toolbar button operations are explained in Table 4-1.

Table 4-1 *Scanner toolbar buttons (part 1 of 2)*

Button	Icon	Function
Back		Returns to the previously viewed screen. This button is always at the left-hand edge of the toolbar.
Home		Returns to the Home screen. This button is always alongside the Back button on the left of the toolbar.
Pause		Indicates live data from the vehicle is being displayed. Selecting pauses data collection.

Table 4-1 *Scanner toolbar buttons (part 2 of 2)*

Button	Icon	Function
Record		Indicates the data being displayed is paused and not being updated. Selecting resumes data collection.
Clear		Erases all the data in the buffer and begins a new recording. Selecting opens a confirmation message.
Sort		Determines the order in which the data parameters are listed on the screen.
Trigger		Opens a menu that allows you to set, arm, and clear threshold values that automatically trigger a data movie recording.
Zoom		Incrementally increases and decreases the scale of the data being displayed.
Custom Data List		Opens a menu for selecting which parameters display in the data list.
View		Switches the screen viewing mode between a parameter list and a data graph display.
Lock/Unlock		Locks or unlocks the highlighted parameter. Locked parameters move to the top of the list and do not scroll as you move through the data.
Save		Saves the current screen information, along with the data stored in the buffer, to tool memory.
Tools		Opens the tools menu, which allows you to adjust basic tool settings.
Previous Frame		Moves back one frame of data with each button push when viewing recorded or paused data.
Next Frame		Moves forward one frame of data with each button push when viewing recorded or paused data.
Back 10 Frames		Moves back 10 frames at a time when viewing recorded or paused data. Hold the button down to keep moving back through the data.
Forward 10 Frames		Moves forward 10 frames at a time when viewing recorded or paused data. Hold the button down to keep moving forward through the data.

Additional buttons appear on the toolbar when special operations are available. These buttons are explained in the Operations chapters when applicable. When a selectable item on the screen is highlighted, a yellow frame surrounds the item to indicate that it is in focus.

Main Body

The main body of the screen is the lower portion, which displays either a menu of available tests or data from the vehicle. A vertical scroll bar appears along the right-hand edge of the main body when there is additional data either above or below what is currently on the screen (Figure 4-2).

1— **Beginning**
2— **Up 1 Page**
3— **Slider (position indicator)**
4— **Down 1 Page**
5— **End**

Figure 4-2 *Sample scroll bar*

To navigate data in the main body:

- Tap the **Up 1 Page** or **Down 1 Page** arrowhead buttons near the ends of the scroll bars to move through the data in the direction of the arrow one page at a time.
- Select the **Beginning** arrowhead at the very top of the scroll bar to quickly move to the start of the data list.
- Use the **End** arrowhead at the very bottom of the scroll bar to quickly move to the bottom of the data list.
- Touch and drag the **Slider** to scroll through the data. The slider indicates the relative position of the current screen to the total available data.

The **Up** (▲) and **Down** (▼) arrows on the keypad can also be used to move through the data one line at a time. Press and hold an arrow down to rapidly scroll the data.

4.3 Component Test and Scope Multimeter Navigation

This section describes general navigation for Component Test and Scope Multimeter screens. Although there are some differences, the interface operates similarly for both modules.

4.3.1 Screen Layout
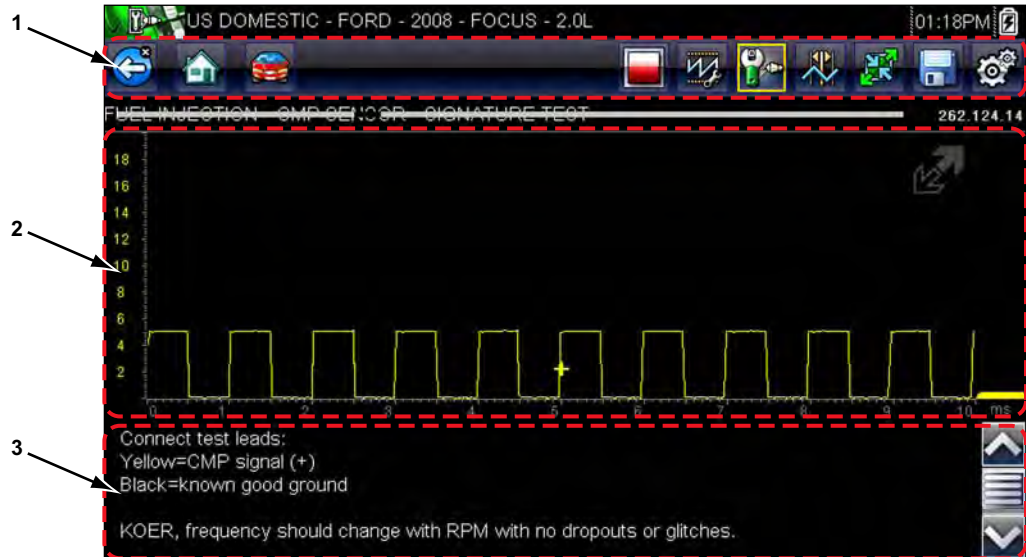
1— **Toolbar**—contains test controls
2— **Main Body**—displays menus and test data
3— **Information Panel**—shows test and tool status

Figure 4-3 *Sample Component Test screen*

A typical Scope Multimeter screen would be similar to the Component Test screen shown above, and navigation is similar as well. The differences are in the information that is being displayed on the screen, and how the data is gathered.

Component Test data is vehicle specific. Therefore, the meter that displays is configured to perform the selected test on the identified vehicle. In addition to displaying test results; procedures, tips, and specifications for the selected test are available at the touch of a button.

Scope Multimeter tests are more general and not tied to a specific vehicle. Therefore, there is no need to go through the vehicle identification sequence when using the Scope Multimeter. However, more adjustments to the meter settings are usually needed and the supporting information is not available.

Toolbar

The toolbar, located under the title bar, contains a number of selectable tool control buttons. What buttons appear on the toolbar varies, as only buttons that are active or available for the current screen and test mode display.

A brief description of common toolbar button operations are shown in .

Table 4-2 *Component Test and Scope Multimeter toolbar buttons (part 1 of 2)*

Button	Icon	Function
Back		Returns to the previously viewed screen. This button is always at the left-hand edge of the toolbar.
Home		Returns to the Home screen. This button is always alongside the Back button on the left of the toolbar.
Change Vehicles		Cancels the current vehicle identification and returns you to the database selection screen.
Back 10 Frames		Moves back 10 frames at a time when viewing recorded or paused data. Hold the button down to keep moving back through the data.
Forward 10 Frames		Moves forward 10 frames at a time when viewing recorded or paused data. Hold the button down to keep moving forward through the data.
Previous Frame		Moves back one frame of data with each button push when viewing recorded or paused data.
Next Frame		Moves forward one frame of data with each button push when viewing recorded or paused data.
Stop		Stops the collection of data, which allows you to more closely examine the trace and to review the data that is being held in the memory buffer.
Record		Indicates that data collection has been paused and the data being displayed is not being updated. Selecting resumes data collection.
Profile		Opens and closes a field of controls at the bottom of the screen that allows you to adjust certain attributes of how the sampled signal displays.
Information		Available for Component Test only, opens and closes an information window at the bottom of the screen, that contains details about the test being performed.
Cursors		Turns the cursors on and off. The cursors are two vertical rules that can be repositioned on the screen to measure intervals.

Table 4-2 *Component Test and Scope Multimeter toolbar buttons (part 2 of 2)*

Button	Icon	Function
Expand/Collapse		Expands the meter display to fill the entire screen, or collapses the meter to show the information panel or profile details at the bottom of the screen
Save		Saves a recording of the data being displayed on the screen along with the data that is being held in the memory buffer.
Tools		Opens the tools menu, which allows you to adjust basic tool settings.

Additional buttons appear on the toolbar when special operations are available. These buttons are explained in the operations chapters where applicable.

Main Body

The main body of a Component Test screen displays one of three things:

- A selectable menu
- Component information
- A test meter

The main body of a Scope Multimeter screen displays:

- A selectable menu
- A test meter

Select from a menu using the touch screen or the control buttons.

Component Information screens contain information to assist you with testing.

Test meters can display two circuit traces, or waveforms, 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 following in the main body:

- Trigger position; touch and drag the trigger indicator (+) to reposition it.
- The expand/collapse icon in the upper-right corner of the main body performs the same function as the Expand/Collapse button on the Toolbar.
- 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.

Information Panel

The information panel at the base of the screen shows either test data or Profile details in Component Test, and Profile details only in Scope Multimeter. Refer to Component Test Operations, on page 49 and Scope Multimeter Operations, on page 56 for details.

Scanner Operations

The Scanner establishes a data link to the electronic control systems of the vehicle being serviced. This allows you to retrieve diagnostic trouble codes (DTCs), view live data parameters, and perform tests. Scanner testing requires connecting the scan tool to the test vehicle using the data cable and test adapters. On screen instructions tell you how to connect the Scanner. Additional connection information can be found in the appropriate vehicle communication software manual for the test vehicle. Vehicle communication software manuals are available on the internet at: http://diagnostics.snapon.com/usermanuals.

5.1 Vehicle Identification

The Scanner information presented is provided by the ECM of the vehicle. Therefore, certain attributes of the vehicle must be entered into the scan tool to ensure the test data displays correctly. This vehicle identification sequence is menu driven, simply follow the screen prompts to make a series of choices. Each selection advances you to the next screen. Exact procedures may vary by the make, model, and year of the test vehicle.

▶ **To identify a vehicle for Scanner testing:**

1. Tap the **Scanner** button on the Home screen.

   A list of manufactures displays (Figure 5-1).

Figure 5-1 *Sample manufacturer list*

The list includes Demonstration, which opens the Demonstration program (see The Demonstration Program, on page 15).

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 data has been entered (Figure 5-2).

Figure 5-2 *Sample confirmation dialog box*

4. From the Confirm Vehicle screen select:

    a. **OK** to continue.

    b. **Cancel** to return to the previous screen.

    When the vehicle identification is confirmed, a list of systems available for testing displays.

5. Select a system from the list to continue (Figure 5-3).

Figure 5-3 *Sample available systems list*

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

The identification sequence is now complete.

5.1.1 Alternative Vehicle Identification

Occasionally, you may identify a test vehicle that the Scanner does not recognize, the database does not support, or has some unique characteristics that prevent it from communicating with the Scanner through the normal channels. In these instances, a menu of alternate choices displays.

Alternate choices allow you to establish communication with the vehicle by other means. The following alternatives are available:

- Manufacturer—allows you to begin diagnosing by first selecting from a list of makes.
- OBDII/EOBD—allows you to perform generic OBD-II or EOBD tests. See OBD-II/EOBD Operations, on page 40 for additional information.
- Select by Database—allows you to begin the vehicle identification by first selecting which database to load. Selecting opens a menu of available databases.

5.2 Connecting to a Vehicle

Instructions for connecting the Scanner to the vehicle with the data cable are shown on the screen once a selection is made from the list of systems available for testing (Figure 5-4).

Figure 5-4 *Sample vehicle connection message*

If an optional cable adapter is needed, the instructions tell you which one to use, and also where to locate the vehicle diagnostic connector to perform the selected tests. Refer to the appropriate *Vehicle Communication Software Manual* for additional details.

5.2.1 Cables

One of two data cables, one for OBD-II/EOBD compliant vehicles and an optional one for non-OBD-II/EOBD models, is used to connect the scan tool to the test vehicle. The 26-pin end of either cable attaches to the data cable port on the top of the scan tool. The connector is secured with captive screws. The 16-pin end of the OBD-II/EOBD cable directly plugs into the data link connector (DLC) of the test vehicle. With the non-OBD-II/EOBD cable, a cable adapter attaches to the 15-pin end of the cable and the adapter then plugs into the vehicle test connector.

On-screen instructions on the scan tool tell you which cable, and adapter if needed, to use once a vehicle has been identified. The screen message also includes the location of the vehicle diagnostic connector the cable attaches to for testing the selected system.

A replaceable 7.5 amp blade-type fuse is installed in the vehicle connector end of the cable to protect the unit from high circuit voltage and current. A green LED, also on the vehicle connector end of the cable, illuminates whenever power is supplied to the cable. An LED that fails to illuminate indicates either a problem on the vehicle power circuit or a blown data cable fuse.

All OBD-II/EOBD vehicles have vehicle battery power (B+) available on the DLC. The optional auxiliary power cable supplies power for testing non-OBD-II/EOBD models that do not have B+ available on the diagnostic connector. The optional cable and adapters are required for testing non-OBD-II/EOBD models.

▶ **To connect the data cable to the vehicle:**

1. Follow the on-screen instructions for connecting to the vehicle (Figure 5-4).
2. Select **Continue** once the data cable is connected.

   The Scanner establishes communication then displays a list of available tests. If the Scanner 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.

NOTE:
The internal battery charger of the diagnostic tool begins recharging the battery any time the data cable is connected to a powered DLC.

5.2.2 No Communication Message

When the screen displays a "no communication" message, it means the scan tool and the vehicle control module cannot communicate with each other for some reason.

The following conditions cause a "no communication" message to display:

- The Scanner 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.

5.3 Operations

The Scanner allows you to establish a data link to the electronic control systems of the vehicle being serviced in order to view live data parameters and perform tests. Data may be available from multiple systems, such as engine, transmission, antilock brake system (ABS), and others. Functional tests, troubleshooting tips, and trouble code information are typically available.

The Scanner has two main functions:

1. **Scanner**—provides access to vehicle systems to perform functions such as reading codes, viewing data, and conducting functional tests.
2. **Troubleshooter**—provides the diagnostic power of Troubleshooter, a database of experience based information developed by master technicians.

After a system is selected and the Scanner establishes communication with the vehicle, a Scanner Main menu, which lists available tests, displays.

Figure 5-5 *Sample Scanner Main menu*

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

- **Data Display**— displays data parameter information from the vehicle control module. Selecting may open a submenu of viewing options.
- **Codes Menu**—displays diagnostic trouble code (DTC) records from the vehicle 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.
- **Functional Tests**—provides specific subsystem and component 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).
- **Troubleshooter**—provides step-by-step procedures, integrating parameter data and retrieving trouble codes when appropriate, for specific symptoms of the identified vehicle.

▶| **To perform a Scanner test**

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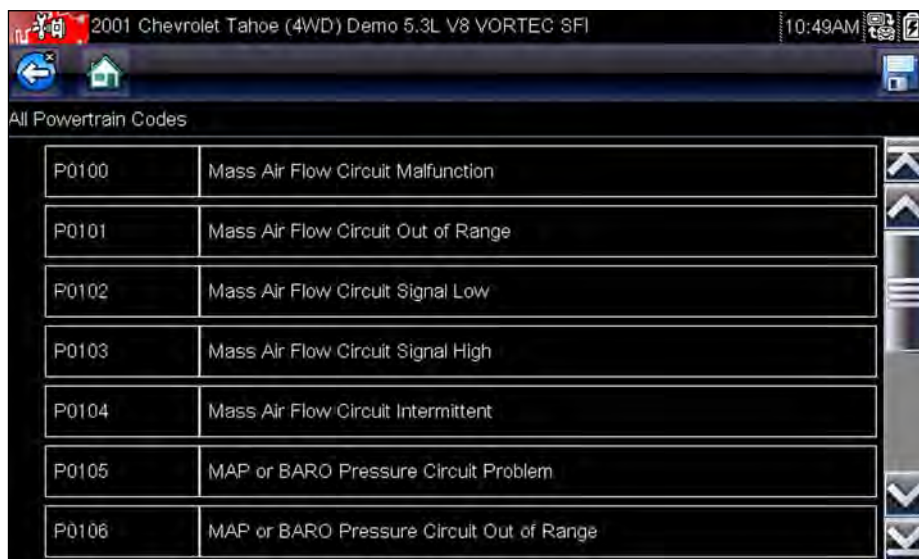5. **Select the test from the Scanner main menu**—Select the desired test.

5.3.1 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 29
- Freeze Frame/Failure Records, on page 29
- DTC Status, on page 29

Display Codes

Selecting opens either a list of diagnostic trouble codes (DTCs) stored in the selected electronic control module (ECM), or a submenu of DTC viewing options. A code list includes the DTC and a brief description (Figure 5-6).

Figure 5-6 *Sample code list*

Submenu options 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.

Clear Codes

The Scanner clears codes from the control module memory on some 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 40).

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.

DTC Status

This selection allows you to view the records of a particular DTC.

To check DTC status

1. Select **DTC Status** from the Codes Menu.

    The DTC Status entry field displays (Figure 5-7).

2. Use the keypad on the touch screen to enter the characters of the DTC.

3. Tap the **Check Mark** button on the toolbar once all the code characters are entered.
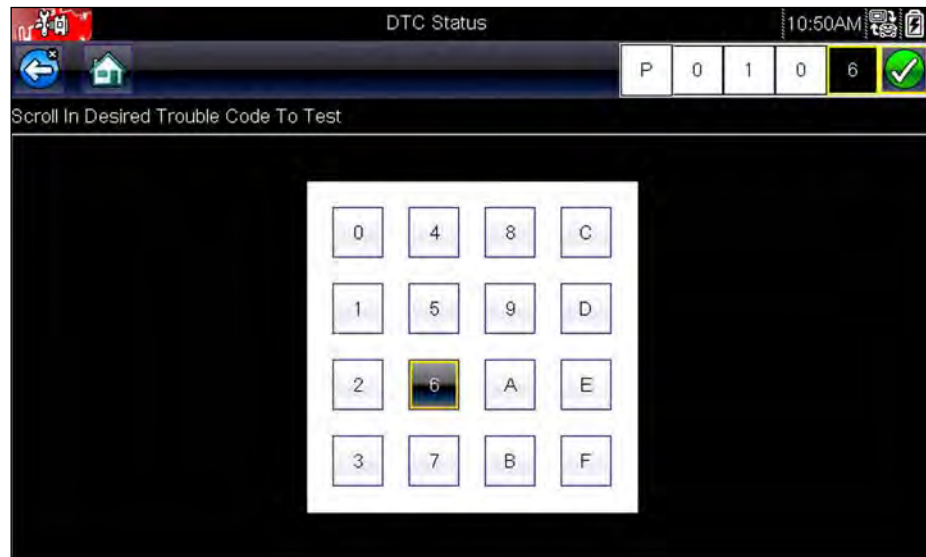
Figure 5-7 *Sample DTC Status entry field*

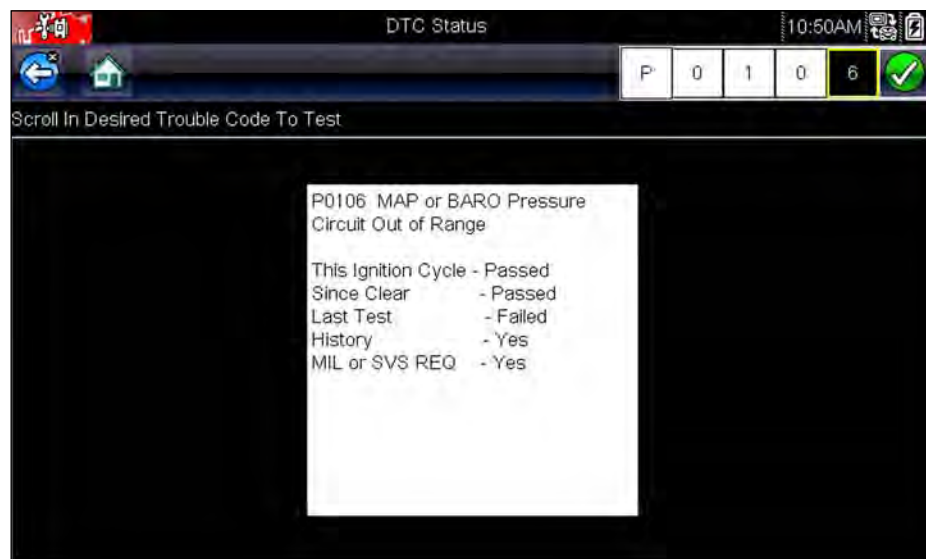The DTC status report displays (Figure 5-8).

Figure 5-8 *Sample DTC status report*

4. Tap **Back** to return to the DTC status entry screen.
5. Tap **Back** again to return to the Codes menu.

5.3.2 Data Display

Select **Data** to view live datastream parameters from the vehicle ECM. In data display mode the screen has a toolbar and a main body (Figure 5-9).

Figure 5-9 *Sample data display screen*

The buttons on the toolbar operate as shown in Table 4-1 on page 17 while viewing data.

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** button on the toolbar selects which parameters are fixed (see Locking Parameters, on page 34).

Pausing Data Collection

You may "pause" the collection of data from the vehicle control module to more closely examine it. When data is paused, all previous frames of data stored in the scan tool memory buffer are available for review.

▶ **To pause data collection:**

1. While viewing live data, touch the **Pause** button.

    On the toolbar, the Record button replaces the Pause button and the Previous Frame, Back 10 Frames, Next Frame, and Forward 10 Frames buttons display. A frame 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 frame 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 toolbar buttons to more accurately position the cursor. The cursor, a vertical line that indicates your position when in the graph mode, appears once you begin navigating through the data (Figure 5-10).
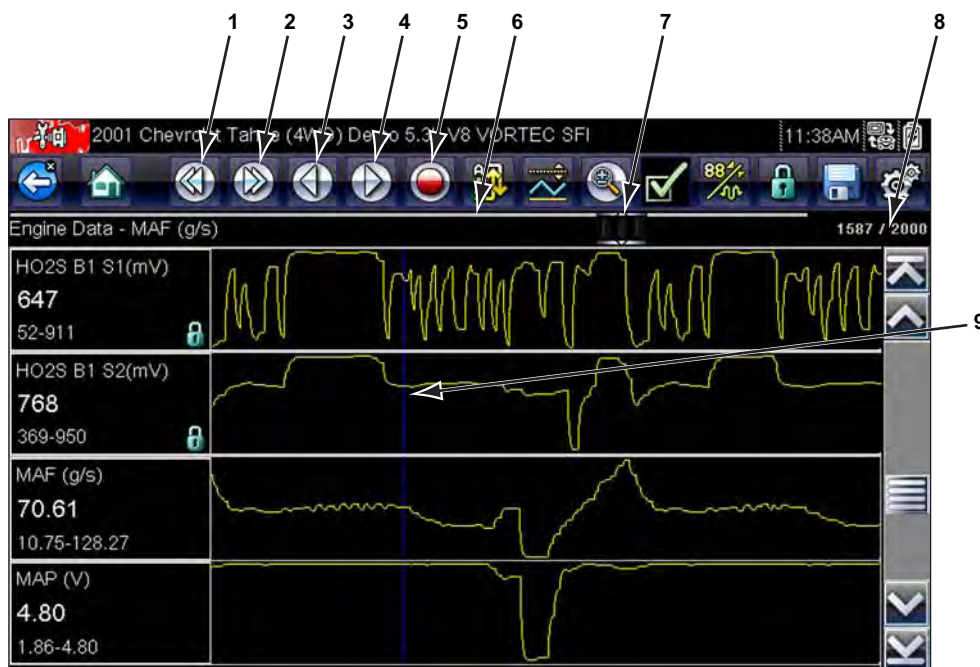
1— **Back 10 Frames button**
2— **Forward 10 Frames button**
3— **Previous Frame button**
4— **Next Frame button**
5— **Record button**
6— **Bar Graph**
7— **Slider**
8— **Frame counter (current frame/total frames)**
9— **Cursor**

Figure 5-10 *Sample paused frame of data*

2. Scroll to review the data in the frame.
3. To switch frames, touch **Previous Frame** or **Next Frame**. Each button touch moves one frame in the selected direction.

To resume collecting data:

*   Touch the **Record** button.

    The display changes to live 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** button can be set to perform the Pause/Play function. See Configure Shortcut Key, on page 74 for additional information.

Customizing the Data List

The **Custom Data List** button on the Scanner 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 cannot 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. Tap the **Custom Data List** button on the toolbar to select it.

   The data selection screen displays and two new buttons 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 buttons provide options for selecting and deselecting parameters to include or remove from the custom data list:

Button	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 touching 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. Touching the **Select All/Deselect All** button immediately changes all of the parameters to the same condition, a second touch changes them all back.

   b. Touching the **Select/Deselect** button activates it. Now you can add or remove parameters by touching individual entries in the list.

   Keep the following in mind:

   – Items at the top of the list that cannot be highlighted are locked and cannot be turned off.

   – Use the **Select All** button to display the complete list.

   – Use the **Deselect All** button to remove all of the highlights.

   – Use the **Cancel** button to return to the data display.

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

Changing Screen Views

Selecting the **View** button opens a dropdown 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 5-9).

The 1, 2, and 4 Graph views divide the screen horizontally to simultaneously display data graphs for the indicated number of parameters (Figure 5-11). Use the scroll bar or the **up (▲)** and **down (▼)** keys to view other parameters in the list.
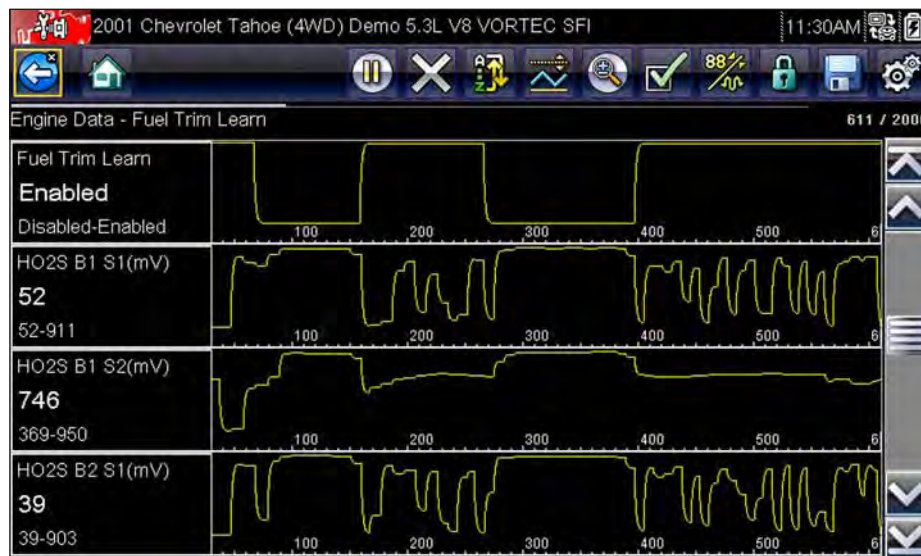

Figure 5-11 *Sample 4 Graph view screen*

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** button 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 5-12). 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. Tap the **Lock/Unlock** button 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.

Figure 5-12 *Sample 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. Tap the **Lock/Unlock** button 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.

Saving

The **Save** button is used to record movies of vehicle datastream values. Saving helps when trying to isolate an intermittent problem or to verify a repair during a road test. Saved files also provide documentation that helps you explain intermittent problems to your customers.

A number of data movies can be stored, which can later be opened by selecting the Previous Vehicles and Data button on the home screen.

Saved files can also be downloaded to a personal computer (PC) through the Mini USB port. Once connected to the PC, SOLUS Ultra 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.

ShopStream Connect is a free download available at: http://diagnostics.snapon.com/SSC.

▶ **To save a movie:**

*   Select **Save**.

    A save movie dialog box displays while data is being saved. The movie is saved when the message box disappears.
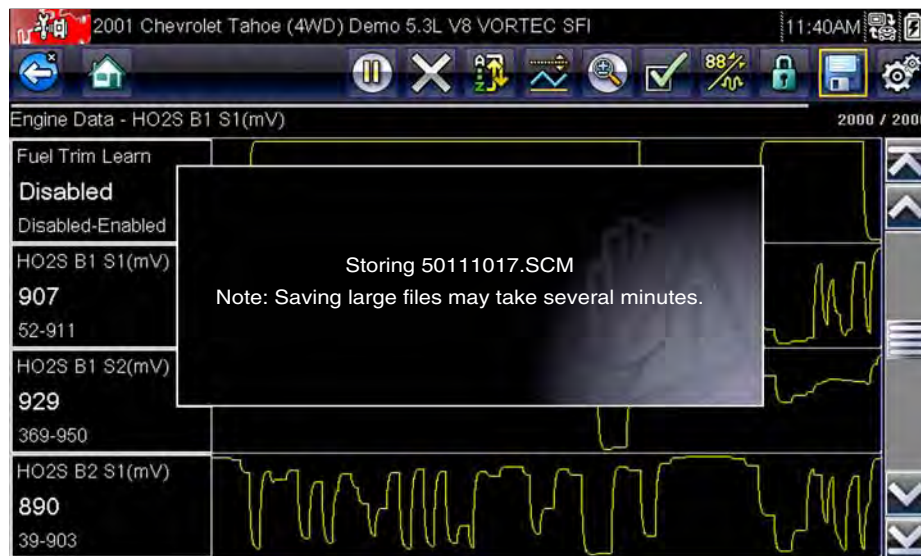
Figure 5-13 *Sample save dialog box*

NOTE:
The **Shortcut** key can be programmed to perform the Save Screen or Save Movie function. See Configure Shortcut Key, on page 74 for details.

Setting Trigger Levels

The Trigger button on the toolbar allows you to configure the scan tool to automatically capture data when a parameter value crosses a threshold. When triggering is armed, a "trigger event" pauses data collection and records a data movie. These movies are similar to an OBD-II/EOBD freeze-frame event, but include much more information.

Selecting the **Trigger** button 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 scan tool to capture an event when the signal crosses a threshold value.
- **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. Tap the **Trigger** button.
3. Select **Set Trigger** from the dropdown menu.

   A graph of the highlighted parameter with a trigger toolbar above it fills the main body of the screen (Figure 5-14).
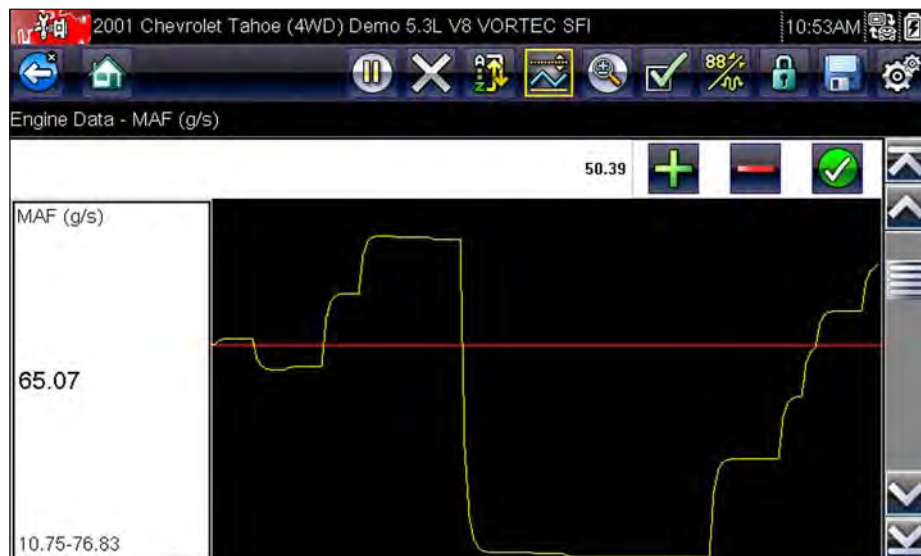
Figure 5-14 *Sample trigger set screen*

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.   Tap the plus (**+**) and minus (**–**) buttons on the toolbar, or use the up ▲ and down ▼ arrow keys to position the upper trigger level to where you want it on the graph.

5.   Tap ✓ on the toolbar, or press the **Y/✓** key, to set the upper threshold.

     A lower trigger level line now appears at the mid-point of the graph.

6.   Tap the plus (**+**) and minus (**–**) buttons on the toolbar, or use the up ▲ and down ▼ arrow keys to position the lower trigger level line to where you want it on the graph.

7.   Tap ✓ on the toolbar, or press the **Y/✓** key, to set the lower threshold.

8.   Press **Y/✓** once the lower trigger is set to exit.

The display returns to the live 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 a recording.

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.   Tap the **Trigger** button on the toolbar.

2.   Select **Arm Triggers** from the dropdown 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.

5.3.3 Functional Tests

The **Functional Tests** selection is used to access vehicle-specific subsystem and component 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 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 datastream information in the main body (Figure 5-15).

Figure 5-15 *Sample functional test screen*

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

A Data List button, 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 button is only available when the test is inactive.

5.4 Exiting the Scanner

The Scanner 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 Scanner tests and power down the diagnostic tool. A warning message displays if you attempt to shut down while the Scanner 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 tool.

To exit the Scanner:

1. From any active data screen, tap the **Back** button on the toolbar.

    A "stopping communications" message briefly displays followed by the Data menu.

2. From the Data Menu, tap **Back** on the toolbar.

    Again, a "stopping communications" message briefly displays followed by the Main menu.

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

OBD-II/EOBD Operations

This Home screen option allows you to access Generic OBD-II/EOBD Scanner tests without completing a vehicle identification. This presents a quick way to check for emissions-related diagnostic trouble codes (DTCs), isolate the cause of an illuminated malfunction indicator lamp (MIL), check monitor status prior to emissions certification testing, verify repairs, and perform a number of other emissions services. Also use OBD-II/EOBD for testing OBD-II compliant vehicles that are not included in the Scanner databases.

The Data Cable must be connected to the test vehicle and communicating with the electronic control module (ECM) because OBD-II/EOBD is a Scanner function. Remember, only generic OBD-II information is available. You must select from the Vehicle Manufacturers Menu for enhanced OBD-II functions.

Two options are available after OBD-II/EOBD is selected on the Home screen:

- OBD Health Check
- OBD Direct

6.1 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. Tap **Continue** or press **Y/✓** to open a submenu of test options (Figure 6-1).
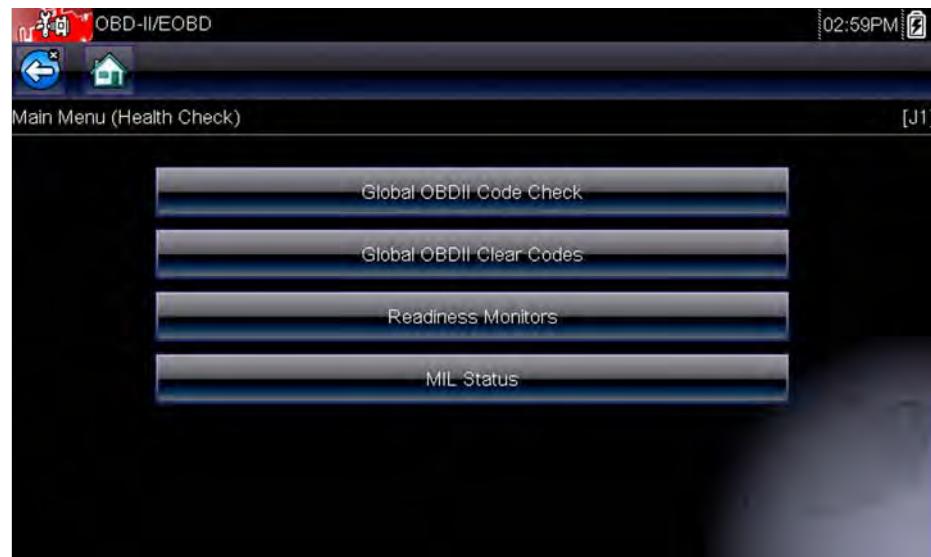
Figure 6-1 *Sample OBD Health Check menu*

6.1.1 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 (Figure 6-2).
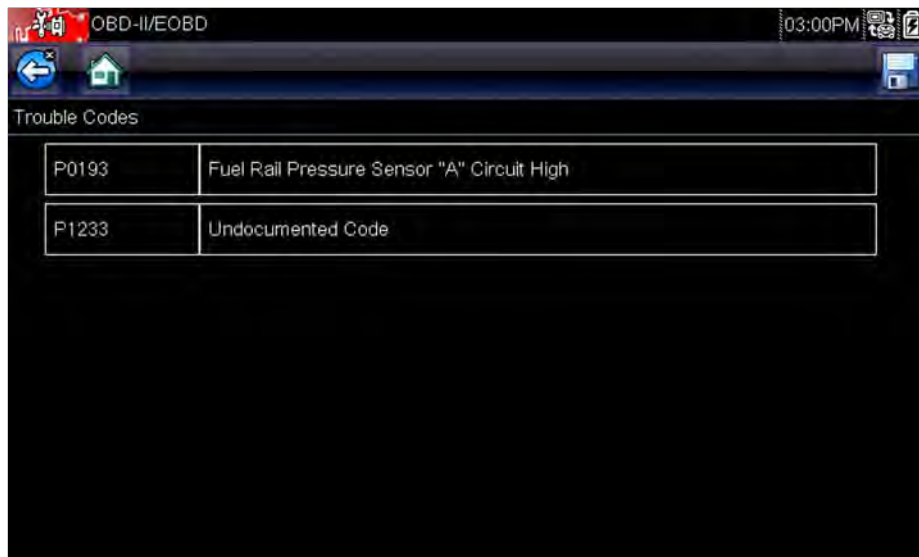

Figure 6-2 *Sample code list*

Codes

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

OBD-II/EOBD Codes have a priority according to their emission severity, with higher priority codes overwriting lower priority codes. 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 scan 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.

6.1.2 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.

6.1.3 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. All of the Readiness Monitors must run and complete prior to emissions certification testing. 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 6-3).

Figure 6-3 *Sample 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.

6.1.4 MIL Status

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

6.2 OBD Direct

Selecting OBD Direct opens a menu of two choices:

- OBD Diagnose
- OBD Training Mode

Training mode allows you to navigate through the menus without being connected to a vehicle. Selecting OBD Diagnose opens a menu that lets you choose from the following options:

- **Start Communication**—initiates a test session
- **Select Communication Protocol**—establishes which communication protocol to use
- **Connector Information**—provides vehicle data link connector (DLC) location details

6.2.1 Start Communication

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

▶ **To perform an OBD-II/EOBD Test:**

1. Select **Start Communications** from the OBD-II/EOBD menu.

   A vehicle type menu displays:
   - 12V Light Duty Vehicle
   - 24V Heavy Duty/Goods Vehicle

2. Select an option from the menu.

   A connection message displays.

3. Connect the data cable to the test vehicle.

4. Select **Continue**.

   The scan tool establishes a communication link with the test vehicle, then opens an information screen (Figure 6-4).

Figure 6-4 *Sample protocol information screen*

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

5. Select **Continue**.

A Select Service menu of available tests opens:

- **–** Readiness Monitors, on page 44
- **–** MIL Status, on page 45
- **–** ($01) Display Current Data, on page 45
- **–** ($02) Display Freeze Frame Data, on page 45
- **–** ($03) Display Trouble Codes, on page 45
- **–** ($04) Clear Emissions Related Data, on page 46
- **–** ($05, 06, 07) Display Test param./Results, on page 46
- **–** ($08) Request Control of On-board System, on page 47
- **–** ($09) Read Vehicle Identification, on page 47
- **–** ($0A) Emission Related DTC with Permanent Status, on page 47

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

Figure 6-5 *Sample service menu*

6. Select a test to continue.

Readiness Monitors

Use this menu item to check the readiness of the monitoring system. If a monitor system is not supported, it is not displayed. Scroll, if needed, to view the entire list of monitors (Figure 6-3). 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 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.

($01) Display Current Data

Use this test to display the serial data transmitted by the selected 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 Scanner, see Data Display, on page 30 for more information.
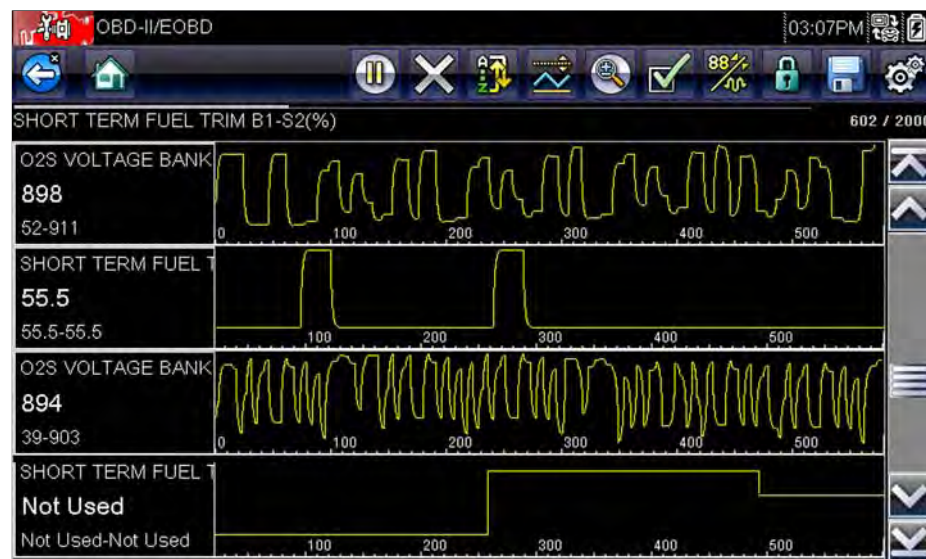
Figure 6-6 *Sample current data display*

($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 fame 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 a Scanner code display (see Display Codes, on page 28 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 6-7).
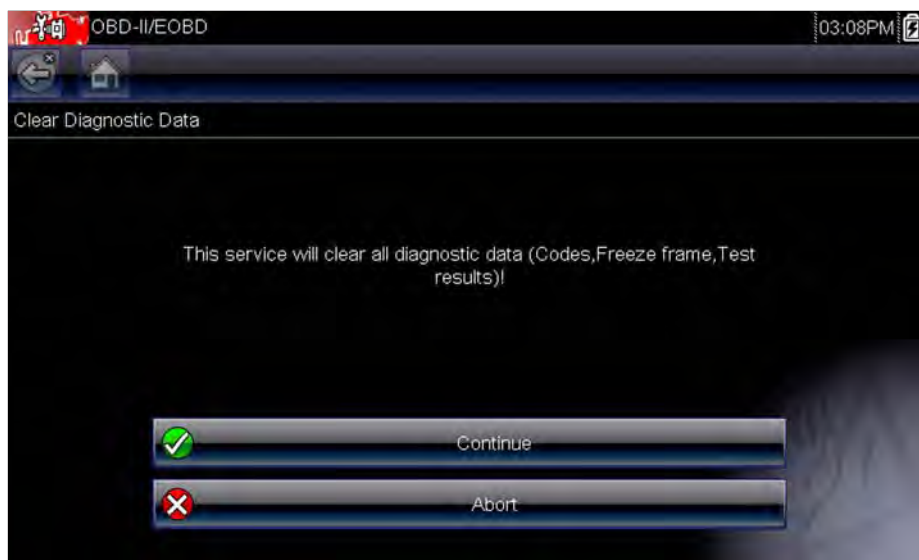
Figure 6-7 *Sample clear codes confirmation*

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 the test results from the monitored systems. The available data is for specific systems and components that the onboard 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 Scanner to control the operation of an onboard system, test, or component. Select a test and follow the on-screen instructions.

($09) Read Vehicle Identification

The purpose of this service is to enable the Scanner 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.

6.2.2 Select Communication Protocol

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

- 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)

Touch **Select Communication Protocol** to open a menu of options (Figure 6-8).
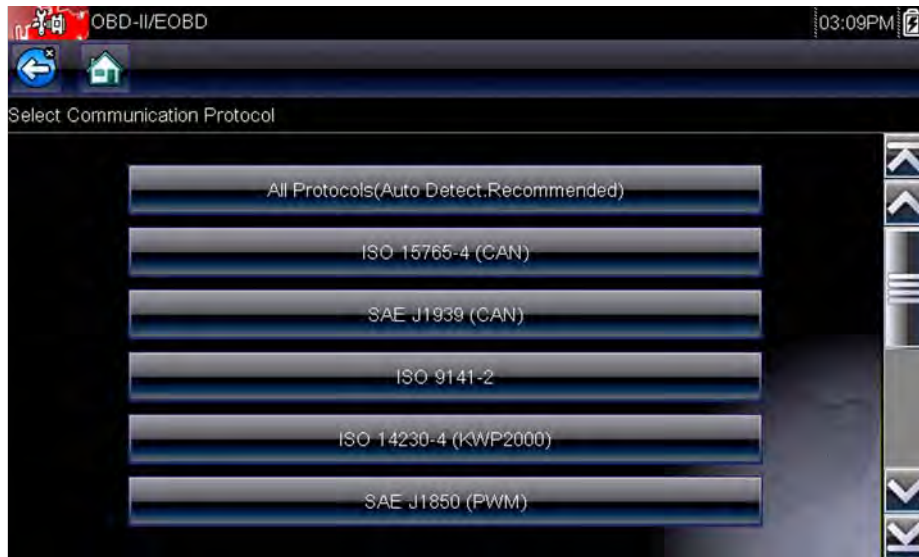
Figure 6-8 *Sample communication protocol menu*

The Scanner attempts to establish communication using each protocol in order to determine which one the vehicle is broadcasting on when **All Protocols** setting is selected.

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

6.2.3 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.

Component Test Operations

The Component Test software 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.

Component Test 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 Vehicle Identification

The information presented is specific to the vehicle being tested. Therefore, certain attributes of the test vehicle must be entered into the unit so that the correct data can be retrieved. Vehicle identification information is carried over if you enter the Component Test 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, you simply follow the screen prompts and make a series of choices. Each selection you make advances you to the next screen.

7.1.1 Identifying a Test Vehicle

Exact procedures to identify the test vehicle may vary somewhat by vehicle and market. The following procedure, which identifies a 2008 Ford Focus for testing the fuel injection system, is typical of what to expect.

▶ **To identify a vehicle for Component Test:**
1. Tap the **Component Test** button on the Home screen.
2. Tap **US Domestic** from the database selection screen.
   A list of manufacturers displays.
3. Select **FORD** from the list of manufacturers.
   A list of model years displays.
4. Select **2008** from the list of years.
   A list of models displays.
5. Scroll and select **Focus** from the list of models.
   A list of engines displays.
6. Select **2.0L** from the list of engines.
   A confirmation screen displays (Figure 7-1).
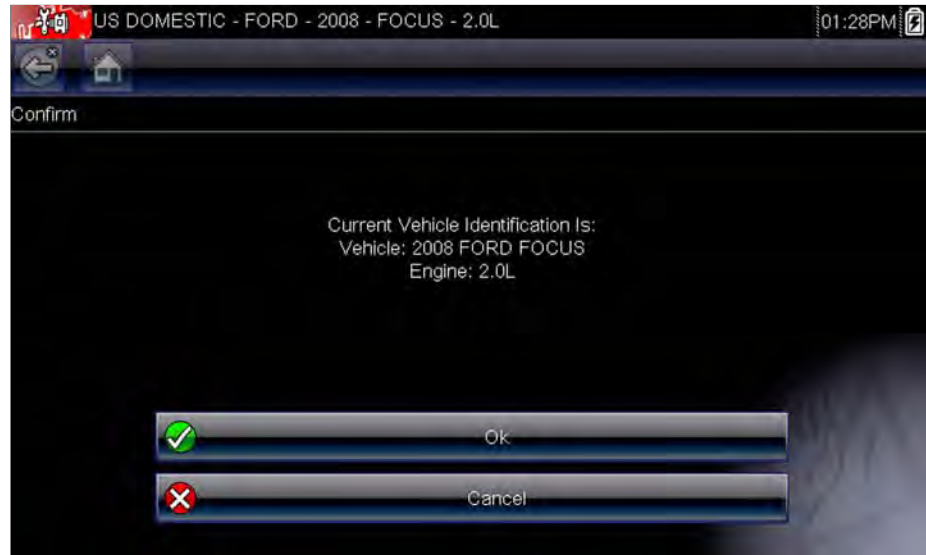
Figure 7-1 *Sample confirmation dialog box*

7.   Select **OK** from the confirmation screen.

     A list of systems available for testing displays (Figure 7-2).
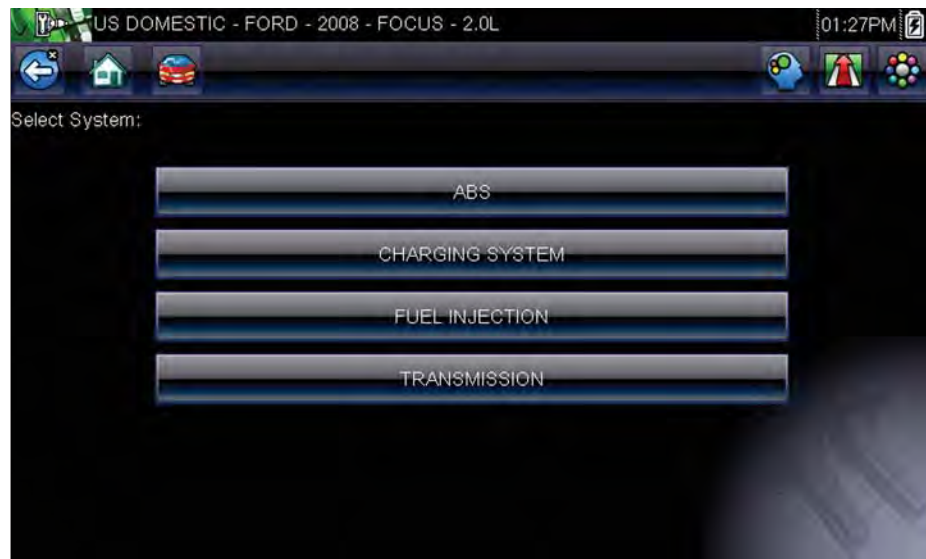
Figure 7-2 *Sample available systems menu*

8.   Select **FUEL INJECTION** and a list of tests available for the identified vehicle displays

9.   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 Component Test information and perform tests.

7.2 Top Level Menu Options

There are three toolbar buttons, known as the Top Level Menu buttons, that are only available on the Component Test System Selection screen. Each button opens an additional menu of supplemental information designed to help you get the most out of the Component Test module. Top Level Menu options include:

- Power User Tests
- How To Guide
- Features and Benefits
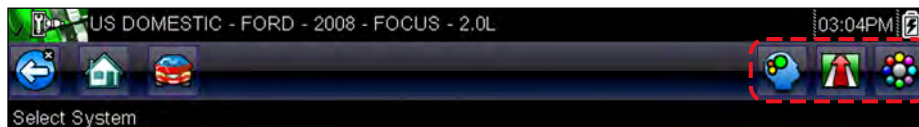
Figure 7-3 *Sample Top Level Menu Option buttons*

7.2.1 Power User Tests

The **Power User Tests** option gives you quick access to a pre-configured 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.

7.2.2 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.

7.2.3 Features and Benefits

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

- **5-MINUTE WALK THRU WITH DEMO BOARD**—exlpains 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 demonstration board not only helps you learn how to use the Component Tests software, it allows you to hone your skills and diagnostic techniques without an actual test vehicle.

7.3   Operations

The Component Test 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 Component Test 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 pre-configured meter for performing the selected test, instructions for performing the test, and offers tips and resources to reduce setup and testing time.

7.3.1   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 7-4).
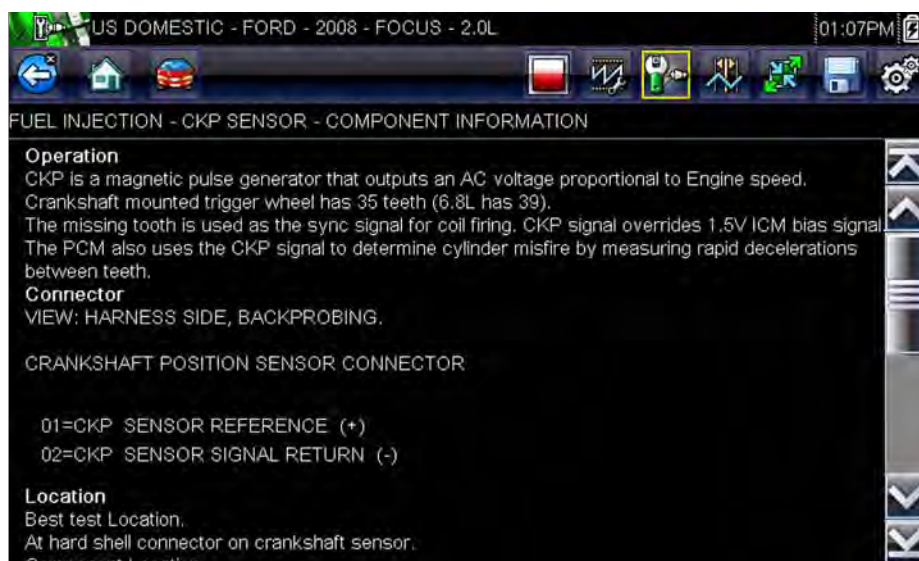
Figure 7-4 *Sample Component Information screen*

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** key, to return to the component menu.

7.3.2 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 7-5 when multiple choices are available.

Figure 7-5 *Sample 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 Component Test list and the test screen displays (Figure 7-6).
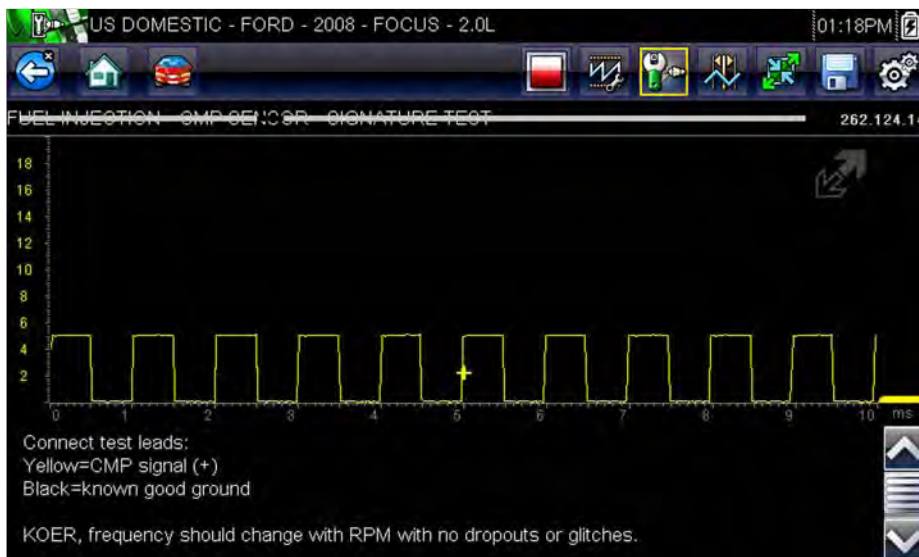
Figure 7-6 *Sample Test screen*

A 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. Tap the **Expand/Collapse** on the toolbar to view the test meter only.

5. Select **Back** on the toolbar to return to the menu.

Adjusting Profile

The pre-configured meter can be used as is for conducting most component tests. However, there are some instances you may want to make adjustments in order to capture a better image of circuit activity. This is done by selecting the **Profile** button from the toolbar.
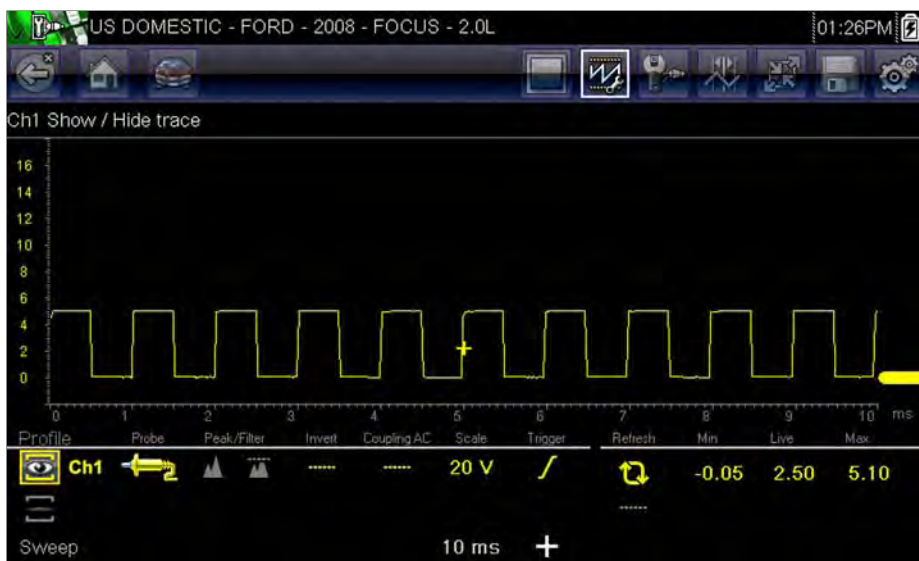
Figure 7-7 *Sample Profile window*

▶ **To adjust profile:**

1. Select **Profile** from the toolbar.

   The Profile window opens below the main body of the screen.

2. Use the touch screen or the control keys to make changes to the Profile:

   – **Profile**—switches the trace on and off.

   – **Probe**—identifies the type of test probe being used.

   – **Peak**—maximizes the signal sampling rate for capturing fast events, such as voltage spikes, dropouts, and glitches.

   – **Filter**—removes noise and interference from the trace.

   – **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 total value displayed on the vertical axis of the display.

   – **Trigger**—switches triggering on or off, and determines which slope of the trace trigger.

3. Tap **Profile** on the toolbar or press **N/X** to move focus back to the toolbar once you are finished making adjustments.

For more detained information about adjusting how a sampled signal displays on the screen refer to Trace Controls, on page 62.

Chapter 8 — Scope Multimeter Operations

The Scope Multimeter module provides all the tools needed for performing circuit tests and for monitoring signals and circuit activity.

8.1 Getting Started

The Scope and Multimeter enables your diagnostic tool to function as either a digital multimeter (DMM), a graphing multimeter, or a 2-channel oscilloscope.

8.1.1 Capabilities

The following tables detail the software and hardware capabilities:

- Scope
- Graphing Multimeter
- Digital Meter

Table 8-1 *Scope*

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 VDC (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 port on the diagnostic tool for values on Ch.1, or to the green port on the tool for values on Ch. 2. Connect the negative (–) lead to GND (black port)[1].
1. Do not use the Low Amp Probe to measure current on conductors at a potential greater than 46VAC peak or 70VDC.		

Table 8-2 *Graphing Multimeter*

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)	50VDC	Do not measure greater than 50 VDC (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 port on the diagnostic tool for values on Ch.1, or to the green port on the tool for values on Ch. 2. Connect the negative (–) lead to GND (black port)[1].
1. Do not use the Low Amp Probe to measure current on conductors at a potential greater than 46VAC peak or 70VDC.		

Table 8-3 *Digital Meter*

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)	50VDC	Do not measure greater than 50 VDC (rms)
Signal Measurement Input Impedance	10 Mohm	
Ohm Measurement Diode Test Continuity Test	Ch. 1— banana jack, yellow (–) Ch. 2— banana jack, green (+)	
Ohms	400 Ohm—4Mohm	Fixed scales or auto ranging
Glitch Capture	Approximately 50 uS	
Diode test	2V scale	

8.1.2 Leads and Adapters

The Scope Multimeter uses standard safety plugs that are compatible with many accessories. The leads, clips, and adapters supplied with or available for the unit 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.

Channel 1 Lead

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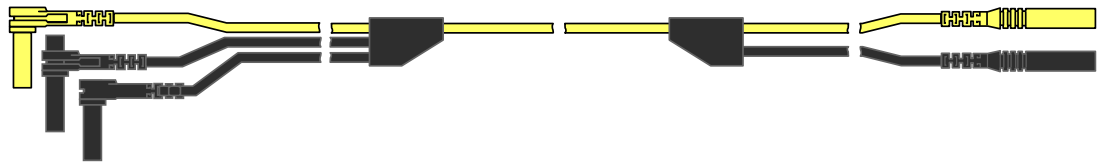
Figure 8-1 *Yellow Channel 1 Lead*

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) port on top of the unit. 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 port on the unit.

Channel 2 Lead

The shielded green lead (Figure 8-2) 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 8-2 *Green Channel 2 lead*

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 8-3).
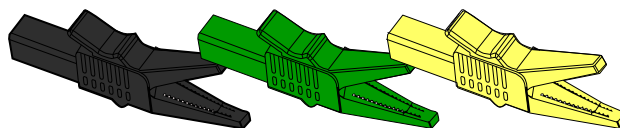
Figure 8-3 *Alligator clips*

Secondary Coil Adapter Lead (optional)

The optional Secondary Coil Adapter lead (Figure 8-4) connects to the clip-on secondary wire adapter, coil-in-cap adapter or coil-on-plug adapter to display secondary waveforms.
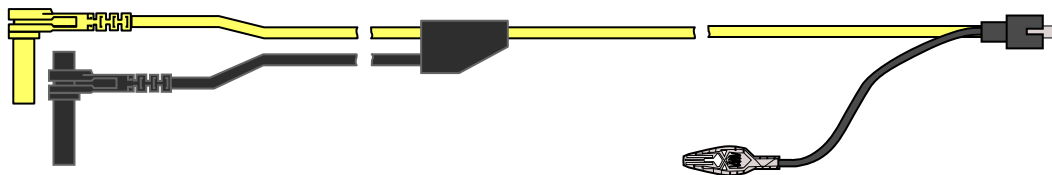
Figure 8-4 *Secondary Coil Adapter lead*

Secondary Ignition Clip-on Wire Adapter (optional)

The optional Secondary Ignition Clip-on Wire Adapter (Figure 8-5) connects the Secondary Coil Adapter lead to the vehicle secondary wire to display ignition patterns.
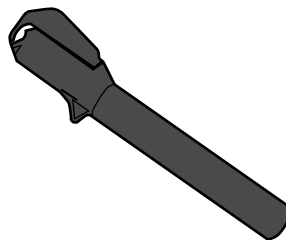
Figure 8-5 *Secondary Ignition Clip-on Wire Adapter*

Low Amp Current Probe (optional)

The optional Low Amp Current Probe (Figure 8-6) 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 8-6 *Low Amp Current Probe*

8.2   Operations

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

8.2.1   Starting the Scope and Multimeter

Use the following procedure to set up the scope multimeter for performing tests.

▶ **To start the scope multimeter:**

1.   Select the **Scope Multimeter** button on the Home screen.

     The Scope Multimeter main menu opens and offers the following setup options:

     – Lab Scope
     – Graphing Multimeter
     – Digital Multimeter

2.   Tap to select an option.

     A submenu of scope or meter configuration displays, see below for additional information.

3.   Tap to select the correct configuration for the tests to be performed.

     The Scope Multimeter displays configured for the selected test.

Lab Scope Options

The following options are available for testing:

- 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

Graphing Multimeter Options

The following options are available for testing:

- Dual Graphing Meter
- Volts DC
- Volts DC - Average
- Volts AC RMS
- 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

Digital Multimeter Options

The following options are available for testing:

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

8.2.2 Scope and Multimeter Setup

The following sections explain how to adjust the scope and multimeter for the specific type of signal being sampled. A pre-configured meter, which reduces setup time, is available for many applications in Component Test, see Power User Tests, on page 51 for details.

Most of the setup operations are available by selecting the **Profile** button on the toolbar. Selecting the button opens the Trace Controls window at the bottom of the screen. Other operations are suspended while Profile is active. Note how the other toolbar buttons are greyed out in Figure 8-7 because Profile is selected.

Figure 8-7 *Sample toolbar with Profile selected*

Trace Controls

The Trace Detail controls are used to adjust individual characteristics of how the signal is sampled and displayed for each channel. Available options include:

- Profile—switches the waveform on and off.
- Probe—identifies the type of test probe being used.
- 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.

Profile

The profile icons are used to switch the channel off and on.

Profile	Icon	Description
On		The waveform displays for the designated channel.
Off		The waveform does not display.

Tap a highlighted icon or press **Y/✓** to switch the channel off and on.

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 **Profile** from the toolbar.

   The Profile information window opens

2. Tap the **Probe** icon for the desired channel.

   The Probe selection menu opens (Figure 8-8).
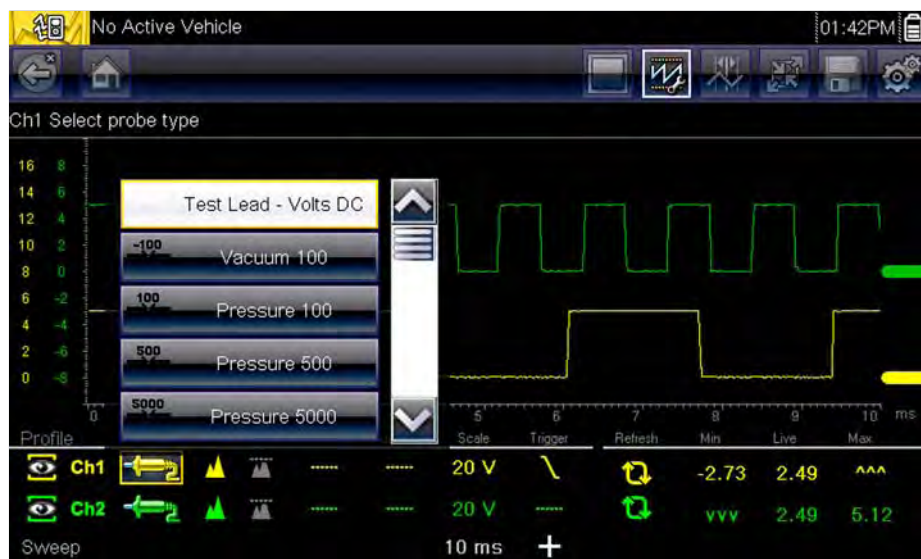
Figure 8-8 *Sample probe selection menu*

3. Highlight the desired probe in the menu.

4. Tap the highlighted probe to select it.

5. 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		Any signal interference on the sampled circuit is included in the waveform displayed for 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. Tap the **Scale** value for the channel you wish to adjust.

The Scale menu opens (Figure 8-9).
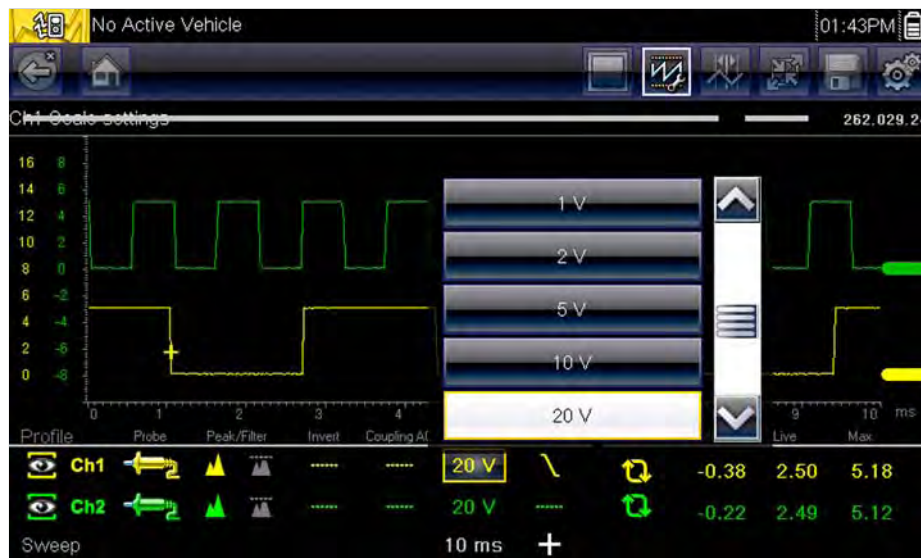
Figure 8-9 *Sample Scale menu*

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

Trigger

Triggering 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. Tap 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.

3. Once the slope is determined, tap the plus sign (**+**) at the bottom of the information window. The trigger adjustment controls open (Figure 8-10).
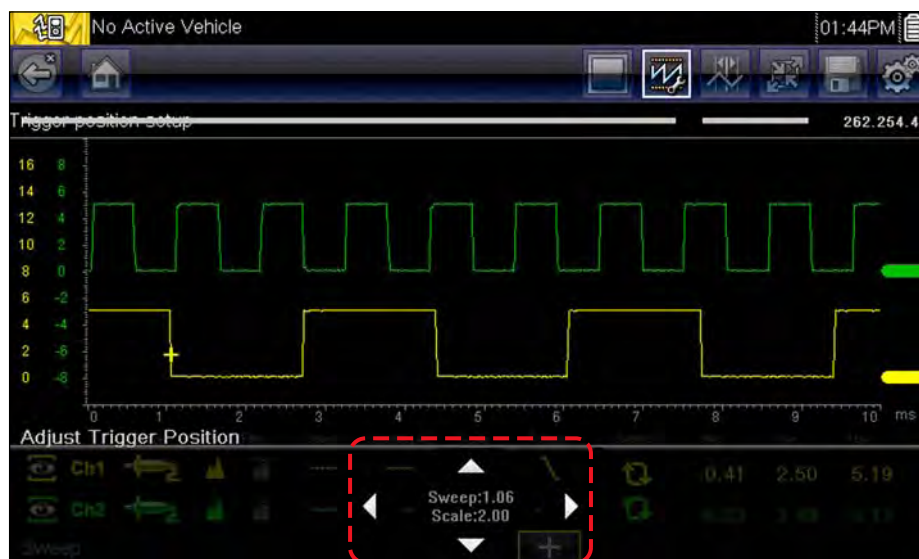
Figure 8-10 *Sample Trigger controls*

4. Tap 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.
5. Select **Profile** from the toolbar, or press the **N/X** key, to exit.

Refresh

Selecting **Refresh** from the Profile 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 nanoseconds 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:**

1. Select **Profile** from the Scope Multimeter toolbar.

   The Profile information window opens.

2. Tap the **Sweep** value on the bottom line of the Profile information panel.

   The Sweep menu opens (Figure 8-11).
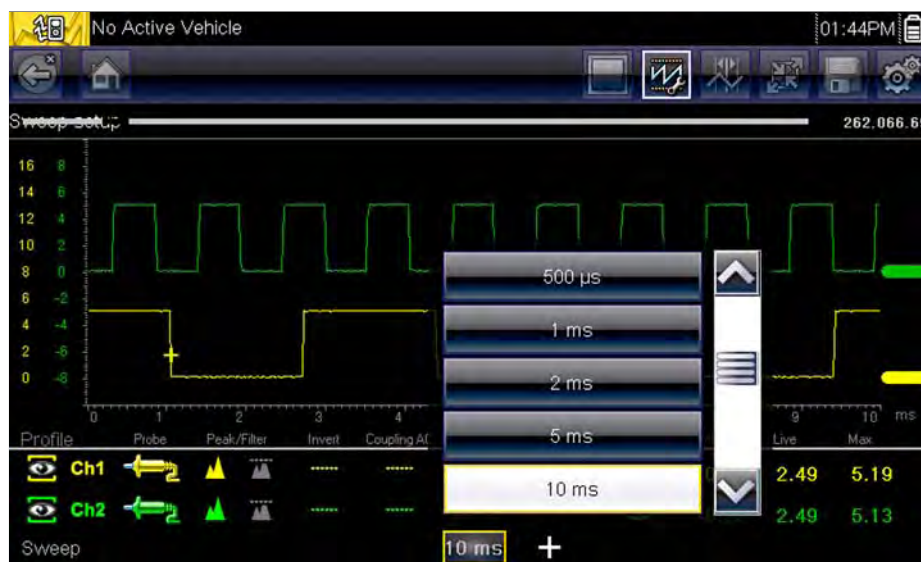
Figure 8-11 *Sample Sweep menu*

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

Cursors

Selecting the **Cursor** button on the Scope Multimeter toolbar places two vertical rules on the screen that can be repositioned to measure intervals (Figure 8-12).
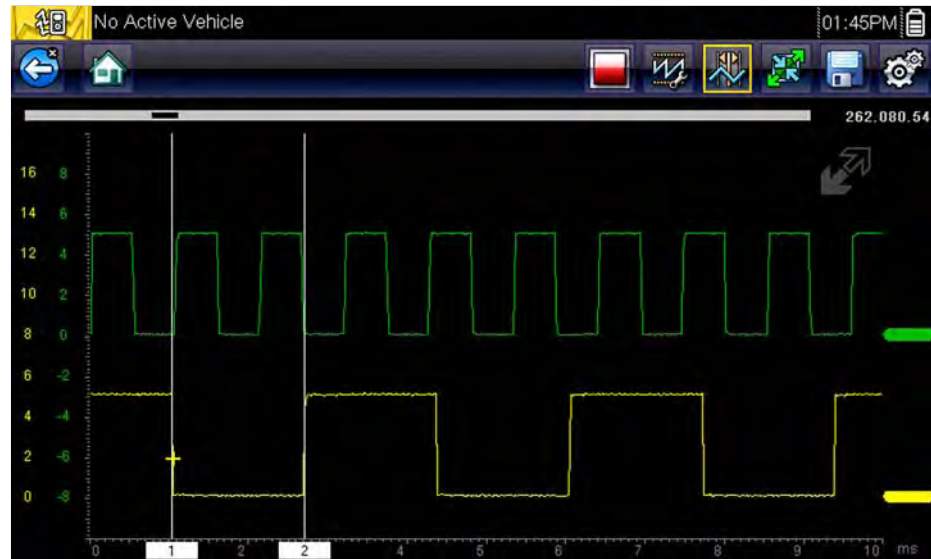
Figure 8-12 *Sample cursor display*

▶ **To reposition the cursors:**

1. Tap the **Cursor** button on the toolbar to activate cursors.

2. Touch and drag the numbered rectangle in the sweep area of the display to move that cursor to where you want it.

3. Touch and drag to move the other cursor.

4. Tap the **Cursor** button to cancel the cursors.

Chapter 9 — Previous Vehicles and Data

The Previous Vehicles and Data Home screen selection allows you to quickly configure the diagnostic tool to the identity of a recently tested vehicle, and to access saved data files. A menu of options opens when **Previous Vehicles and Data** is selected:

- Vehicle History
- View Saved Data, on page 71
- Delete Saved Data, on page 72

9.1 Vehicle History

The 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 9-1 *Sample 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 that includes the vehicle ID, date, and time. Scroll to view the entire list.
3. With the item to be opened highlighted, either tap the vehicle ID or press the **Y/✓** key.

   The appropriate software loads and a vehicle ID confirmation screen displays.
4. Select **OK** or press **Y/✓** to continue.

A connection message displays.

5. Connect the data cable to the vehicle, then select **OK** or press **Y/✓** to continue.

The menu for the last system tested on the selected vehicle displays.

9.2   View Saved Data

Selecting the **View Saved Data** menu option opens a list of all the data movies 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. The vehicle ID characteristics are included in the listings as well.

Figure 9-2 *Sample 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.

▶ **To review a movie:**

1. Select **Previous Vehicles and Data** from the Home screen.
2. Select **View Saved Data** from the menu.
3. Select a movie from the list of saved files.

The movie opens and plays in real time. The **Play** button changes to the **Pause** button at the end of the movie.

Movie reviewing tips:

• The **Pause/Play** and **Graph** toolbar buttons are active while a movie is playing, so you can stop the movie or switch between list and graph view at any time.

• The **Previous Frame** and **Next Frame** buttons are active if the data is paused.

9.3 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/Deselect and Select All/Deselect All buttons 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.

Tools

The Tools option on the home screen is used to configure the diagnostic tool for your personal preferences. Tap the **Tools** button to open a menu of options.
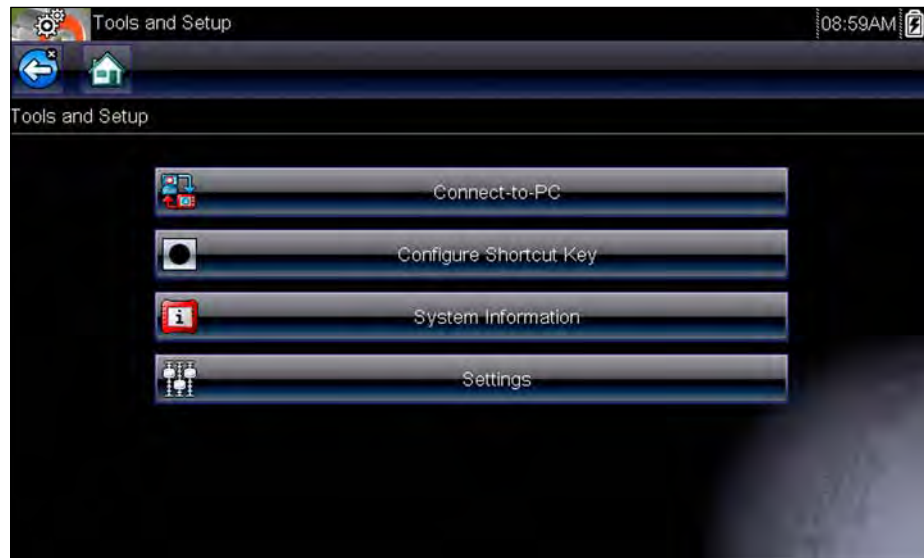
Figure 10-1 *Sample Tools menu*

10.1 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 Key, on page 74—use to change the function of the shortcut key
- System Information, on page 74—use to view configuration information for the diagnostic tool
- Settings, on page 75—use to configure certain characteristics of the diagnostic tool

10.1.1 Connect-to-PC

Connect-to-PC opens a menu of two choices: Connect -to-PC and Connect-to-ShopStream. The Connect-to-PC option allows you to access the saved files on your diagnostic tool through your personal computer. For shops that use the ShopStream network, Connect-to-ShopStream allows you to connect into the system as a scanner.

The optional ShopStream Connect™ software, which lets you view data files on a personal computer, transfer files between the tool and PC, and download software updates from the PC to the tool, offers an ideal way to manage saved data files. ShopStream Connect is a free software program that can be downloaded from the Internet at: http://diagnostics.snapon.com/SSC.

▶ **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.
3. Select **Connect-to-PC** from the Connect-to-PC menu.
4. Follow the instructions on the screen to complete the operation.

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

10.1.2 Configure Shortcut Key

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

- **Brightness**—opens the brightness setting screen.
- **Save Screen**—saves a bitmap image of the visible screen.
- **Save Movie**—saves a recording of the data buffered in tool memory.
- **Show Shortcut Menu**—opens the menu so you can quickly select from any of the functions.
- **Toggle Record/Pause**—programs the Shortcut key to work as the Pause and Play buttons.

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

10.1.3 System Information

The **System Information** option lets you view configuration information for your diagnostic tool.

Figure 10-2 *Sample system information screen*

▶ **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** key to return to the options menu.

10.1.4 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, on page 75
- Configure Scanner, on page 80
- Configure Scope/Meter, on page 81
- Configure Units on page 83

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 75—adjusts the intensity of the screen back lighting.
- Color Theme, on page 76—changes the background color of the screen display.
- High Contrast Toolbar, on page 77—enhances toolbar graphics for poor lighting conditions.
- Font Type, on page 77—switches between standard and bold text for better visibility.
- Backlight Time, on page 78—adjusts how long the screen stays on with an idle unit.
- Touch Calibration, on page 78—calibrates the touch screen display.

Date & Time options include:

- Time Zone, on page 79—sets the internal clock to the local time standard.
- Clock Settings, on page 79—sets the time on the internal clock.
- Daylight Savings Time, on page 80—configures the clock for Daylight Savings Time.
- Time Format, on page 80—switches the time displays between a 12 or 24 hour clock.
- Date Format, on page 80—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 10-3).
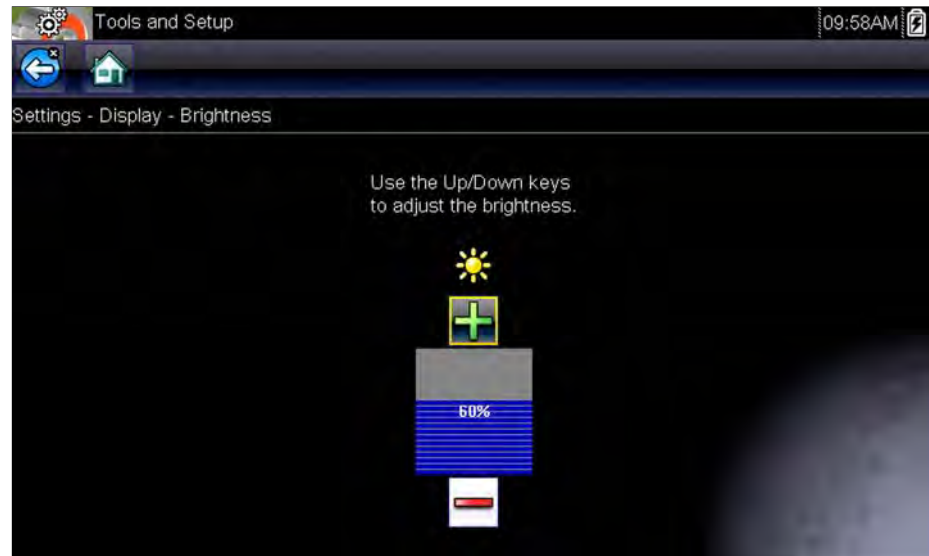
Figure 10-3 *Sample brightness setting screen*

Each tap of the **Plus** and **Minus** buttons, 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** key 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.
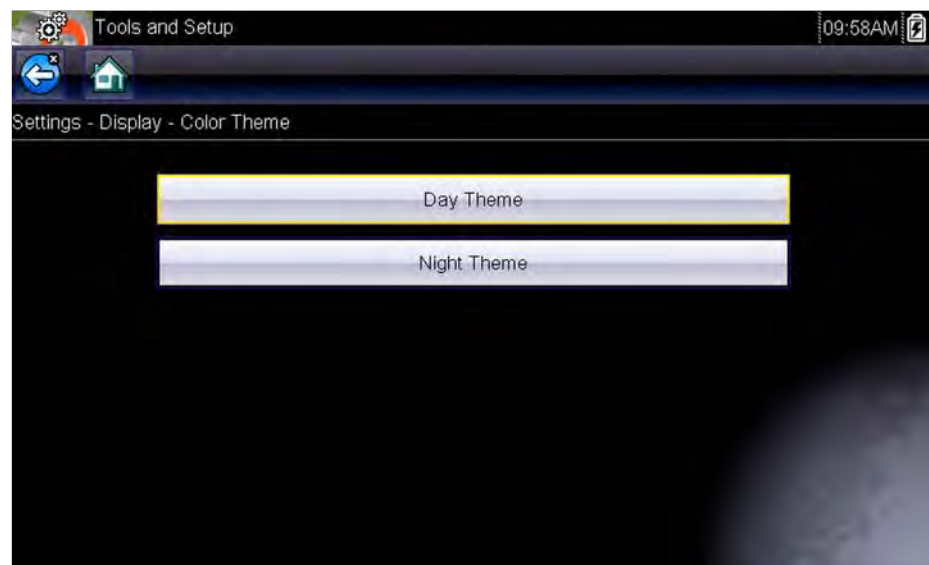
Figure 10-4 *Sample Night Theme menu screen*

High Contrast Toolbar

This option allows you to switch to a high contrast toolbar. This toolbar features black and white buttons with crisp graphics that are easier to see in poor lighting conditions or bright sunlight.
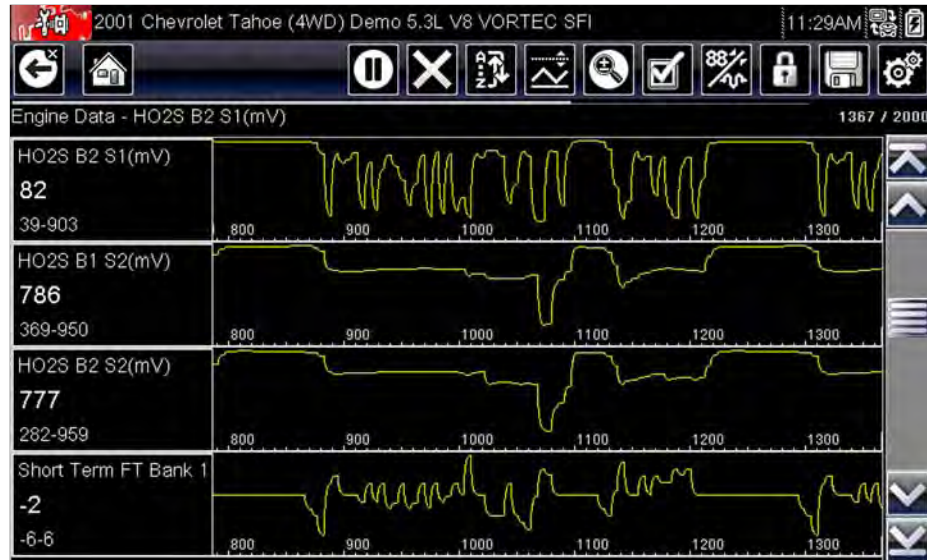
Figure 10-5 *Sample high-contrast toolbar*

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.
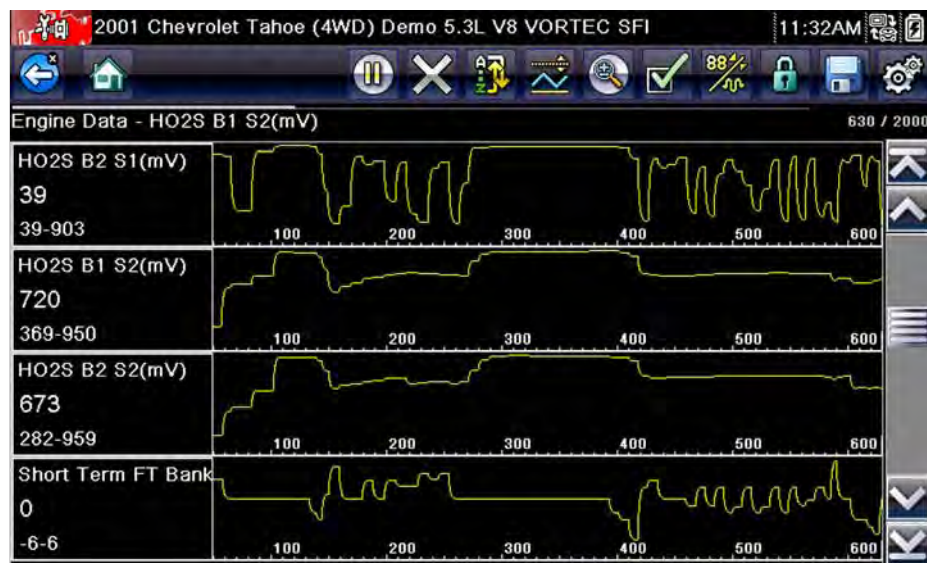
Figure 10-6 *Sample bold type on a black background*

Selecting opens a menu with two choices: Normal Font and Bold Font. Tap a menu item, or scroll with the keypad and Press **Y/✓**, to make a selection. The change is instantaneous. Select the Back or Home button 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 tool is inactive. The following choices are available:

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

Tap the menu item desired, or scroll with the keypad and Press **Y/✓**, to make a selection. Select **Back** or **Home** on the toolbar to return to either the Settings menu or the Home screen.

Touch Calibration

Calibrating the touch screen maintains the accuracy of the touch-sensitive display. Perform the following procedure on a routine basis to keep your diagnostic tool in good working order.

▶ **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 10-7).

Figure 10-7 *Sample calibration screen*

4. Touch each box on the screen as it displays.

   The display returns to the Settings menu once the screen calibration procedure is complete.

IMPORTANT:
It is critical to complete the touch screen calibration sequence once it has begun. Never power down the unit while a screen calibration is in process, serious damage to the unit may result.

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 10-8).
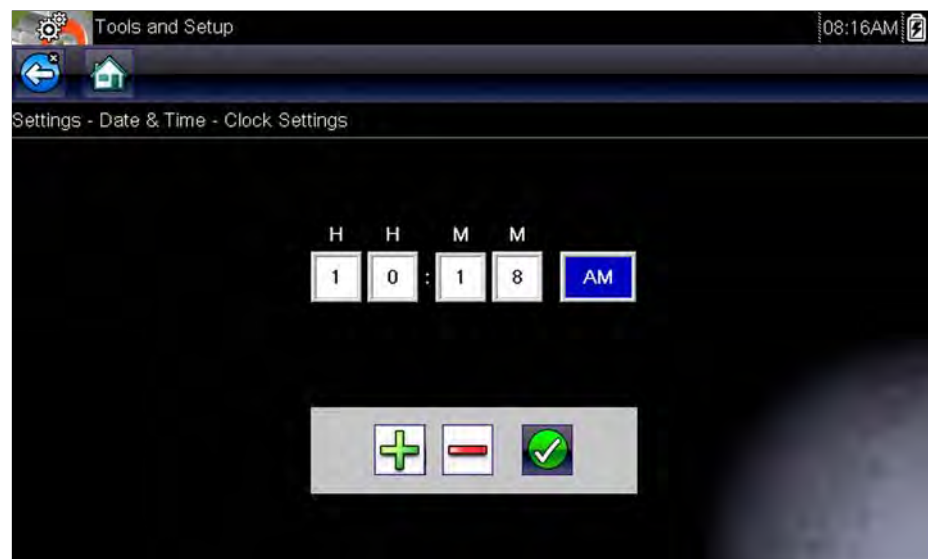
Figure 10-8 *Sample Clock Settings screen*

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

Configure Scanner

This option determines whether or not the scales are displayed on the data graphs when using the Scanner. Scales are the graduations and values that display on the horizontal axis at the base of the parameter graphs. The waveform to fill the entire graph area with scales switched off.

Figure 10-9 *Sample scanner screen with scales hidden*

▶| **To switch scanner 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. Tap the **Back** button or press the **N/X** key 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 81
- Display, on page 81
- Divisions, on page 82

Trigger Mode

Configure Scope/Meter allows you to choose the type of trigger to begin an automatic recording, see Trigger, on page 66 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 tap **Back** or press the **N/X** to return to the Configure Scope/Meter menu.

Display

This option switches a grid pattern on the meter screen on and off.
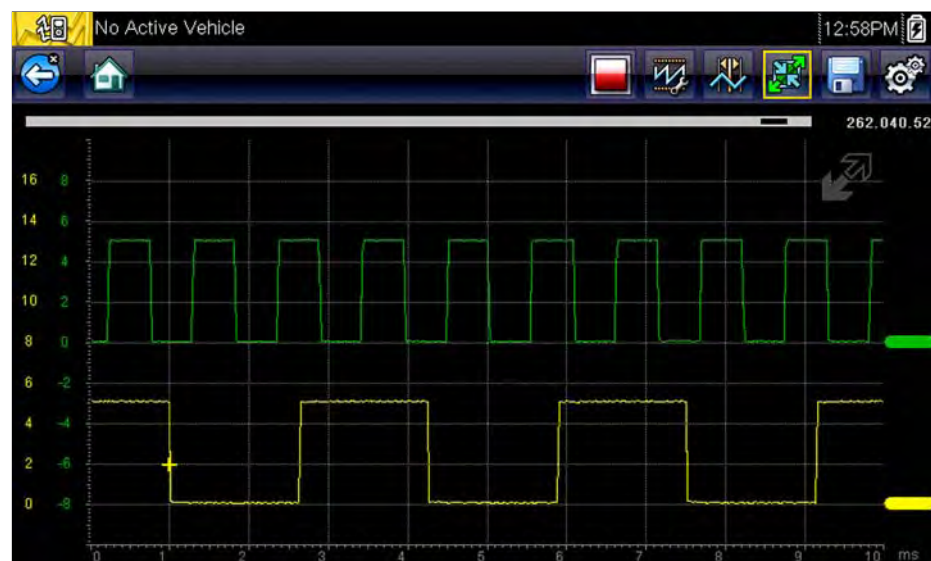
Figure 10-10 *Sample Scope multimeter screen grid*

▶ **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. Tap the **Back** button or press the **N/X** key 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.
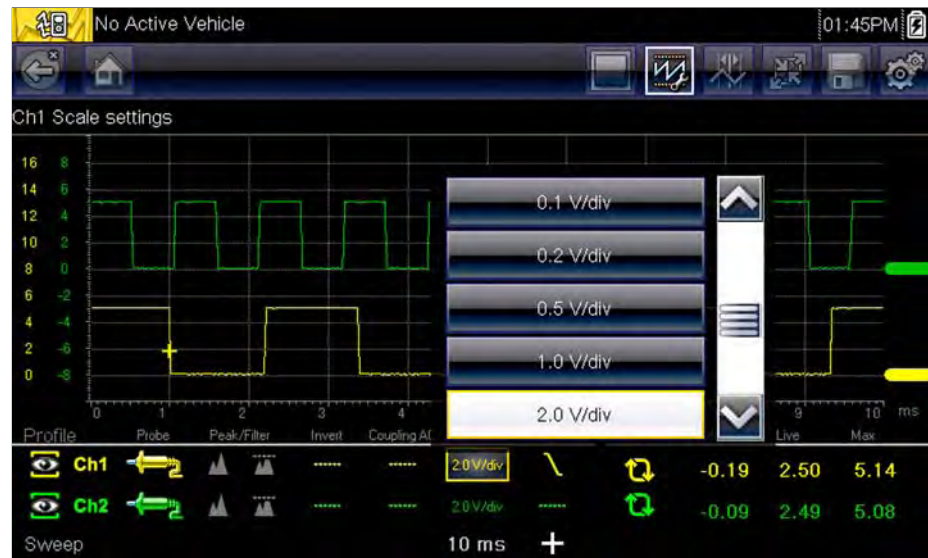
Figure 10-11 *Sample Scope Multimeter screen set to Per Division*

▶ **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. Tap the **Back** button or press the **N/X** key twice to return to the menu.

          d. Select **Trace Settings** or **Display Settings**, and repeat Step 4 if needed.

5.   Tap the **Back** button or press the **N/X** key 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 10-12 *Sample 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.

     – Temperature

     – Vehicle Speed

     – Distance

     – Vacuum

     – Pressure (Scope)

     – Pressure, Air (Scanner)

     – Pressure, Other (Scanner)

4.   Select a setting from the listed choices.

5.   Select **Back** on the toolbar or press the **N/X** key to return to the options menu.

Maintenance

This chapter covers how to care for your diagnostic tool.

11.1   Cleaning and Inspecting the Diagnostic Tool

When using the diagnostic tool perform the following tasks to keep it in top shape:

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

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

11.1.1 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.

11.2   Battery 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.

11.2.1 Battery 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 in 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.

11.2.2 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 captive screws that retain the battery compartment cover on the back-side of the diagnostic tool.
2. Pull up on the inner edge of the battery compartment cover to release it, pivot the cover into an upright position, then lift the battery cover off of the housing.
3. Slide the battery down to disengage the electrical contacts.
4. Remove the battery from the tool housing.
5. Align the tabs on the sides of the battery compartment with the slots on the new battery, then place the battery into the housing.
6. Slide the battery up to engage the electrical contacts and snap it into place.
7. Fit the battery cover onto on the housing, then pivot the cover down so that it snaps into place.
8. Snug up the captive screws to hold the cover in place. ***Do not overtighten the screws!***
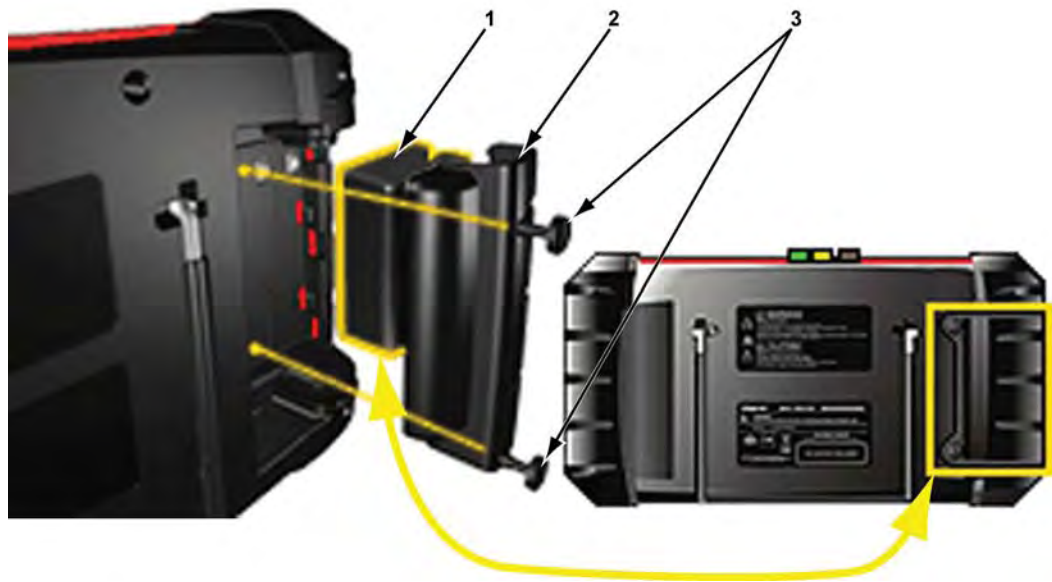
1— Battery
2— Battery Cover
3— Captive Screws

Figure 11-1 *Battery pack replacement*

11.2.3 Disposing of the Batteries

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:

* North America—Rechargeable Battery Recycling Corporation (RBRC) at http://www.rbrc.org or http://www.call2recycle.org, or call 1(800) 822-8837 (USA)

* United Kingdom—Electrical Waste Recycling Company at http://www.electricalwaste.com

Products bearing the WEEE logo (Figure 11-2) are subject to European Union regulations.

Figure 11-2 *sample WEEE logo*

NOTE:
Always dispose of materials according to local regulations.

Contact your sales representative for details.

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