

MODIS™ Ultra

User Manual



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User Manual Information

This manual includes information and images applicable with diagnostic software version 18.4 and later. Some information within this manual may not be applicable with other diagnostic software versions.

The information in this manual is periodically revised to ensure the latest information is included. The current version of this manual and other technical documentation is available online from Snap-on Diagnostics.

Product Support Information

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Website Links:

Snap-on Diagnostics and Information

- <http://diagnostics.snapon.co.uk>

Manuals / Technical Documentation - This manual is periodically revised to ensure the latest information is included. Download the latest version of this manual and other related technical documentation at:

- <https://www.snapon.com/diagnostics/uk/User-Manuals.htm>

For technical assistance in all other markets, contact your selling agent.

Product Training Videos

Diagnostic tool specific training videos are available on our website. Follow along and learn the basics of diagnostic tool operation with our free training videos.

Videos are product specific and are available at:

<http://diagnostics.snapon.co.uk> - Click on the "Training and Support" tab, select "Diagnostic Tools", then select the applicable diagnostic tool, and then select "See Quick Tips".



NOTE:

Sample titles are listed below. Not all titles may be available for all diagnostic tools, and are subject to change.

| Snap-on® Training Solutions® - Training Videos (examples) | |
|-----------------------------------------------------------|---------------------------------|
| Introduction and Navigation | Global OBD-II |
| Scanner Codes | Digital Multimeter |
| Scanner Data in PID View | Graphing Multimeter & Lab Scope |
| Scanner Data in Graphing View | Guided Component Tests |
| Fast-Track® Troubleshooter | Vehicle Specs & Resets |
| Functional Tests | SureTrack® & Wi-Fi |

Diagnostic Quick Tips - Video Series

Snap-on Diagnostic Quick Tips videos are available at no charge on our website and on our YouTube channel. These videos are developed from real repair case studies to help professional technicians use diagnostic tools to solve specific vehicle problems (e.g. performing a Ford Relative Injector Flow Test).

Additional videos are also available showing specific diagnostic tool features (e.g. ShopStream Connect - Software Updates).



Figure 1-1

Videos are available at:

<http://diagnostics.snapon.co.uk> - Click on "Diagnostic Tools", then select the applicable diagnostic tool, then select "See Quick Tips"

<https://www.youtube.com/user/snaponscanner/videos> - Use the search function to find a title, or enter "Diagnostic Quick Tips" in the search field to see a list of all applicable titles.



NOTE:

URL links (above) and titles listed (below) are subject to change and may not be available in all markets.

A sample list of titles are listed below, other titles may be available.

Some videos may not be applicable for use with all diagnostic tools.

| Snap-on® Training Solutions® - Diagnostic Quick Tips Videos (examples) | |
|------------------------------------------------------------------------|-------------------------------------------------|
| Air/Fuel Ratio Sensor Test | Fuel Injector Voltage and Current Tests (Scope) |
| Alternator Ripple Test (Scope) | Fuel Pump Current Ramp Test (Scope) |
| BMW® Rain Sensor Calibration | Harley-Davidson® ABS Brake Bleed |
| CAN Bus Diagnostics (Scope) | Harley-Davidson® Functional Tests |
| Chevrolet® Volt Coolant Pump Bleed | Harley-Davidson® Key Fob Programming |

| Snap-on® Training Solutions® - Diagnostic Quick Tips Videos (examples) | |
|-------------------------------------------------------------------------------|-------------------------------------------------------|
| Chrysler HVAC Test | Hyundai Blind Spot Detection System Calibration |
| Chrysler VVT System Cleaning | Hyundai Occupant Detection System Reset |
| Chrysler Wheel & Tire Calibrations | Ignition Coil Current and Voltage Comparison |
| COP Ignition Test | Ignition Coil Current Ramp Test |
| Dual Screen Diagnostics: Scanner vs. Scope | Ignition Coil Primary Voltage Test |
| Electronic Throttle Control System Diagnostics | Ignition System Diagnostics Using the SIA2000 (Scope) |
| FIAT® 500 Proxi Alignment | MINI Battery Relearn |
| FIAT® 500 Throttle Body Relearn | Multi Channel Cam / Crank Correlation |
| Flex Ray Bus Diagnostics | OBD-II Mode 10 Permanent Codes |
| Ford Battery Monitor System | Oil Specs & Service Light Resets |
| Ford Coil Current RFI Test (Scope) | PID Trigger Functions (Scanner) |
| Ford Flash Reprogramming | Piezo Injectors Signature Test |
| Ford Misfire Monitor Neutral Profile Correction (Scanner) | Relative Compression Test (Scope) |
| Ford PATS Key Programming | ShopStream Connect - Data Manipulation |
| Ford Relative Compression Test | ShopStream Connect - Software Updates |
| Ford Relative Injector Flow Test | Speed Up Your Diagnostics (Scanner) |
| Ford TPMS Reprogramming | The Power of Troubleshooter Tips (Scanner) |
| Ford® 6.7L Transmission Solenoid Characterization | Top Level Menus: Built In Scope Training |
| Ford® Diesel Injector Coding | Toyota EVAP Test |
| VW / Audi Flexible Service Reset (Scanner) | Toyota Multiple Freeze Frame (Scanner) |
| | Toyota Transmission Compensation Coding |

Contents

| | |
|--------------------------------------------------------------|-----------|
| Safety Information | 1 |
| Chapter 1: Using This Manual | 3 |
| Conventions | 3 |
| Bold Text | 3 |
| Symbols | 3 |
| Terminology | 3 |
| Notes and Important Messages | 4 |
| Hyperlinks | 4 |
| Procedures | 4 |
| Chapter 2: Introduction | 5 |
| Functional Description | 5 |
| Technical Specifications | 7 |
| Control Keys | 8 |
| Accept (Y/✓) Key | 8 |
| Directional Keys | 8 |
| Cancel (N/X) Key | 8 |
| S (Shortcut) Key | 9 |
| Power Key | 9 |
| Power Sources | 9 |
| Internal Battery | 9 |
| AC Power Supply | 9 |
| Vehicle Power | 10 |
| The Stand | 10 |
| Chapter 3: Getting Started | 11 |
| Powering Up | 11 |
| Home Screen | 11 |
| Title Bar | 11 |
| Home Screen Buttons | 13 |
| Common Toolbar Control Icons | 14 |
| The Demonstration Program | 15 |
| Powering Down | 15 |
| Emergency Shutdown | 15 |
| Chapter 4: Navigation | 16 |
| Screen Messages | 16 |
| Loading and Connecting Messages | 16 |
| Confirmation Messages | 16 |
| Warning Messages | 16 |
| Error Messages | 16 |
| Scanner Navigation | 17 |
| Screen Layout | 17 |
| Guided Component Tests and Scope Multimeter Navigation | 20 |

| | |
|------------------------------------------------------------------------------|-----------|
| Screen Layout..... | 20 |
| Chapter 5: Scanner..... | 23 |
| Vehicle Identification..... | 23 |
| Alternative Vehicle Identification | 25 |
| Connecting to a Vehicle..... | 25 |
| Cables..... | 26 |
| No Communication Message | 26 |
| Operations | 27 |
| Codes Menu..... | 29 |
| Data Display..... | 35 |
| Functional Tests..... | 42 |
| Exiting the Scanner | 44 |
| SureTrack | 45 |
| SureTrack Operation..... | 45 |
| Chapter 6: OBD-II/EOBD | 51 |
| OBD Health Check | 51 |
| Global OBD II Code Check | 52 |
| Global OBD II Clear Codes | 53 |
| Readiness Monitors | 53 |
| MIL Status | 53 |
| EOBD | 54 |
| Start Communication | 54 |
| Select Communication Protocol | 58 |
| Connector Information | 59 |
| Chapter 7: Guided Component Tests | 60 |
| Vehicle Identification..... | 60 |
| Identifying a Test Vehicle | 60 |
| Training and Classes..... | 61 |
| Power User Tests | 62 |
| How To Guide | 62 |
| Features and Benefits | 62 |
| Index | 62 |
| Operations | 63 |
| Component Information | 63 |
| Tests | 64 |
| Chapter 8: Scope Multimeter..... | 67 |
| Overview..... | 67 |
| Digital Multimeter (DMM) | 67 |
| Graphing Multimeter (GMM) | 68 |
| Lab Scope..... | 69 |
| Tests and Capabilities (Quick Reference)..... | 70 |
| Test Leads and Accessories | 72 |
| Channel 1 Lead..... | 72 |
| Channel 2 Lead..... | 72 |
| Alligator Clips and Probes..... | 73 |
| Secondary Ignition Coil Adapter Lead and Clip-on Adapter (optional) | 73 |

| | |
|------------------------------------------------------------|------------|
| Low Amp Current Probe (optional)..... | 73 |
| Temperature Probe Adapter (optional) | 74 |
| Pressure Transducers and Adapters (optional) | 74 |
| Waveform Demonstration Tools (optional)..... | 75 |
| General Information..... | 76 |
| Scope Multimeter Screen Layout and Features..... | 76 |
| Measurement Out of Range (Alert)..... | 78 |
| Operation and Controls | 79 |
| Test Lead / Probe Connection | 79 |
| Test Lead / Probe Calibration | 80 |
| Control Panel and Settings | 81 |
| Secondary Ignition Testing | 97 |
| Optional Settings | 99 |
| Display (Grid on/off)..... | 99 |
| Divisions..... | 100 |
| Saving and Reviewing Scope / Multimeter Data Files..... | 104 |
| Data Buffer..... | 104 |
| Saving Files | 105 |
| Stopping and Reviewing Data Files..... | 106 |
| Saving Screens..... | 107 |
| Using the Zoom Function..... | 107 |
| General Reference | 110 |
| Basic Setup Tips (unknown signal type) | 110 |
| Using Known Good Waveforms..... | 111 |
| Troubleshooting Signals | 112 |
| Units of Measurement / Conversions..... | 113 |
| Glossary of Common Terms | 115 |
| Chapter 9: Previous Vehicles and Data..... | 118 |
| Vehicle History..... | 118 |
| View Saved Data..... | 119 |
| Viewing Codes and Code Scan Results..... | 120 |
| Delete Saved Data | 121 |
| Chapter 10: Tools | 122 |
| Tools Menu..... | 122 |
| Connect-to-PC | 122 |
| Configure Shortcut Key..... | 123 |
| System Information | 124 |
| Settings | 124 |
| Chapter 11: Maintenance | 134 |
| Cleaning and Inspecting the Diagnostic Tool | 134 |
| Cleaning the Touch Screen | 134 |
| Battery Service | 134 |
| Battery Safety Guidelines | 135 |
| Replacing the Battery Pack..... | 135 |
| Disposing of the Batteries | 136 |
| Chapter 12: Wi-Fi Connection / Troubleshooting..... | 137 |
| Checking if Wi-Fi is On/Off | 137 |

| | |
|---------------------------------------------------------------|------------|
| Checking if Wi-Fi is Connected | 138 |
| Wi-Fi Icons (Setup)..... | 138 |
| Turning Wi-Fi On and Connecting to a Network..... | 138 |
| Add Network Advanced (Connecting to a hidden network)..... | 140 |
| Wi-Fi Testing | 140 |
| Wi-Fi Troubleshooting and Status Messages..... | 142 |
| Informative Messages | 144 |
| Chapter 13: ShopStream Connect | 145 |
| Using SSC (Connecting to your PC) | 145 |
| SSC Main Screen | 146 |
| Scanner DataViewer..... | 147 |
| Image Viewer..... | 148 |
| Printing the Code Scan Report..... | 149 |
| Software Upgrades and Updates | 151 |
| End User License Agreement | 152 |

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

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.

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 Guided Component Test database into a single hand-held 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:

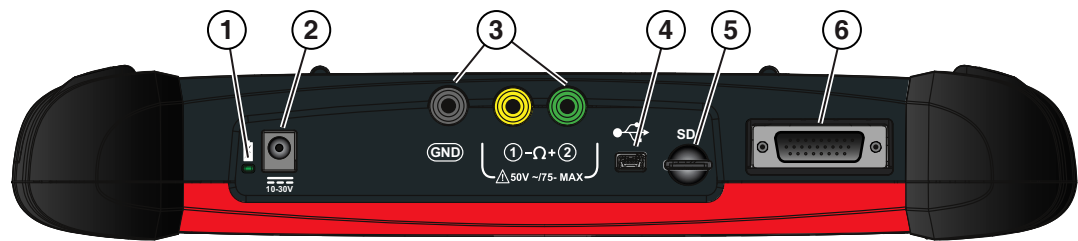
- [Functional Description](#)
- [Technical Specifications](#), on page 7
- [Control Keys](#), on page 8
- [Power Sources](#), on page 9
- [The Stand](#), on page 10

2.1 Functional Description



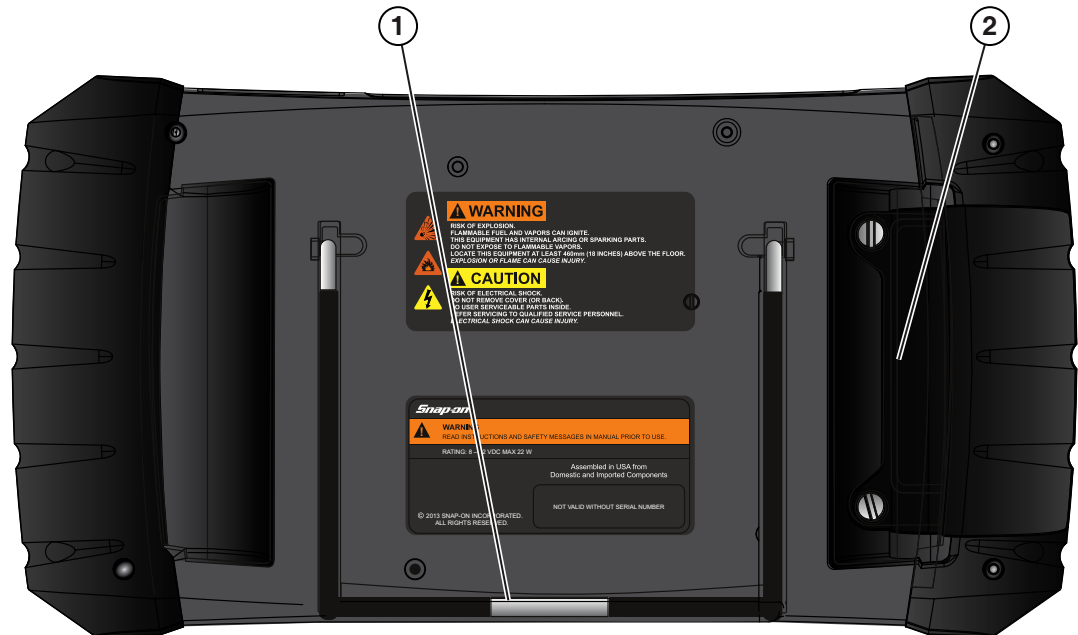
- 1— N/X key (No, Cancel, or Return)
- 2— Y/✓ key (Yes, Accept, or Continue)
- 3— Directional key; left (◀), right (▶), up (▲), down (▼)
- 4— Shortcut key
- 5— Power key

Figure 2-1 Front view



- 1— Battery Status Indicator LED (light emitting diode)
- 2— DC Power Supply Input Port
- 3— Scope/Multimeter Jacks
- 4— Mini USB Client Port
- 5— Micro secure digital (microSD) Card Port
- 6— 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 30V DC

Dimensions:

Width:

12.9 inches
327.2 mm

Height:

6.5 inches
165 mm

Depth:

2.04 inches
51.8 mm

Weight (including battery):

3.25 lbs.
1.47 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

Meter

Category I

Environmental Conditions:


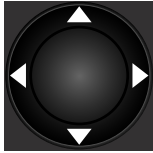



This product is intended for indoor use only
This product is rated for Pollution Degree 2 (normal conditions)

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 123 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 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 Power Supply to a power outlet charges the internal battery.

2.4.2 AC Power Supply

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

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 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.



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.
- Wi-Fi signal strength
- 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 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 128 for additional information.

A Wi-Fi signal and communication icon display between the clock and the power supply icon whenever the diagnostic tool is actively communicating with a vehicle or is connected to Wi-Fi.

Table 3-2 Communication icon

| Icon | Definition |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Indicates the Scanner module is actively communicating with a vehicle. |
|  | Wi-Fi Signal Strength - Indicates signal strength of the wireless network connection. Three bars - indicate full strength signal Zero to 1 bar - indicate weak or no signal |







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 , 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 , on page 51 for details. |
| Guided Component Tests |  | Opens a diagnostic database of specific tests for the identified vehicle. See Guided Component Tests , on page 60. |
| Scope Multimeter |  | Configures the unit to operate as a lab scope, graphing multimeter, or digital multimeter. See Scope Multimeter , on page 73. |
| Previous Vehicle & Data |  | Use to connect to a recently tested vehicle, or to access saved data files. See Previous Vehicles and Data , on page 118 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 122 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 Common Toolbar Control Icons

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

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

3.3 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.



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.

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.

3.4 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.

3.4.1 Emergency Shutdown

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

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:

- [Screen Messages](#)
- [Scanner Navigation](#), on page 17
- [Guided Component Tests and Scope Multimeter Navigation](#), on page 20

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.

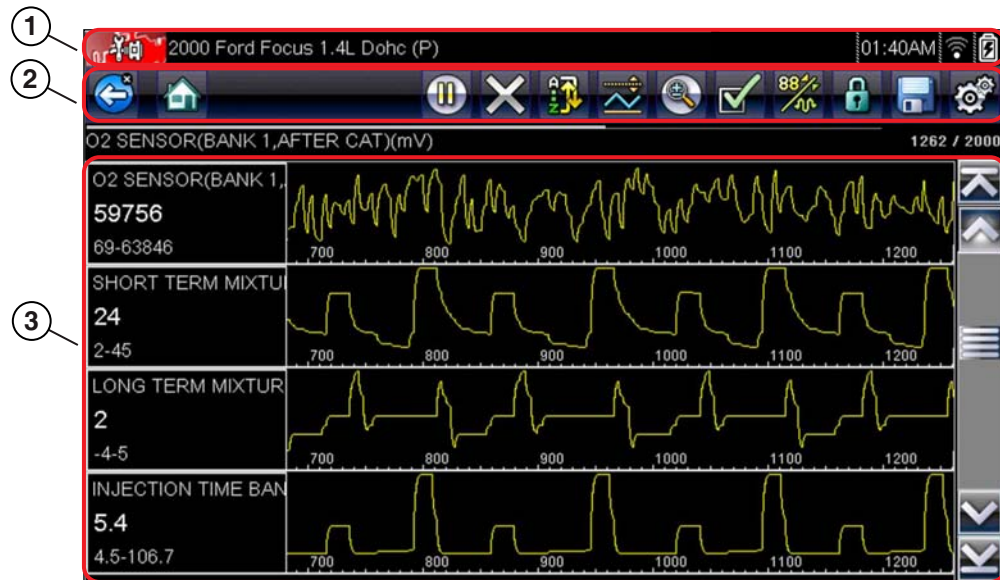
Examples of possible errors include:

- 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/EODB 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 11 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. |

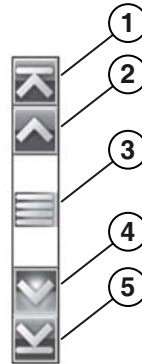
Table 4-1 Scanner toolbar buttons (part 2 of 2)

| 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 Point |  | Moves back one data point with each button push when viewing recorded or paused data. Hold the button down to keep moving back through the data . |
| Next Point |  | Moves one data point with each button push when viewing recorded or paused data. Hold the button down to keep moving back through the data. |
| Previous Screen |  | Moves back one complete screen at a time when viewing recorded or paused data. Hold the button down to keep moving back through the data. |
| Next Screen |  | Moves back one complete screen 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:

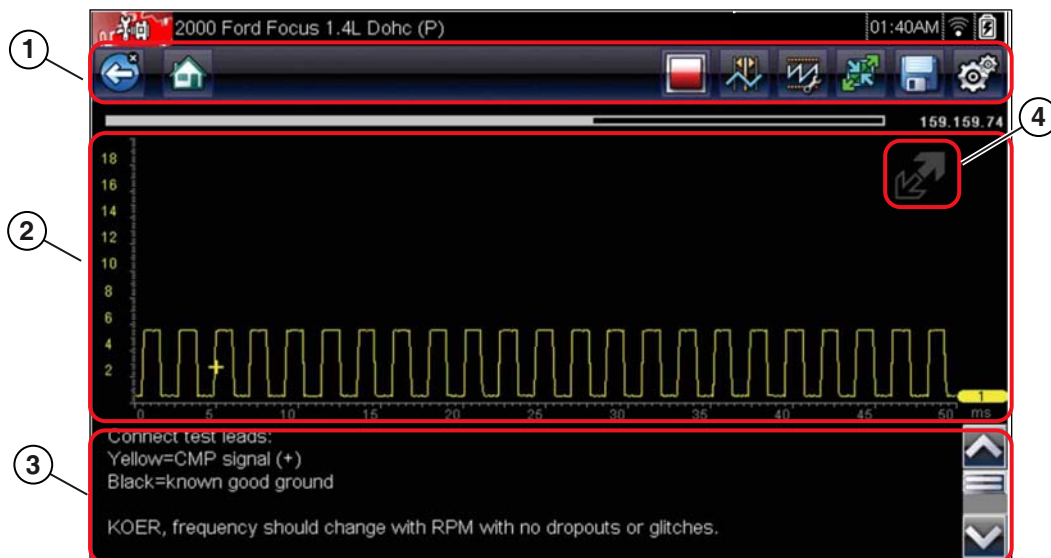
- Tap the **Up 1 Page** or **Down 1 Page** arrowhead buttons near the ends of the scroll bars to move through the data in the direction of the arrow one page at a time.
- Select the **Beginning** arrowhead at the very top of the scroll bar to quickly move to the start of the data list.
- Use the **End** 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 Guided Component Tests and Scope Multimeter Navigation

This section describes general navigation for Guided 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
- 4— **Expand/Collapse icon**—operates like the toolbar button, see [Table 4-2](#)

Figure 4-3 Sample Guided Component Test screen

A typical Scope Multimeter screen would be similar to the Guided 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.

Guided 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](#).

Table 4-2 Guided Component Test and Scope Multimeter toolbar buttons

| 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. |
| Previous Screen |  | Moves forward one complete screen at a time when viewing recorded or paused data. Hold the button down to keep moving back through the data. |
| Next Screen |  | Moves forward one complete screen at a time when viewing recorded or paused data. Hold the button down to keep moving forward through the data. |
| Previous Point |  | Moves back one data point with each button push when viewing recorded or paused data. Hold the button down to keep moving back through the data. |
| Next Point |  | Moves forward one data point with each button push when viewing recorded or paused data. Hold the button down to keep moving back through the 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. |
| Cursors |  | Turns the cursors on and off. The cursors are two vertical rules that can be repositioned on the screen to measure intervals. |
| 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 Guided 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 Guided Component Test, and Profile details only in Scope Multimeter. Refer to [Guided Component Tests](#), on page 60 and [Scope Multimeter](#), on page 73 for details.

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.

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).

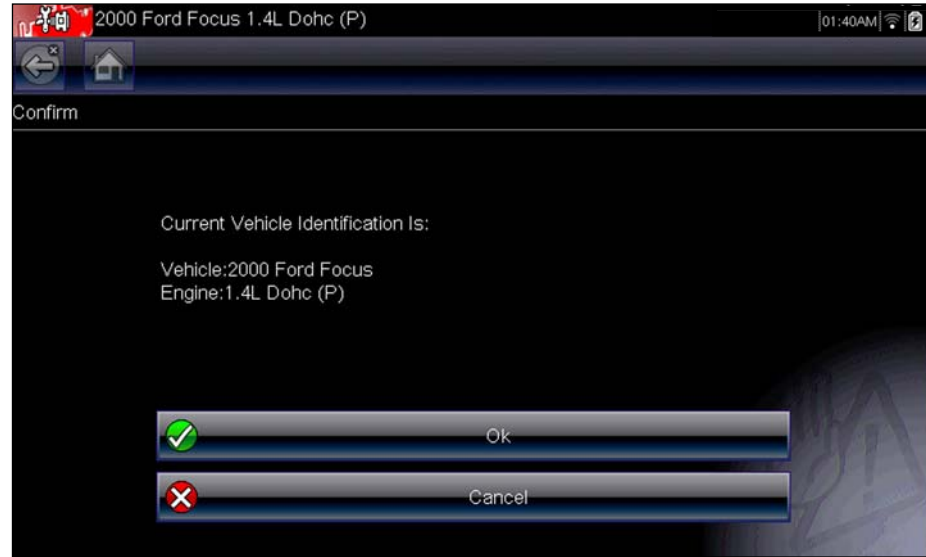


Figure 5-2 Sample confirmation dialog box

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](#), on page 51 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](#)).

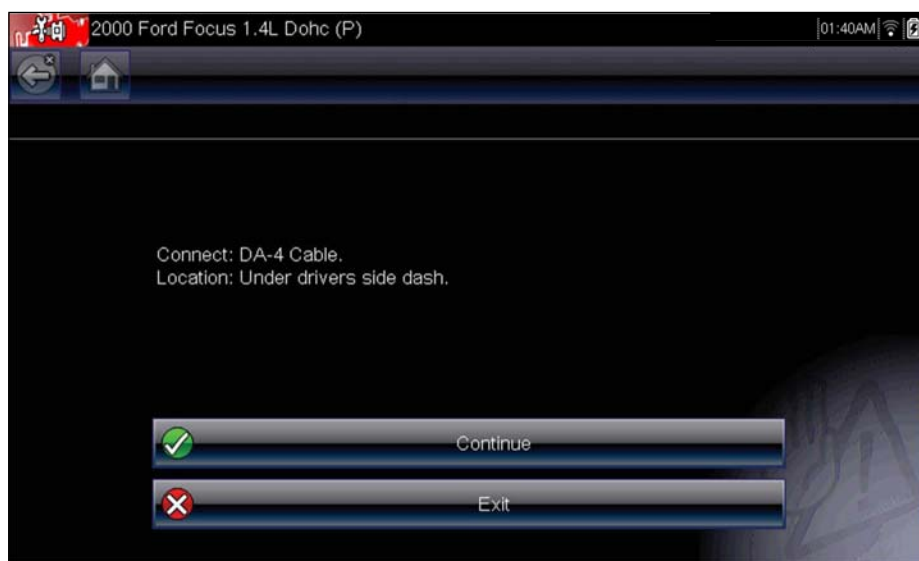


Figure 5-4 Sample vehicle connection message

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 31
- [Freeze Frame/Failure Records](#), on page 31

Display Codes

This function opens either a list of diagnostic trouble codes (DTCs) stored in the selected vehicle electronic control module (ECM), or a submenu of DTC viewing options. The code list includes the DTC and a brief description ([Figure 5-6](#)).

If SureTrack® (optional) is active and data is available for a selected DTC, additional troubleshooting information from SureTrack (e.g. Common Replaced Parts data ([Figure 5-6](#)), Real Fix and Related Fixes) will also be available. For additional information about using SureTrack, see [SureTrack](#), on page 45.

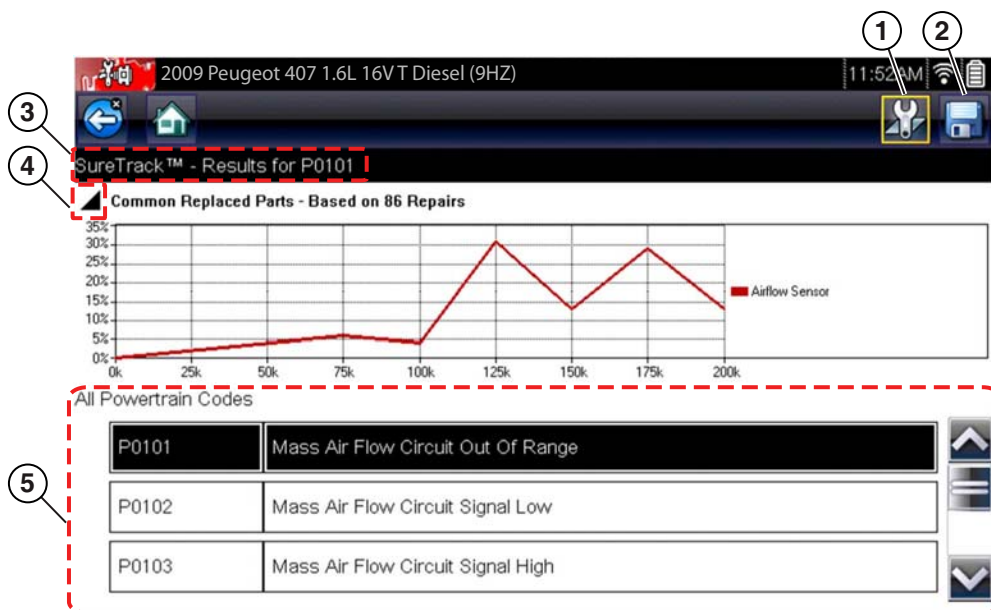


Figure 5-6 DTC results

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

Submenu options include:

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

Saving and Reviewing Codes

Selecting the **Save icon** (Figure 5-6) saves the displayed DTC results list as an (.XML) file. The (.XML) file can be reviewed later, by selecting **Previous Vehicles and Data > View Saved Data** and then selecting the (.XML) file from your saved file list (Figure 5-7). When opened, the (.XML) file displays basic vehicle information and a list of DTCs with a brief description of each.

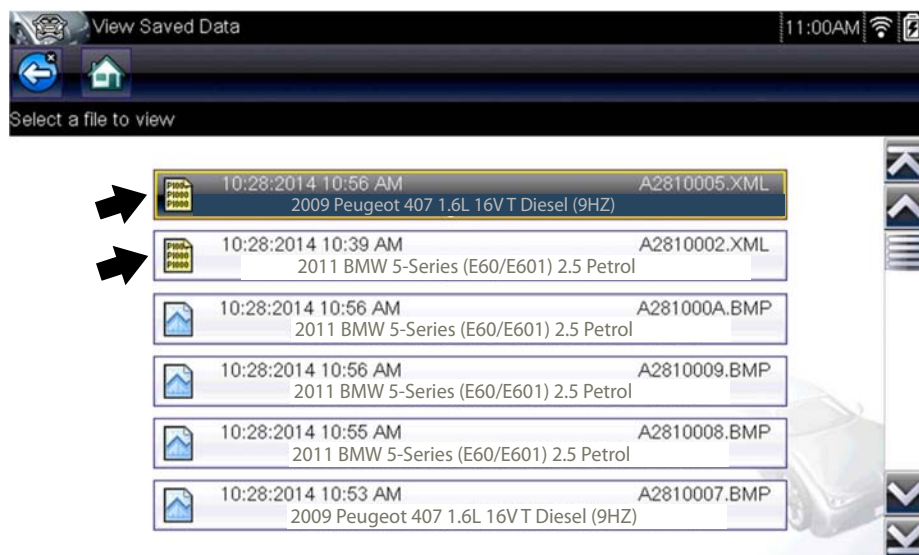


Figure 5-7 Typical - DTC (.XML) files in the View Saved Data list

If SureTrack is active and data is available, additional troubleshooting information from SureTrack (e.g. Common Replaced Parts data (Figure 5-6), Real Fix and Related Fixes) will also be displayed. For additional information about accessing SureTrack and using it's features, see [SureTrack](#), on page 45.

Saved (.XML) files can also be transferred to a personal computer (PC) using ShopStream Connect (Figure 5-8). Once the Diagnostic Tool is connected to the PC, (.XML) files can be printed, transferred, and copied. ShopStream Connect is a companion program that is available online, at no charge. See the ShopStream Connect website information at the front of this manual to visit the website and download the application.

**NOTE:**

(.XML) files transferred with ShopStream Connect are text files containing vehicle information, and the DTC list. The files can be viewed and printed from ShopStream Connect ([Figure 5-8](#)).

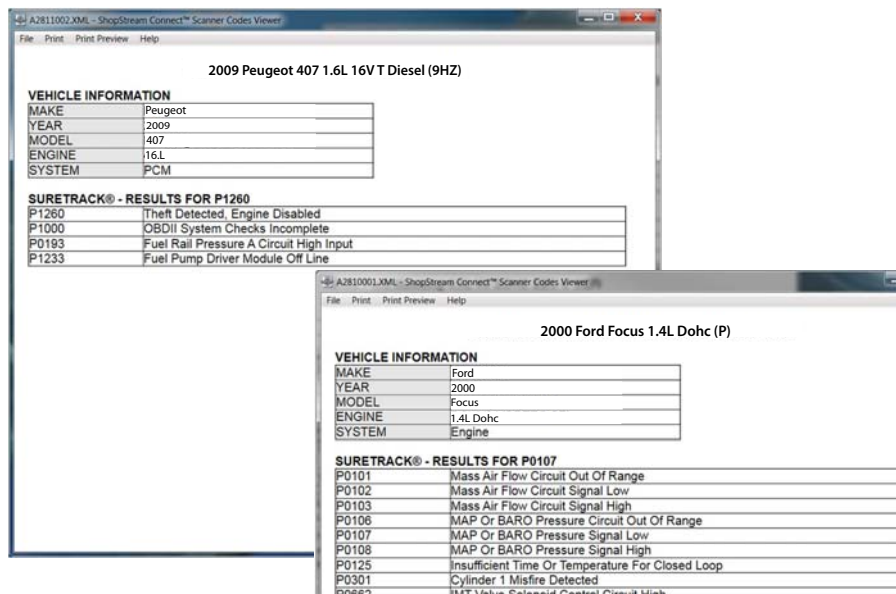


Figure 5-8 Typical - (.XML) files, viewed in ShopStream Connect

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 51).

**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.

Code Scan

One of the benefits of performing a code scan is that you can quickly show your customer diagnostic related issues with a pre scan report, and then after repairing the issues you can use the post scan report to show that the repairs were completed (Figure 5-9). In addition, by using ShopStream Connect the reports can be given to the customer and also saved for your own records, for more information, see [ShopStream Connect](#), on page 145.

IMPORTANT:

PRE / POST Scan Importance - As many systems do not turn on the check engine light or other indicator, performing a vehicle code scan before making any repairs may help in troubleshooting, by identifying possible unknown issues that may be related to the present symptoms.

Performing pre and post scans also allows you to record in report format the pre-condition of the vehicle and compare the post scan after work is complete to confirm the repairs were completed properly.

Pre and post scan is required by some manufacturers for pre and post collision work as well as by some insurance companies.



| VEHICLE INFORMATION | |
|---------------------|-------------------------|
| MAKE | Peugeot |
| YEAR | 2009 |
| MODEL | 407 |
| ENGINE | 1.6L 16V T-Diesel (9HZ) |
| SYSTEM | |

| RESULT OF CODE SCAN | |
|------------------------------------------------------|-----------------------------------------------------------------------------------|
| Systems detected : 11 | |
| Engine Management - Codes : 2 | |
| Transmission - Codes : 3 | |
| Antilock Brakes - Codes : 1 | |
| Airbag - Codes : 2 | |
| Alarm - Codes : 3 | |
| Battery Charge Status Unit (If Equipped) - Codes : 3 | |
| Climate Control - Codes : 3 | |
| Electric Steering - Codes : 3 | |
| Tire Pressure Monitoring - Codes : 2 | |
| Xenon/ Directional Lights Left - Codes : 3 | |
| Xenon/ Directional Lights Right - Codes : 3 | |
| Engine Management | |
| P0117 | Engine Coolant Temperature Signal, Short Circuit To Earth (Temperature Very High) |
| P0112 | Inlet Air Temperature Signal (Flowmeter), Short Circuit To Earth |
| Transmission | |
| 0FF2 | Control Unit Fault No Signal |
| 0FFF | Configuration Fault No Signal |
| U3003 | Battery Voltage |
| Antilock Brakes | |
| C1383 | Brake Fluid Level Switch Electrical Fault |
| Airbag | |
| B2666 | Passenger's Seat Position Sensor, Short Circuit To Battery |
| B160A | Rear Right Hand Side Airbag Present But Not Configured |
| Alarm | |
| 0FF2 | Control Unit Fault No Signal |
| 0FFF | Configuration Fault No Signal |
| U3003 | Battery Voltage |
| Battery Charge Status Unit (If Equipped) | |

Figure 5-9 Typical Code Scan Report in Shopstream Connect

Depending on the vehicle, Code Scan (if supported) may be available from the Systems menu. Selecting **Code Scan** starts an active scan of vehicle control modules, and opens the Code Scan results screen (Figure 5-10). A progress indicator is shown at the top indicating the active scanning progress. Once completed, the results are displayed by system category.

The following Code Scan related control icons are used:

| Icon | Function |
|-----------------------------------------------------------------------------------|------------------------------------------------------------|
|  | Refresh - Restarts the code scan |
|  | System - Opens the main menu of the system selected |

The following results are displayed progressively as the modules are scanned:

- **The total number of systems (modules) detected** (Figure 5-10).

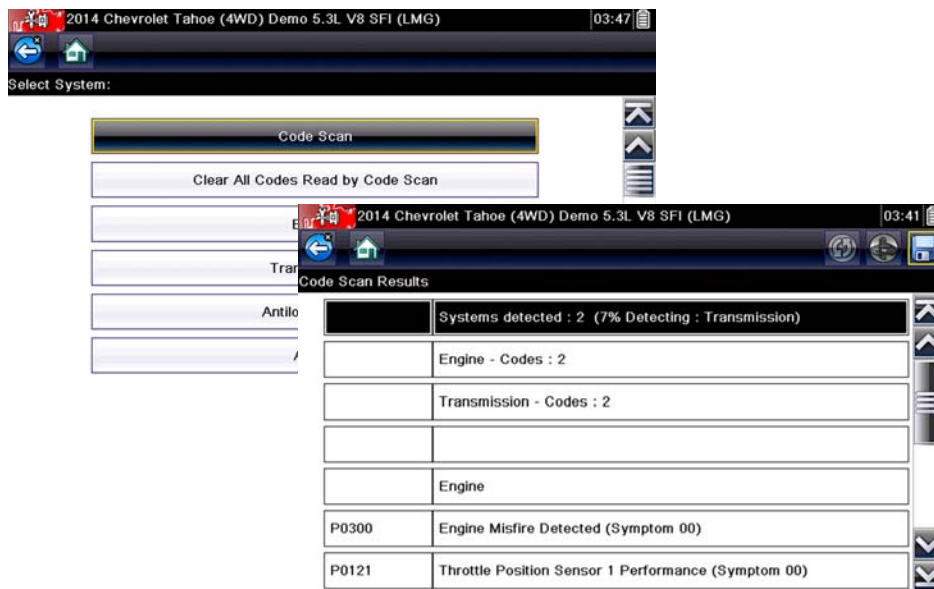


Figure 5-10 Code Scan systems analyzed result total

- **A list of all the systems analyzed with DTCs totals.** A categorized system list with DTC totals is displayed in the order they are scanned. To view the main menu for a system in the list, select the system, then select the **System** icon (Figure 5-11).

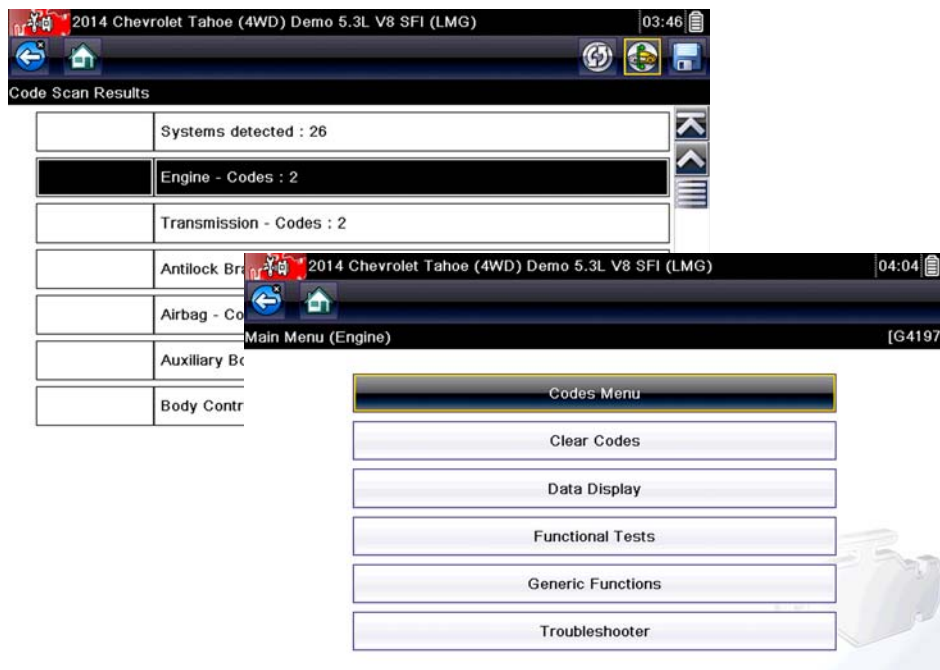


Figure 5-11 System icon (opens Main Menu)

Saving Codes, and Code Scan Results)

When using the code scan feature, or when viewing individual system codes (e.g. engine, transmission) selecting the **Save** icon from the toolbar saves the results as a data file.

The saved file(s) can be viewed using two methods:

- On the diagnostic tool - See [View Saved Data](#), on page 119.
- Using ShopStream Connect - See [ShopStream Connect](#), on page 145.

Printing the Code Scan Report

The vehicle system report can also be customized and printed using ShopStream Connect - See [Printing the Code Scan Report](#), on page 149.

Clear All Codes Read by Code Scan

Selecting **Clear All Codes Read by Code Scan** erases all DTCs from all vehicle system modules that were read by Code Scan.



NOTE:

Clear All Codes Read by Code Scan may not clear global OBD-II codes on some vehicles.

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 5-12).



Figure 5-12 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 38).

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 5-13).



- 1— Previous Screen button
- 2— Next Screen button
- 3— Previous Point button
- 4— Next Point button
- 5— Record button
- 6— Bar Graph
- 7— Slider
- 8— Frame counter (current frame/total frames)
- 9— Cursor

Figure 5-13 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 123 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 5-12).

The 1, 2, and 4 Graph views divide the screen horizontally to simultaneously display data graphs for the indicated number of parameters (Figure 5-14). Use the scroll bar or the **up** (▲) and **down** (▼) keys to view other parameters in the list.

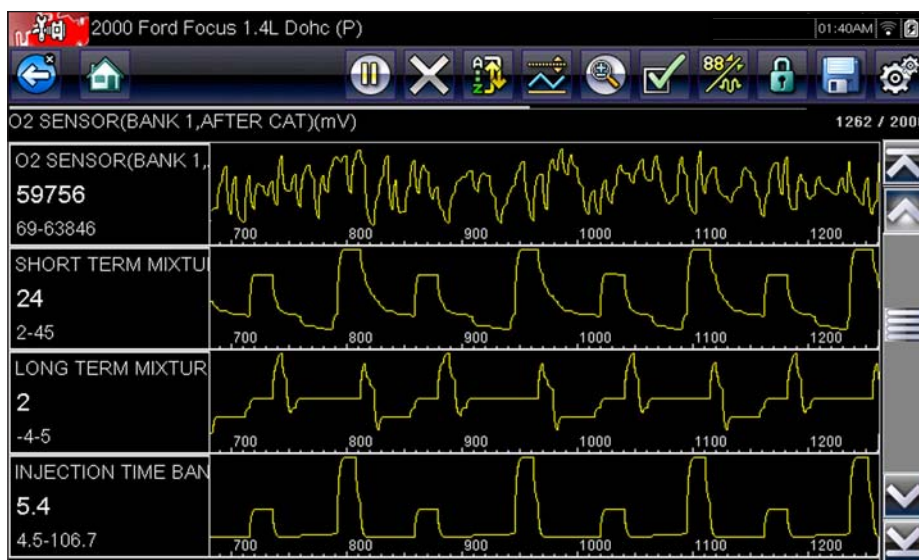


Figure 5-14 Sample 4 Graph view screen



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 5-15). 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.

| Parameter Name | Value |
|----------------------------------|-------|
| O2 SENSOR(BANK 1,AFTER CAT)(mV) | 57059 |
| O2 SENSOR(BANK 1,BEFORE CAT)(mV) | 1 |
| OPEN/CLOSED O2 SENSOR LOOP | OPEN |
| ENGINE SPEED(rpm) | 933 |
| CONTINUOUS DTC COUNTER | 0 |
| THROTTLE POSITION SENSOR(V) | 0.94 |
| TP MODE | C/T |

Figure 5-15 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, 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: <https://www1.snapon.com/ukssc>.



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 5-16 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 123 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/EODB 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 5-17).

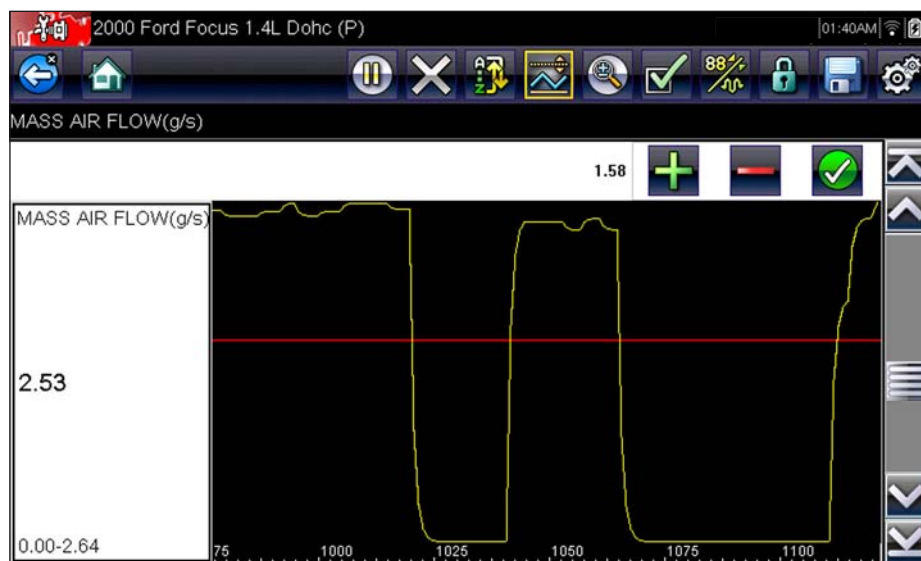


Figure 5-17 Sample trigger set screen

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 ([Figure 5-18](#)).

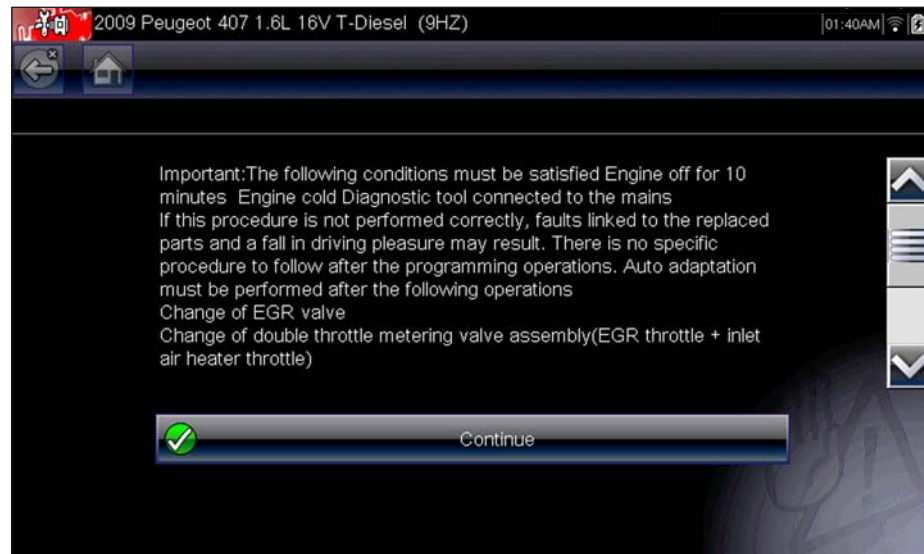


Figure 5-18 Sample functional test screen

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.

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.

Troubleshooter (Fast-Track®)

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

Troubleshooter information is organized into a series of diagnostic tips that are designed to quickly lead you to the root cause of a particular problem. The tips are vehicle-specific, which means only tips that relate to the identified vehicle are presented. Selecting opens a menu that may include:

- **Code Tips**—provides detailed information on setting conditions, testing, and interpreting test results for specific codes.
- **Symptom Tips**—provides diagnostic tests and procedures based on vehicle operation.
- **Time Savers**—provides supplemental information, such as firing order and #1 cylinder location, that may be needed to make a diagnosis.
- **Common Problems**—provides advice and remedies for certain “pattern failures” that have been experienced on vehicles of the same model.
- **Tests and Procedures**—explains how to perform certain tests on the specific test vehicle. Some tips provide specifications and installation information as well.
- **Fast-Track Data Scan**—contains information and guidelines on how to validate data readings for certain sensors and actuators, PID data values are provided.

- **Fast-Track Fixes**—provides actual repair information for related repairs.

**NOTE:**

Troubleshooter appears in a Scanner menu only if tips are available for the system selected on the identified vehicle.

Certain PID data parameter values display directly within the tip when performing Troubleshooter tests and procedures. A tip may also contain a hyperlink to a Troubleshooter Reference, another test or procedure, or a supplemental operation, such as Clear Codes. Hyperlinks are shown in blue, and selecting them opens the link. Troubleshooter References open in a separate window. (Figure 5-19).



P0325 sets when a malfunction with the KS system within the PCM are faulty. The DTC will set when the knock sensor voltage is too low or too high. If there are any abnormal engine noises present then repair it first. Now measure the resistance of the knock sensor it should be 90k to 110K ohms. If it is not then suspect the knock sensor. If it is okay then check the knock sensor circuit and wiring. Make sure the circuit is not routed near the secondary wires. Now clear the DTC and road test it under the conditions that set the DTC. If the DTC resets then suspect the knock sensor module or the PCM. Use care when installing the knock sensor and always torque to the correct specification. Damage to the sensor may occur if it is over torqued.

Tech Note:

Drivability Concern - Ensure that the vehicle is reaching factory recommended operating engine temperature. If this is not attained then multiple DTC's could be present along with the chance of miss diagnosing the customer complaint.

INFO: Select the information icon on the toolbar for more information.

Figure 5-19 Troubleshooter tip

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.

5.5 SureTrack

SureTrack is a comprehensive source of expert knowledge for professional technicians, combining diagnostic experience and detailed parts replacement records. SureTrack will help you improve diagnostic accuracy and reduce repair time.

SureTrack features:

- A Common Replaced Parts graph displaying the parts that are most frequently replaced to successfully complete repairs based on actual vehicle repairs.
- Tips and fixes obtained from completed repairs, validated by SureTrack expert technicians.
- Up-to-the-minute intelligence based on vehicles currently being serviced nationwide.








NOTE:

To access SureTrack, you must have the current software update installed on your scan tool, the Wi-Fi radio turned on and connected to a wireless network. For Wi-Fi setup and connection see, [Wi-Fi Connection / Troubleshooting](#), on page 137

5.5.1 SureTrack Operation

Before you begin using SureTrack, familiarize yourself with the SureTrack control icons shown below.

| Fix It! Icon | Related Tips Icon | Real Fixes Icon | Menu Exit Icon | Common Replaced Parts Graph Icon |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |  |  |
| Opens the SureTrack dashboard | Displays Related Tips for the selected DTC | Displays Related and Real Fixes for the selected DTC | Exits the SureTrack dashboard | Toggles Common Replaced Parts Graph display on/off |

SureTrack repair information may be accessed while reviewing DTC using the Scanner function. As an example, navigate to **Engine > Codes Menu > Display Codes > Engine Trouble Code Information** to view current DTCs and related repair information.

If SureTrack information is available for a selected DTC, the SureTrack status bar will display **"SureTrack - Results for XXX"** (XXX = the selected DTC).

To view SureTrack information for a specific DTC, select the desired DTC from the list to highlight it, then select the **Fix It!** icon (Figure 5-20). Selecting **Fix It!** opens the SureTrack dashboard. See [SureTrack Dashboard on page 47](#) for additional information.

**NOTE:**

The Common Replaced Parts graph can be viewed directly from the DTC results screen by selecting the Common Replaced Parts Graph icon, located to the left of Common Replaced Parts Graph title bar (Figure 5-20).

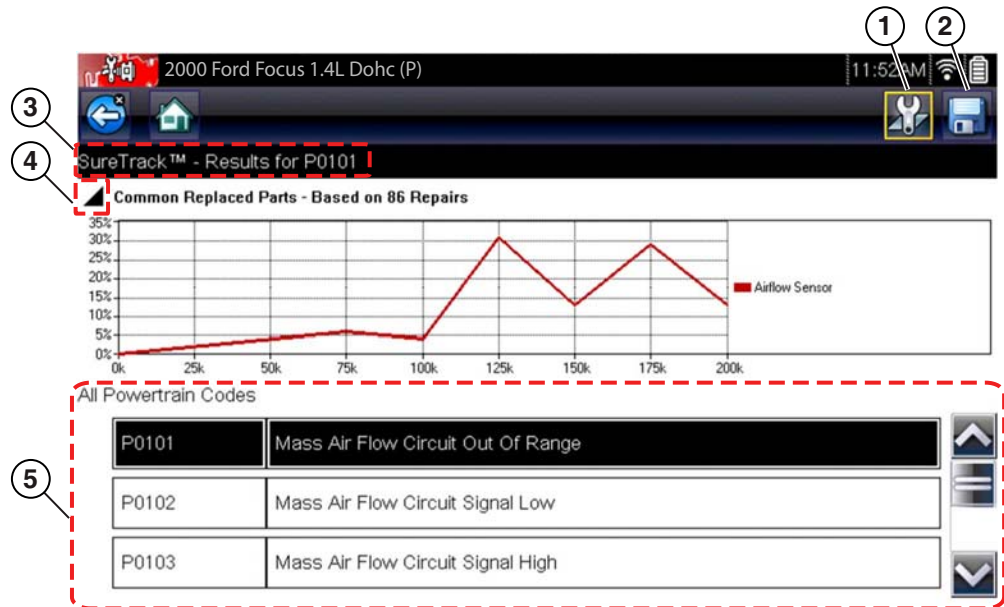
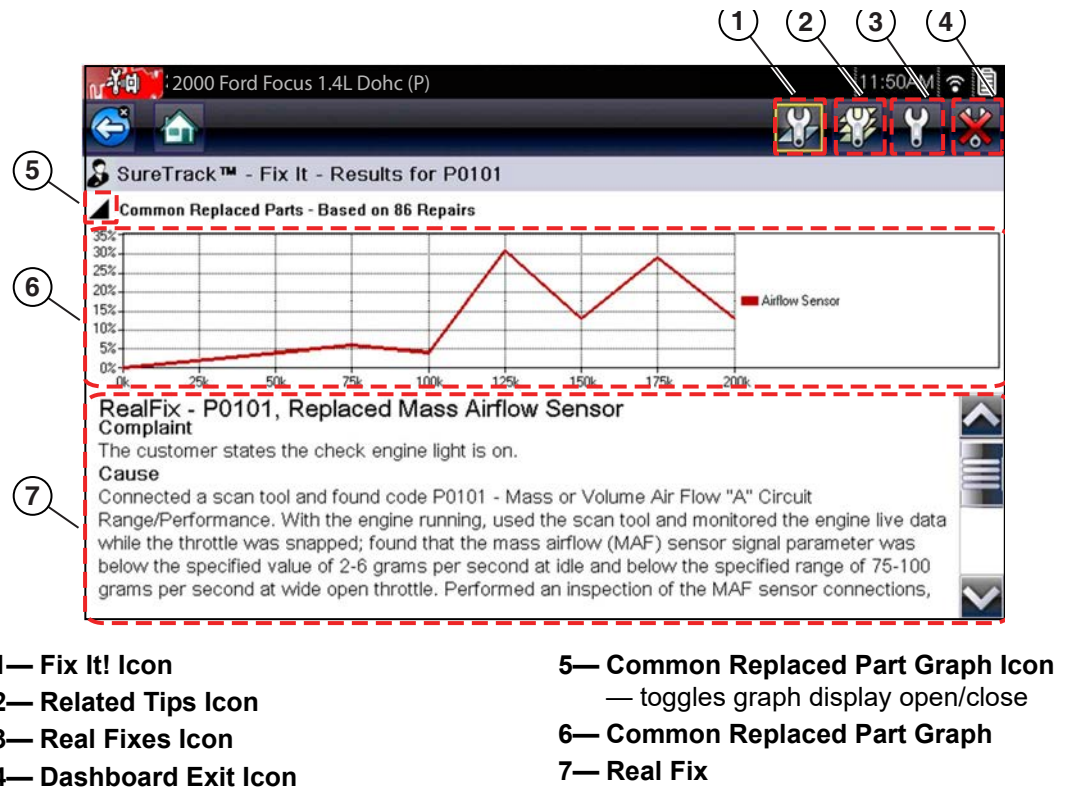


Figure 5-20 SureTrack DTC results

- 1— **Fix It! Icon** — opens SureTrack Dashboard
- 2— **Save Icon** — saves the DTCs list (see, [Saving and Reviewing Codes on page 30](#))
- 3— **SureTrack Status Bar** — displays the active SureTrack status or result
- 4— **Common Replaced Parts Graph Icon** — toggles graph display open/close
- 5— **DTC Results List** — displays current DTCs

SureTrack Dashboard

Selecting the **Fix It!** icon from the DTC results screen opens the SureTrack dashboard. The initial Dashboard screen displays both the Common Replaced Parts Graph and either a Tip or Real Fix for the current DTC (depending on availability). The Related Tips and Real Fixes icons are also available from this screen (Figure 5-21).



- | | |
|------------------------|------------------------------------|
| 1— Fix It! Icon | 5— Common Replaced Part Graph Icon |
| 2— Related Tips Icon | — toggles graph display open/close |
| 3— Real Fixes Icon | 6— Common Replaced Part Graph |
| 4— Dashboard Exit Icon | 7— Real Fix |

Figure 5-21 SureTrack dashboard

Common Replaced Parts Graph

The Common Replaced Parts graph is displayed by selecting the **Fix It!** icon or can be viewed directly from the DTC results screen by selecting the **Common Replaced Parts Graph** icon, located to the left of Common Replaced Parts Graph title bar. The Common Replaced Parts graph shows the percentage of verified fixes (using the parts listed) derived from the total number of repairs by mileage. The graph may display one or more replacement parts based on the captured information. The example below shows a common replaced part for DTC P0106. In this example, the Airflow Sensor is the most common replaced part based on 86 repairs involving vehicles with up to 200k miles. From the graph it can be determined that the majority of the repairs were made to vehicles with 125k or more miles, with 30% at 125k miles and approximately 28% at 175k miles (Figure 5-22).



Figure 5-22 Common Replaced Parts graph

Real Fixes and Related Fixes

- **Real Fixes** - Verified successful repair information and/or procedures for the selected DTC
- **Related Real Fixes** - Additional **Real Fixes** that may be related to the selected DTC.

Fixes have been researched and obtained from professional automotive OEM and specialty technicians from a vast range of repair shops. Fixes may not be available for every vehicle and or DTC.

Fixes (if available) can be displayed in two ways:

- Selecting the **Fix It!** icon (Figure 5-21) from the DTC results screen opens the SureTrack dashboard which may include Real Fixes for the selected DTC. If Real Fixes are not available for the DTC, Tips may be displayed.
- Selecting the **Real Fixes** icon (Figure 5-21) displays Related and Real Fixes (if available). Selecting an item from the list opens additional details about the Fix in a Complaint, Cause, Correction format (Figure 5-23 and Figure 5-24).

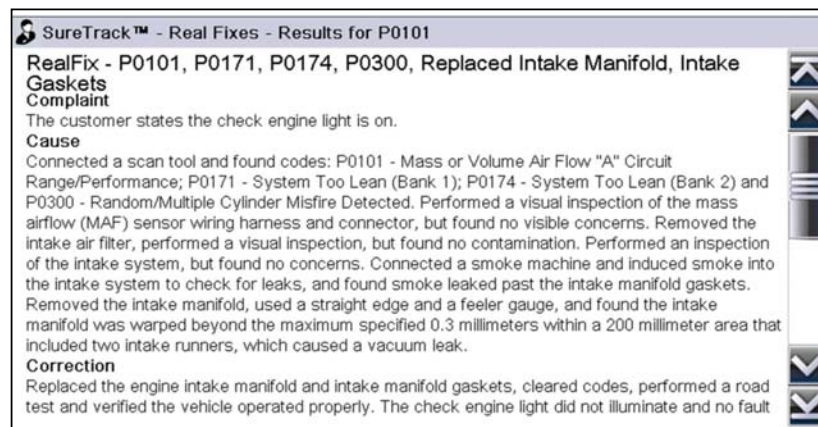


Figure 5-23 Real Fix example



Figure 5-24 Related and Real Fixes examples

Tips and Related Tips

- **Tips** - Experience-based diagnostic and repair tips and information for the selected DTC
- **Related Tips** - Additional **Tips** that may be related to the selected DTC

Tips have been researched and obtained from professional automotive OEM and specialty technicians from a vast range of repair shops. Tips may not be available for every vehicle and or DTC.

Tips (if available) can be displayed in two ways:

- Selecting the **Fix It!** icon from the DTC results screen opens the SureTrack dashboard which may include Tip(s) for the selected DTC. If Tips are not available for the DTC, Real Fixes may be displayed.
- Selecting the **Related Tips** icon will display a list of Related Tips. Selecting an item from the list, opens additional details about the Related Tip (Figure 5-25).

Tip information may include DTC descriptions, symptoms, setting conditions, repair actions and procedures, clearing conditions, diagnostic aids and other references.

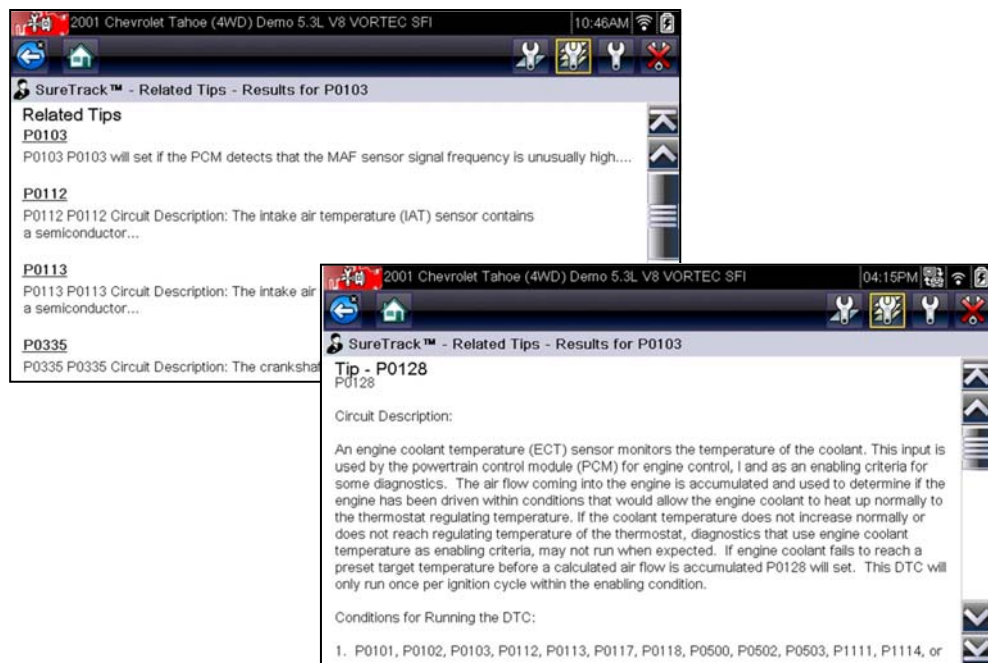


Figure 5-25 Tips and Related Tips examples

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](#)
- [EOBD](#)

6.1 OBD Health Check

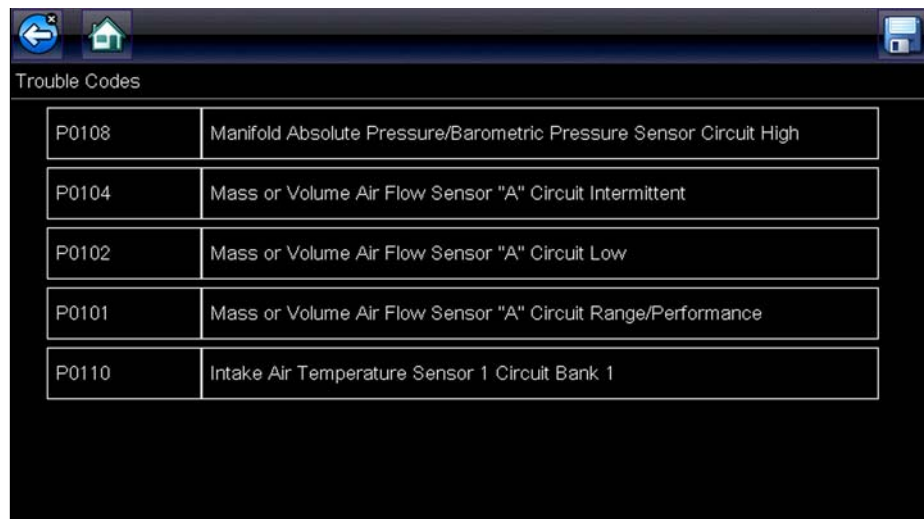
The OBD-II Health Check offers a way to quickly check for and clear emissions-related diagnostic trouble codes (DTCs), and to check readiness monitors for emissions testing. Selecting opens a connection message. Tap **Continue** or press **Y/✓** to open a submenu of test options ([Figure 6-1](#)).



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).



| Trouble Codes | |
|---------------|--------------------------------------------------------------------|
| P0108 | Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High |
| P0104 | Mass or Volume Air Flow Sensor "A" Circuit Intermittent |
| P0102 | Mass or Volume Air Flow Sensor "A" Circuit Low |
| P0101 | Mass or Volume Air Flow Sensor "A" Circuit Range/Performance |
| P0110 | Intake Air Temperature Sensor 1 Circuit Bank 1 |

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](#)).



| ID : \$ | 10 |
|--------------------|---------------|
| MISFIRE | TEST COMPLETE |
| FUEL SYSTEM | TEST COMPLETE |
| COMPONENTS | TEST COMPLETE |
| CATALYST | NOT COMPLETE |
| HEATED CATALYST | NOT SUPPORTED |
| EVAPORATIVE SYSTEM | NOT COMPLETE |

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 EOBD

Selecting EOBD 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 EOBD test session:



To perform an EOBD Test:

1. Select **Start Communications** from the 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).

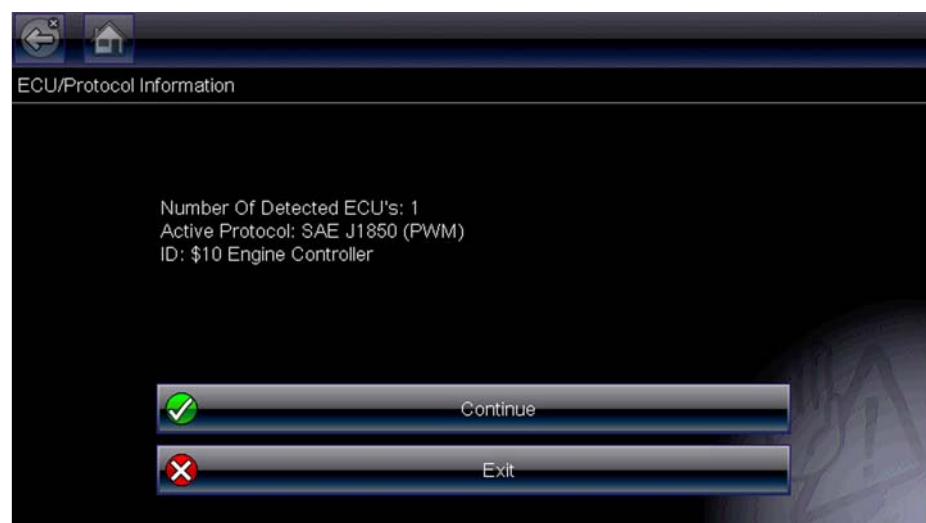


Figure 6-4 Sample protocol information screen

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 55
- [MIL Status](#), on page 56
- [\(\\$01\) Display Current Data](#), on page 56
- [\(\\$02\) Display Freeze Frame Data](#), on page 56
- [\(\\$03\) Display Trouble Codes](#), on page 56
- [\(\\$04\) Clear Emissions Related Data](#), on page 56
- [\(\\$05, 06, 07\) Display Test param./Results](#), on page 57
- [\(\\$08\) Request Control of On-board System](#), on page 58
- [\(\\$09\) Read Vehicle Identification](#), on page 58
- [\(\\$0A\) Emission Related DTC with Permanent Status](#), on page 58

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

(\$03) Display Trouble Codes

This is used to display any stored emission related DTCs reported by the ECM. The display is similar to a Scanner code display (see [Display Codes](#), on page 29 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).

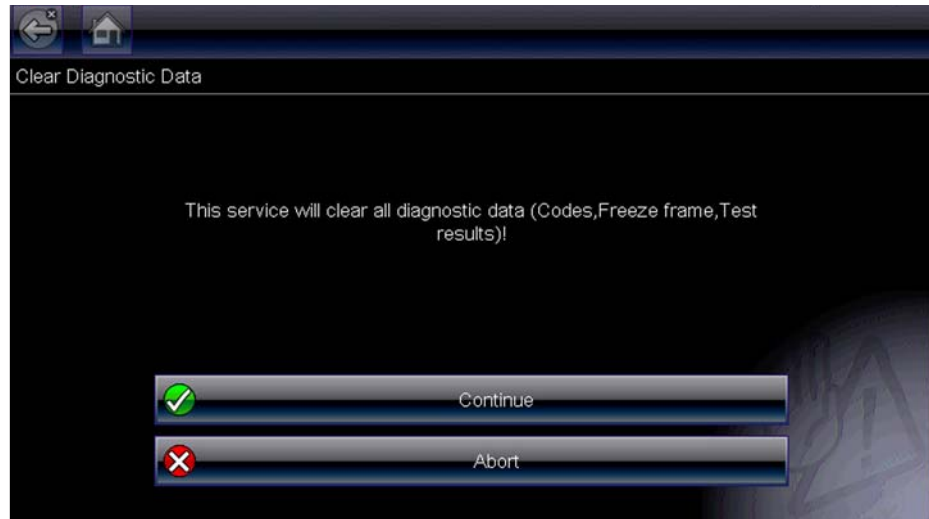


Figure 6-7 Sample clear codes confirmation

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.

The Guided Component Tests 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.

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

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

7.1 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 Guided Component Tests from Scanner or from one of the records stored in Vehicle History. However, you may need to enter additional attributes in some instances.

The vehicle identification sequence is menu driven, 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 Guided Component Tests:

1. Tap the **Guided Component Tests** button on the Home screen.
A list of manufacturers displays.
2. Select **FORD** from the list of manufacturers.
A list of model years displays.
3. Select **2008** from the list of years.
A list of models displays.
4. Scroll and select **Focus** from the list of models.
A list of engines displays.
5. Select **1.6L SIGMAL** from the list of engines.
A confirmation screen displays ([Figure 7-1](#)).

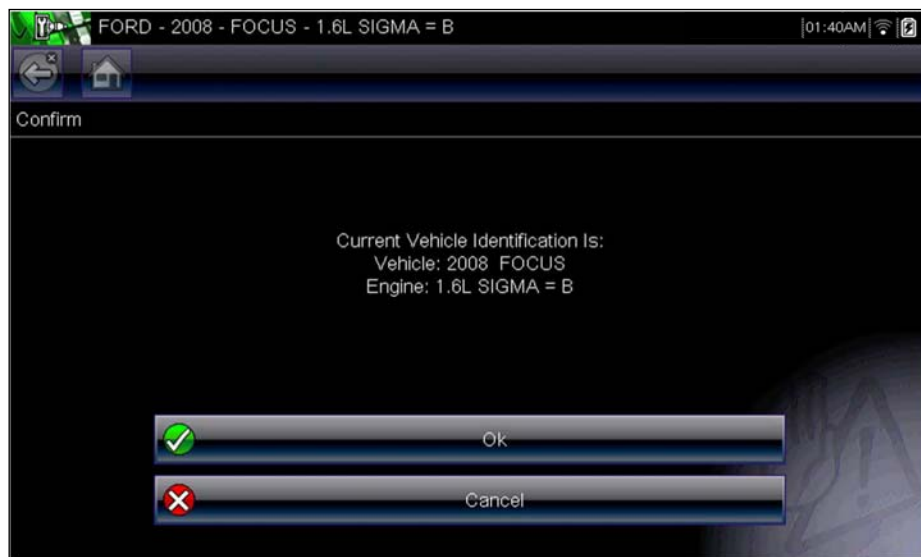


Figure 7-1 Sample confirmation dialog box

6. Select **OK** from the confirmation screen.
7. Select **ENGINE** from the System Select screen and a list of tests available for the identified vehicle displays.
8. Select a test from the list to continue.

The identification sequence is now complete, refer to the Operations section that follows for details on how to navigate through the Guided Component Tests information and perform tests.

7.2 Training and Classes

Training and Classes is a companion feature to the Guided Component Tests function. This resource includes a wide collection of common (non-vehicle specific) reference information and tests, such as measuring fuel pump current ramp, and monitoring CKP and CMP signals simultaneously. Also included are, basic component operation and theory information, testing procedures, tips, definitions, illustrations, diagnostic tool feature descriptions and accessory information.



To access Training and Classes:

1. Select **Guided Component Tests** from the Home screen.
2. Select **Training and Classes** from the Vehicle Make menu to access the menu options.

Each menu option is described in the following sections:

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

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**—explains how to use the optional demonstration board to generate sample signals and sharpen your skills.
- **Accessories**—opens a menu of available optional equipment.
- **Product description**—provides descriptions and a brief overview of meter operations.

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

7.2.4 Index

This feature allows you to access detailed service information and specifications for a specific component.

Selecting **Index** opens an alphabetical list of components, systems, tests, terms, and other items for which there is a brief help file. Some items open an additional menu. Use the **Back** and **Exit** buttons on the Toolbar to return or close the screen.

7.3 Operations

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

1. **COMPONENT INFORMATION**—provides information on the selected component and connector pin details that assists you in understanding the components prior to diagnosis.
2. **TESTS**—opens a 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 7-2](#)).

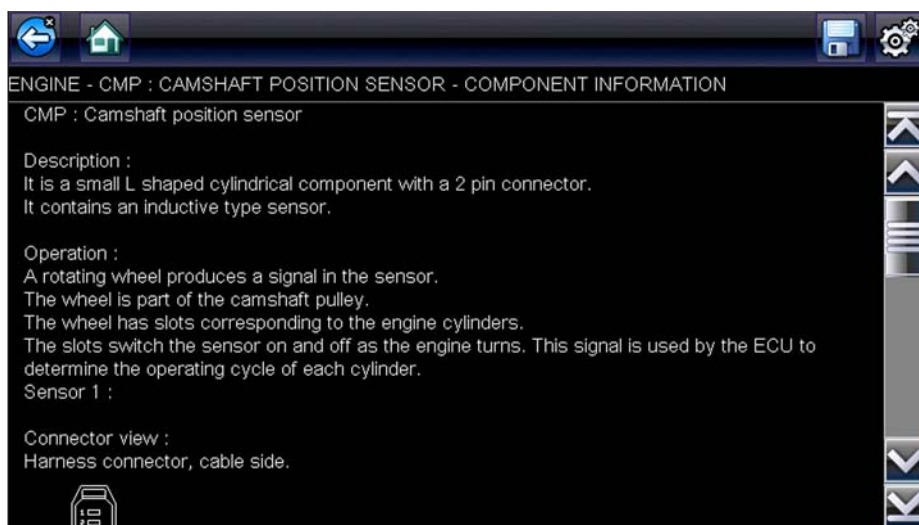


Figure 7-2 Sample Component Information screen

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 7-3](#) when multiple choices are available.

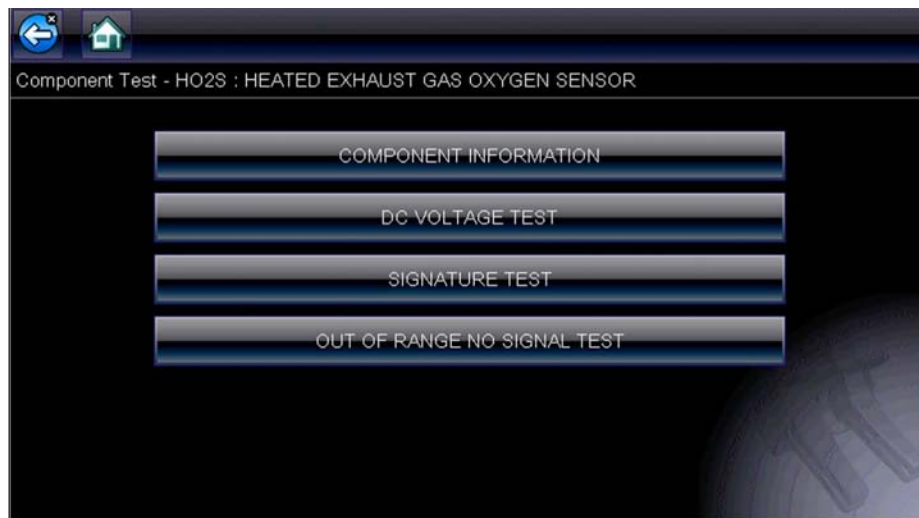


Figure 7-3 Sample O2 Sensors submenu



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 list and the test screen displays ([Figure 7-4](#)).

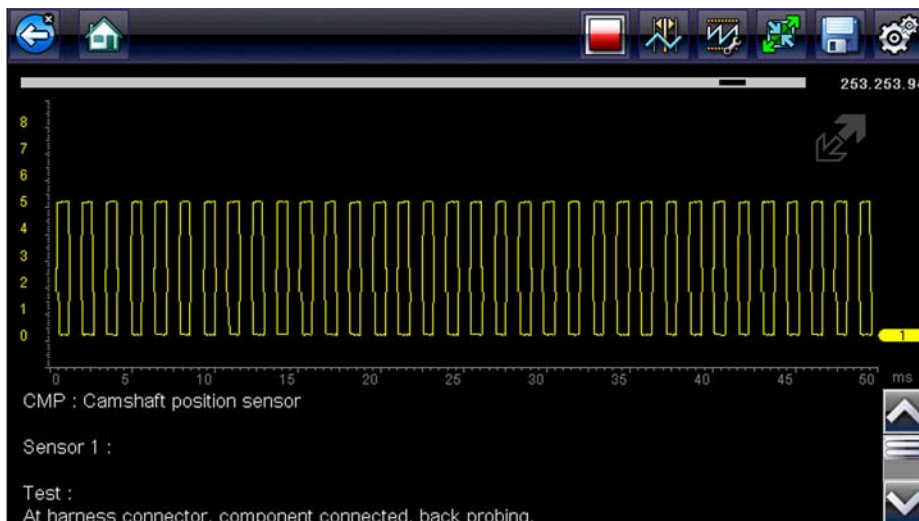


Figure 7-4 Sample Test screen

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

4. 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.

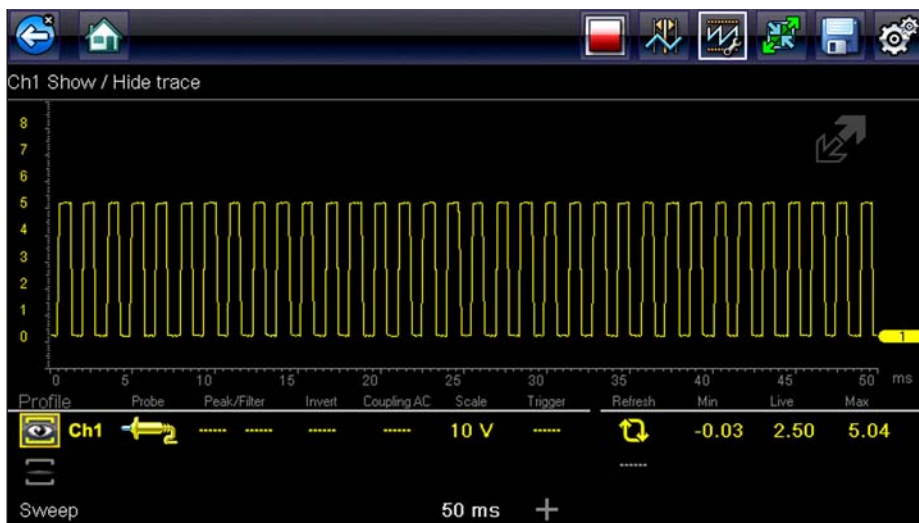


Figure 7-5 Sample Profile window

**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 detailed information about adjusting how a sampled signal displays on the screen refer to [Trace Controls](#), on page 79.



The Scope Multimeter function allows you to perform multiple types of circuit and component measurement tests. This chapter includes general operation procedures, instructions for saving and reviewing test data, optional settings, and general reference information.

8.1 Overview

The Scope Multimeter test functions are:

- Digital Multimeter (DMM)
- Graphing Multimeter (GMM)
- Lab Scope

8.1.1 Digital Multimeter (DMM)

The digital multimeter gives you the ability to quickly make precise common electrical measurements (e.g. DC and AC voltage, resistance and amperage) on circuits and components to verify operation. The meter displays measurements in a digital numerical format, and is typically used for measuring signals that are not rapidly changing.

The DMM is ideal for performing basic tests on most standard automotive circuits, and displays the results in a large easy to see format.

To use the DMM, select the **Scope Multimeter** icon from the home screen then select **Digital Multimeter** from the menu. See [Tests and Capabilities \(Quick Reference\)](#), on page 70 for a list of available testing functions.

Specifications

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

8.1.2 Graphing Multimeter (GMM)

Unlike the DMM, the graphing multimeter provides two channels for testing and plots a visual graphing line of the signal instead of displaying digital values. The GMM displays a signal's measurements over time on a two-dimensional grid. This plotted graph is basically a graphical history (histogram) of the signal's measurements over time.

The GMM uses a higher sample rate (than a DMM) to calculate signal measurements. This characteristic along with the visual graph, make the GMM ideal for finding intermittent dropouts or glitches that may not be obvious when viewing a digital value. A key advantage of the GMM is being able to capture a signal over a long time interval and then review its graphical history, to visually see if and when dropouts have occurred.

In addition, the GMM uses a combination of filter and peak detect modes to provide a good balance between detecting fast glitches and preventing unwanted noise from displaying.

Unlike the lab scope, the sweep scales used with typical GMM tests are of longer time intervals, and may range from seconds to minutes, compared to the lab scope sweep scales that use relatively short time intervals (e.g. milli and micro seconds). This allows you to monitor a signal over a longer period of time when looking for erratic glitches or dropouts.

To use the GMM, select the **Scope Multimeter** icon from the home screen then select **Graphing Multimeter** from the menu. See [Tests and Capabilities \(Quick Reference\)](#), on page 70 for a list of available testing functions.

Specifications

| Function | Range | Accuracy/Comments |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signal Measurement | Ch. 1— (yellow jack) Ch. 2— (green jack) | Each channel input is referenced to common ground (GND— black 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 M Ω @ DC 4 k Ω @ 3 MHz | Channel 1 and 2 |
| VDC (Full Scale) | 75VDC | Do not measure greater than 75VDC |
| VAC (Full Scale) | 50VAC | Do not measure greater than 50 VAC (rms) |
| Ohm Measurement Diode Test Continuity Test | Ch. 1— (yellow jack (-)) Ch. 2— (green jack (+)) | - |
| Ohms | 40 Ω —4 M Ω | Fixed scales |
| Low Amp Probe | 20A scale (100mV/Amp) 40A scale (10mV/Amp) 60A scale (10mV/Amp) | Connect the positive (+) Amp Probe lead to the yellow jack on the diagnostic tool for values on Ch. 1, or to the green jack for values on Ch. 2. Connect the negative (-) lead to GND (black jack) ¹ . |
| 1. Do not use the Low Amp Probe to measure current on conductors at a potential greater than 46VAC peak or 70VDC. | | |

8.1.3 Lab Scope

Similar to the GMM, the lab scope (oscilloscope) plots a visual image line of a signal's measurements over time on a two-dimensional grid. The visual line that is displayed is commonly called a trace, and the graphical form created by a signal is called a waveform.

Unlike the DMM, the lab scope allows you to visually see a signal's waveform, which in turn allows you to see the strength and shape of the signal, as well as any noise that may be occurring on the circuit. The lab scope also samples signals at a high rate, which allows you to see a higher level of detail in short samples of the signal, especially in signals that change rapidly. In addition, the lab scope also provides more control over the acquisition of the signal and in how it is displayed, through the use of triggers and channel controls. All of these features allow you to analyze signals in great detail when performing diagnostics.

To use the lab scope, select the **Scope Multimeter** icon from the home screen then select **Lab Scope** from the menu. See [Tests and Capabilities \(Quick Reference\)](#), on page 70 for a list of available testing functions.

Specifications

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

8.2 Tests and Capabilities (Quick Reference)

The following chart identifies and describes available tests by function.



NOTE:

Not all the tests listed are described in this manual. This list is intended as reference only.

| D M M | G M M | LS | Test | Function |
|-------------|-------------|----|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | ✓ | Two Channel Lab Scope | Displays two Lab Scope channels automatically. |
| | ✓ | | Dual Graphing Meter | Displays two Graphing Multimeter channels automatically. |
| | | ✓ | Ignition Probe | Measures secondary Ignition voltage 2 to 50kV. Displays secondary ignition (kV) waveforms. |
| ✓ | ✓ | ✓ | Volts DC | Measures direct current voltage. DC voltage is measured through the two test leads connected to a DC circuit. |
| ✓ | ✓ | | Volts DC - Average | Measures DC voltage using a filter to determine the average voltage over a period in time. DC voltage is measured through the two test leads connected to a DC circuit. |
| ✓ | ✓ | | Volts AC RMS | Measures the effective AC voltage, not the peak voltage which results in measurements with higher accuracy. The AC RMS (root mean square) voltage value can be defined as the equivalent DC voltage of the AC voltage measured. RMS values are commonly used in AC electrical measurement, as they are more representative of DC measurements. |
| ✓ | ✓ | | Ohms | Measures electrical resistance (opposition to current) 0 to 4 M Ohms. Scope supplied DC current is passed through the circuit to measure the resistance between the two connected test leads. |
| ✓ | | | Diode/Continuity | Measures voltage drop across a diode and continuity through a diode. Scope supplied DC current is passed through the diode to measure the voltage drop between the two connected test leads. Typical setup for positive to negative current flow - positive lead (anode +/side) and negative (cathode -/side). |
| | ✓ | | Frequency | Measures the number of times a signal repeats itself per second. Used to measure frequency of signals such as CKP, CMP and wheel speed sensors. |
| | ✓ | | Pulse Width | Measures the on-time of various components (e.g. components that cycle on and off like the EGR, or canister purge). |
| | ✓ | | Injector Pulse Width | Measures fuel injector on-time when checking for variances when engine load is changed and/or physical problems with the injector. |
| | ✓ | | Duty Cycle | Measures the ratio of the pulse width to the complete cycle width, the on-time of components that cycle on and off like EGR, or canister purge from 0–100%. |
| ✓ | ✓ | ✓ | Low Amps (20) | Used to measure amperage of typical devices (e.g. ignition coils, injectors, fuel pumps) that may draw up to 20A peak (startup) when initially started. Also used to measure parasitic draw. |

| D M M | G M M | LS | Test | Function |
|-------------|-------------|----|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ✓ | ✓ | ✓ | Low Amps (40) | Used to measure amperage of typical motors and devices that may draw up to 40A peak (startup) when initially started. |
| ✓ | ✓ | ✓ | Low Amps (60) | Used to measure amperage of larger motors and devices that may draw up to 60A peak (startup) when initially started. |
| | ✓ | | MC Dwell (60) | Measures carburetor Mixture Control Solenoids (0–60°). The duty cycle of the solenoid is expressed in the dwell angle of a 6 cylinder engine: 100% = 60 deg. |
| | ✓ | | MC Dwell (90) | Measures fuel system Mixture Control Solenoids (0–90°). The duty cycle of the solenoid is expressed in the dwell angle of a 4 cylinder engine: 100% = 90 deg. |
| | ✓ | ✓ | 100 PSI Vacuum | Used to measure vacuum up to 20 in.Hg, using the 0–100 psi transducer. |
| | ✓ | ✓ | 100 PSI Pressure | Used to measure pressures for typical systems such as, fuel, oil, EVAP, hydraulic/transmission fluid etc. up to 100 psi, using the 0–100 psi transducer. |
| | ✓ | ✓ | 500 PSI Pressure | Used to measure pressures for typical systems such as, hydraulic/transmission fluid pressure, cylinder compression, and AC high side up to 500 psi, using the 0–500 psi transducer. |
| | ✓ | ✓ | 5000 PSI Pressure | Used to measure pressures for typical systems such as, ABS, power steering, and heavy-duty hydraulic system fluid up to 5000 psi, using the 0–5000 psi transducer. |
| | ✓ | ✓ | MT5030 Vacuum | Used to measure vacuum up to 29 in.Hg, using the MT5030 pressure transducer adapter. |
| | ✓ | ✓ | MT5030 Pressure | Used to measure fluid and gas pressures up to 500 psi, using the MT5030 pressure transducer adapter. |
| | ✓ | ✓ | EEDM506D Temperature | Used to measure temperatures from -50° to 1800° F (-45 to 982° C), using the EEDM506D pressure transducer adapter. |

8.3 Test Leads and Accessories

Some of the leads, probes and adapters supplied with or that may be available, are explained in the following section.

**NOTE:**

Not all test leads and/or accessories may be available in all markets. Contact your sales representative for information, or to find out more about these and other available accessories.

IMPORTANT:

Avoid damaging test leads, do not pull on the wire when removing the leads from their jacks. Pull only on the lead terminal end.

8.3.1 Channel 1 Lead

The shielded yellow lead is used with channel 1, and is color matched with the channel 1 jack on the diagnostic tool.

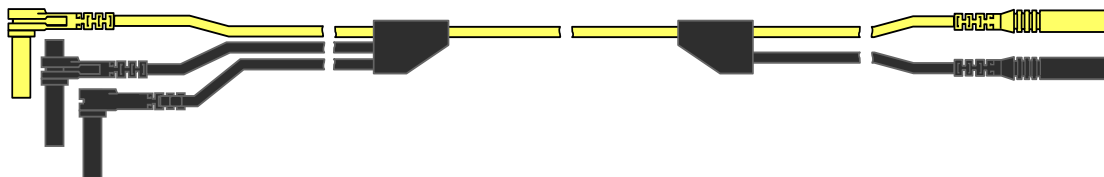


Figure 8-1 Yellow Channel 1 Lead

This lead also includes two black, right-angle common ground plugs. One plug is standard and the other is stackable. The standard ground plug should always be connected to the ground (GND) jack on the diagnostic tool.

The stackable ground plug is used for connecting additional ground leads, such as the Channel 2 or the Secondary Coil Adapter lead grounds. The stackable ground lead is internally connected to the standard ground lead, therefore it does not need to be connected to the diagnostic tool ground jack.

8.3.2 Channel 2 Lead

The shielded green lead is used with channel 2, and is color matched with the channel 2 jack on the diagnostic tool. This lead also includes a black, right-angle stackable ground plug.

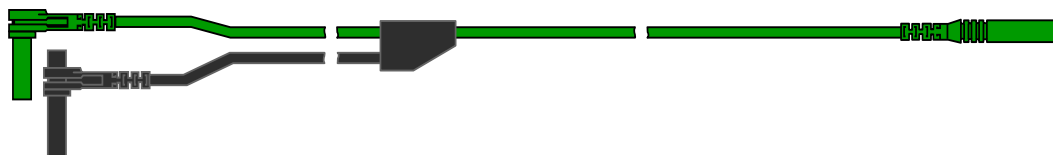


Figure 8-2 Green Channel 2 lead

8.3.3 Alligator Clips and Probes

Insulated alligator clips and probes (pointed type) can be attached to the end of the test leads. Each alligator clip is color matched with a test lead, and the probes are available in red and black.

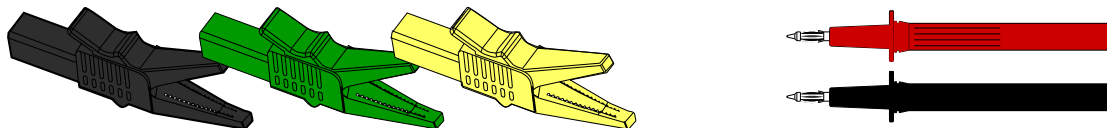


Figure 8-3 Alligator clips

8.3.4 Secondary Ignition Coil Adapter Lead and Clip-on Adapter (optional)

The secondary ignition adapter lead can be used with the secondary ignition clip-on wire adapter, coil-in-cap (CIC), or coil-on-plug (COP) secondary ignition adapters to display secondary ignition signals. The clip-on adapter clips over a secondary ignition wire to pickup a signal, and the CIC and COP adapters attach to the ignition coil. The coil adapter lead includes a black, right-angle stackable ground plug, and a RCA type connector that is used to connect the lead to a secondary ignition adapter. The spring clamp is used to connect to a ground.

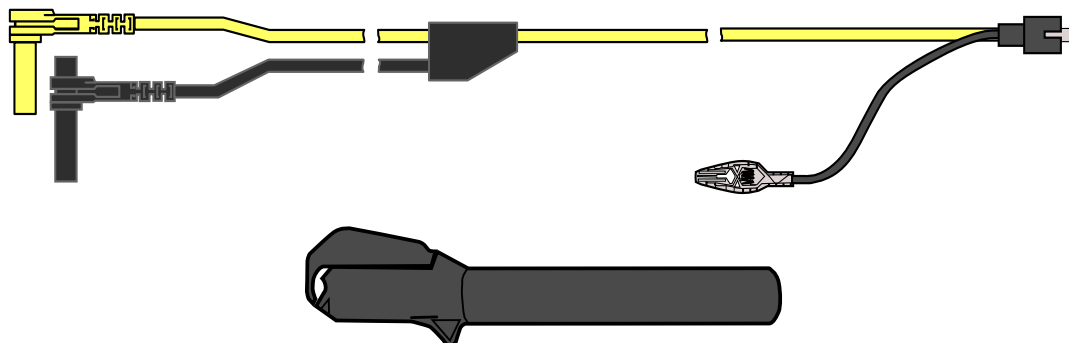


Figure 8-4 Secondary Ignition Coil Adapter Lead and Clip-on Wire Adapter



NOTE:

Contact your sales representative for additional information on OEM specific CIC and COP secondary ignition adapters.

8.3.5 Low Amp Current Probe (optional)

The Low Amp Current Probe is used measure AC or DC current up to 60A. This probe includes two scales (0 to 20A) and (0 to 60A) that can be used to provide accurate and reliable non-intrusive current measurement for components such as, ignition coils, fuel injectors, fuel pumps, relays, and electric motors.



Figure 8-5 Low Amp Current Probe

8.3.6 Temperature Probe Adapter (optional)

The temperature probe adapter can be used to measure temperatures ranging from -50°F to $1,800^{\circ}\text{F}$. Different probes are available for surface, fluid and air temperature measurements.



Figure 8-6

8.3.7 Pressure Transducers and Adapters (optional)

Different pressure transducers and adapters are available for measuring positive and negative gas and liquid pressures. Depending on the adapter, measurement capabilities range from 1 to 5000 psi and up to 29 inHg. Measurement and application capabilities vary per device.



Figure 8-7

8.3.8 Waveform Demonstration Tools (optional)

To help you sharpen your lab scope and graphing multimeter skills, optional waveform demonstration tools are available as a training aid. These demonstration tools generate common waveforms, and allow you to vary their display characteristics by turning glitches on/off, helping you to become more familiar with the lab scope controls. Common waveforms include, AC sine wave, variable frequency and pulse, secondary ignition, and more. There are two tools currently available, the standard model (Figure 8-8 left) and the vehicle simulator model (Figure 8-8 right) which produces waveforms (e.g. Crankshaft Position Sensor (CKP), Camshaft Position Sensor (CMP), Accelerator Pedal Sensor (APP), Wheel Speed Sensor (WSS) Signals, and more) representative of a 2012 BMW 328i Sedan.

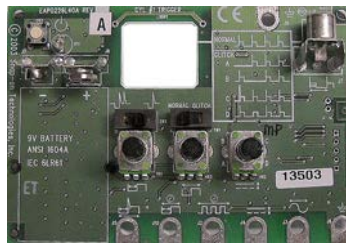


Figure 8-8

8.4 General Information

This section describes the general Scope Multimeter control icon functions, screen layout and optional settings. The screen layout and control icon functions are shared between the digital/graphing multimeters and lab scope.



NOTE:

Scope and Multimeter tests are not vehicle specific, therefore vehicle identification is not required.

8.4.1 Scope Multimeter Screen Layout and Features







- 1— **Toolbar**—contains navigational and control icons
- 2— **Data Buffer Position Indicators**—graphical and numerical position indicators
- 3— **Main Body**—contains the meter/scope display
- 4— **Control Panel**—contains channel/trace controls
- 5— **Expand/Collapse icon**—toggles display between split and full screen views

Figure 8-9

Scope Multimeter Control Icons

The following control icons are common across most Scope Multimeter functions, however use may vary depending on the active function or test. A yellow frame surrounding an icon (highlighted), indicates it is selected. Other control icons (not shown) are described in [Common Toolbar Control Icons](#), on page 14.

| Icon | Function |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Stop - Stops the data buffer</p> |
|  | <p>Control Panel - (a). In full screen mode, when selected this icon becomes surrounded by a white frame and opens the control panel at the bottom of the screen while switching active selection focus to the Show/Hide or Probe icon in the Control Panel. (b). In split screen mode (control panel open), when selected this icon becomes surrounded by a white frame and switches active selection focus to the Show/Hide or Probe icon in the Control Panel.</p> <p>Note: Switching active selection focus to the Control Panel allows manual navigation (using the directional control buttons) of the Control Panel control icons</p> |
|  | <p>Zoom - Increases and decreases screen magnification. The zoom function is only available during data review (scope stopped).</p> |
|  | <p>Cursors - Toggles cursors on/off.</p> |

Main Body

The main body may display the following:

- Menu - Select from a menu using the touch screen or the control buttons.
- Meter/Scope Display - Up to two signal traces can be displayed simultaneously. Each trace is displayed as voltage over time and the voltage level is recorded on the vertical, or “y”, axis and time is presented on the horizontal, or “x”, axis of the screen.

Data Buffer Position Indicators

The graphing multimeter and lab scope functions have the capability to save, store and playback, data (signals) utilizing internal storage “buffer” memory.

The Data Buffer Position Indicators are used to visually see the overall amount and position of the of stored buffer data during saving and playback.

For additional information on the Data Buffer, Data Buffer Position Indicator and Saving, Storing and Reviewing Data files, see [Saving and Reviewing Scope / Multimeter Data Files](#), on page 104.

8.4.2 Measurement Out of Range (Alert)

When performing a test, if a group of arrows displays onscreen, this indicates that the measurement is out of range for the scale selected.

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

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

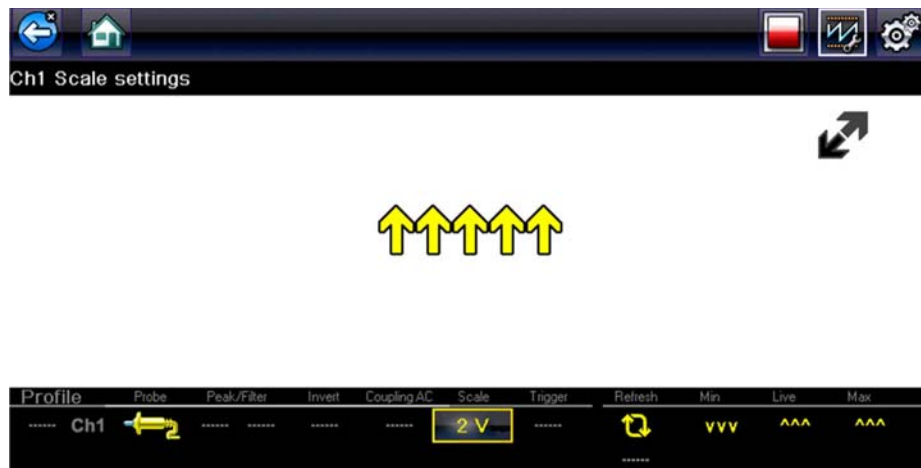


Figure 8-10

WARNING



Risk of electrical shock.

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

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

IMPORTANT:

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

Correct an out-of-range condition by selecting a scale setting appropriate for the signal being sampled. See [Scale \(Vertical scale adjustment\)](#), on page 82 for more information.

8.5 Operation and Controls

This section describes the general operation and controls used to configure the scope or meter to perform testing. All three functions share similar control panel settings, see [Control Panel and Settings](#), on page 81 for additional information.

**NOTE:**

The information in the following sections is intended as a guide and general overview of the controls and functions used within the Scope Multimeter. Not all the settings or controls described throughout this section are applicable with all functions.

**To open a scope multimeter function:**

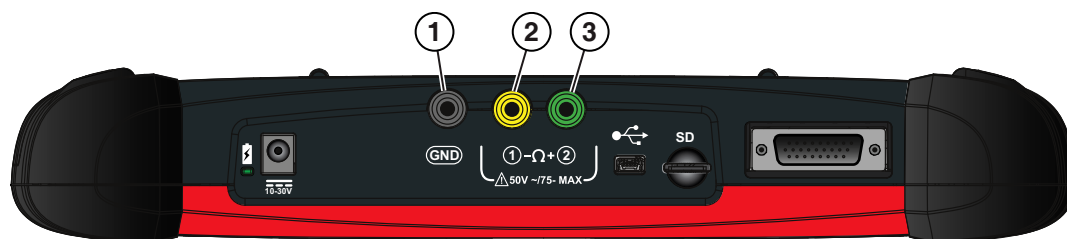
1. Select the **Scope Multimeter** icon from the home screen.
2. Select either **Lab Scope**, **Graphing Multimeter** or **Digital Multimeter** from the menu.

8.5.1 Test Lead / Probe Connection

Standard “safety type” test lead jacks are located on the top of the diagnostic tool, and are compatible with many test leads and probes. Insert the applicable test lead or probe terminal end into the jack to complete the connection.

IMPORTANT:

To avoid damaging test leads, do not pull on the wire when removing the leads from their jacks. Pull only on the lead terminal end.



- 1— Ground Jack (Black)
- 2— Channel 1 Jack (Yellow)
- 3— Channel 2 Jack (Green)

Figure 8-11 Scope Multimeter Test Lead Jacks

8.5.2 Test Lead / Probe Calibration

Certain tests may display a confirmation prompt asking “Do you wish to calibrate this probe?” before continuing with the test. As general practice, it is important to ensure the test probe is calibrated before testing, to ensure accurate results.

Typical resistance, pressure, and vacuum tests will display the calibration message, reminding you to calibrate the probe. To perform the probe calibration, select **Yes** at the prompt and continue to follow the onscreen instructions to complete the calibration.

Example: For the ohms (resistance) calibration process, once completed, zero ohms should be displayed when the leads are connected together. When the leads are separated, the upward arrows on the display indicate infinite resistance or an open circuit.



NOTE:

During an ohms test or a pressure test, a manual probe recalibration can be initiated by selecting the probe icon from the Control Panel to open the probe menu. Then select either the **Ohms** or **Pressure (100, 500, 5000)** items from the probe menu. The menu selections will display a graphic of a balance scale with an “X” through it (on right side) to indicate that probe is not calibrated.

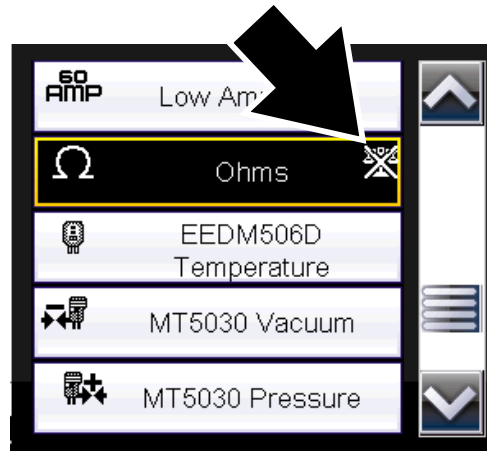


Figure 8-12 Probe menu - Ohms with “not calibrated” indicator displayed

8.5.3 Control Panel and Settings

The control panel is common to all three Scope Multimeter functions, and contains the channel (or “trace”) settings and controls that are used to monitor and adjust the signal being measured. This section provides a general overview of all the channel settings and control features used across all three Scope Multimeter functions.



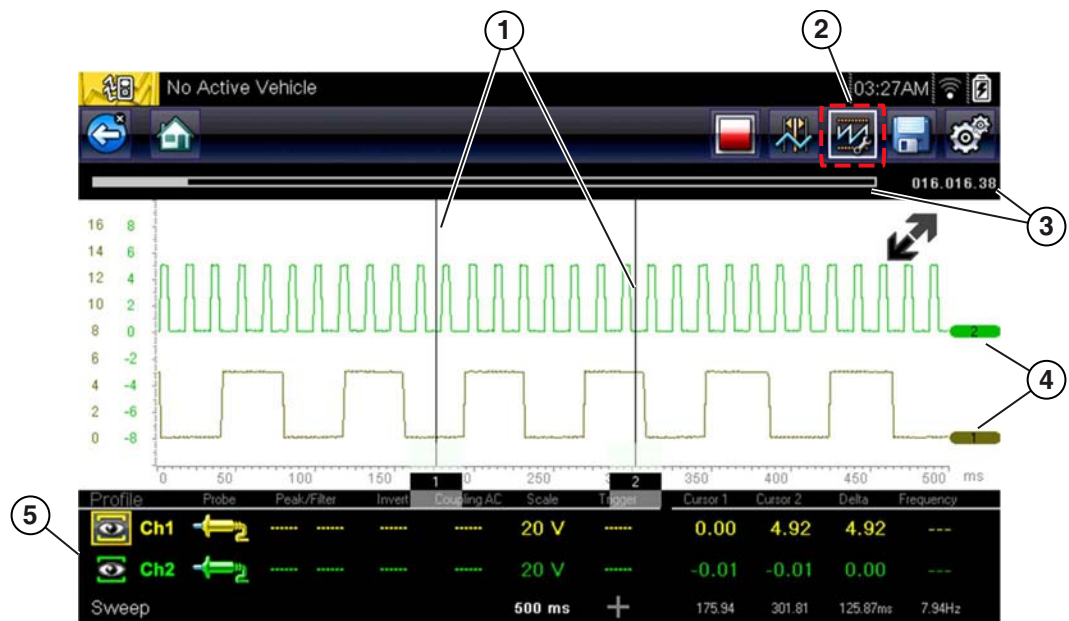
NOTE:

This section is intended as a general overview of the channel settings. Not all the settings or controls described in this section are applicable with all functions, some may be “grayed out” or not active (applicable) depending on the function or test. Function availability is noted as applicable.



NOTE:

The control panel can be toggled on/off by selecting the Expand/Collapse Icon to switch the screen between full and split test meter views.



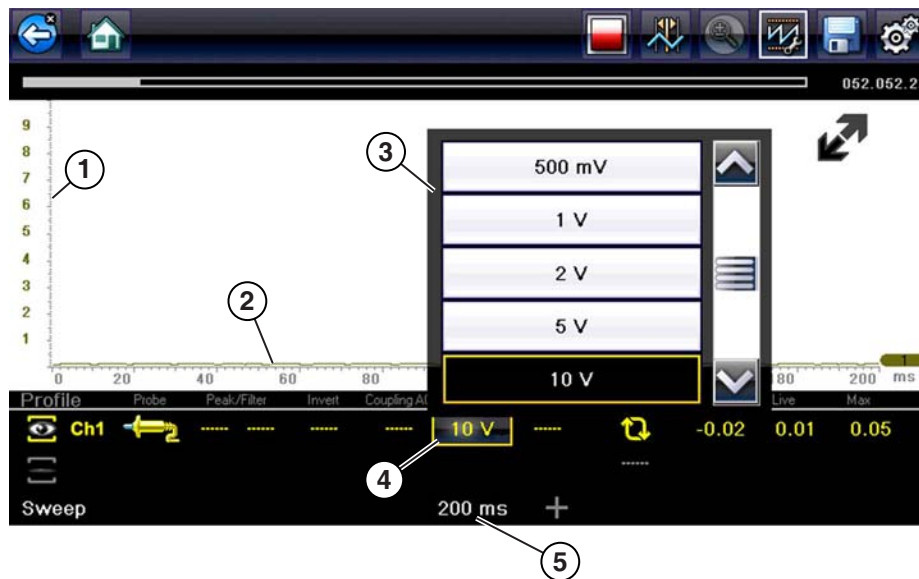
- 1— Cursors
- 2— Control Panel Icon
- 3— Data Buffer Position Indicators—graphical and numerical position indicators
- 4— Zero Base Line Indicators
- 5— Control Panel—contains channel/trace controls and settings

Figure 8-13

Scale, Sweep and Probe Settings

The most common and typically the first adjustments made when performing tests are the setup or adjustment of the scales and selection of a probe. All three of these adjustments are made from the control panel and are described in the following sections.

The following illustration is for reference, and identifies key terms and features used throughout the following sections:



- 1— Vertical Scale - [Y axis]
- 2— Horizontal (sweep or time) Scale - [X axis]
- 3— Vertical Scale Menu
- 4— Vertical Scale Icon
- 5— Sweep Scale Icon

Figure 8-14

Scale (Vertical scale adjustment)

The vertical scale (Y-axis) represents what is being measured (voltage, amperage, pressure etc.), and the unit of measurement it is being measured in. The vertical scale is “always” divided into 10 major divisions; how these divisions are defined, sets the scale of measurement.



NOTE:

Vertical scales (either channel) can be set independently.



NOTE:

Optional vertical scale preference settings are available. The Divisions option allow you to change (to your preference) how the vertical scale menu selections are represented, and the type of value that displays in the vertical scale icon. See [Divisions](#), on page 100.

To adjust the vertical scale unit of measurement, select the **Vertical Scale** icon to open the vertical scale menu. Select a value then press the **N/X** button, to exit the menu. The value displayed in the vertical scale icon indicates the active value.

Example: Selecting 10V, changes the vertical scale to a 10V volt scale. The scale is “always” divided by 10, therefore each division is incremented by 1V.

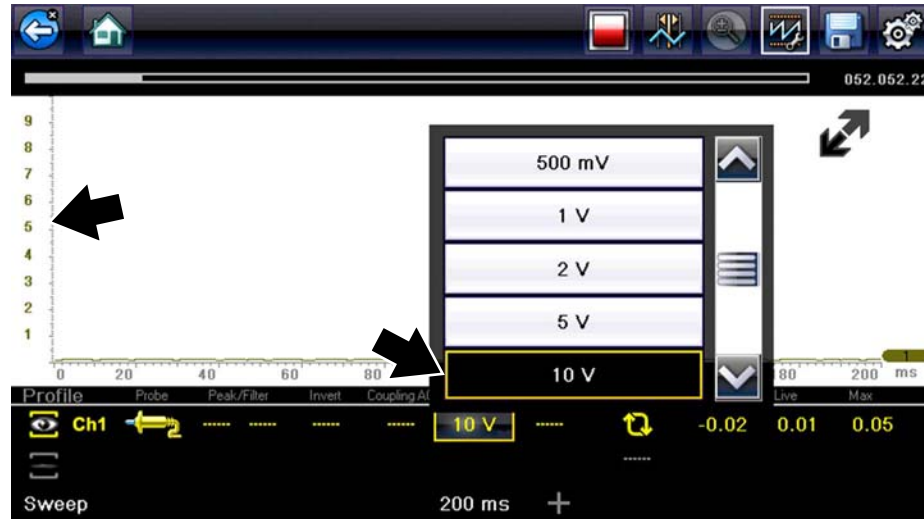


Figure 8-15

Example: Selecting 50 psi displays a 50 psi scale that is divided by 10, therefore each division is incremented by 5 psi.



Figure 8-16

Sweep (Horizontal or Time scale adjustment)

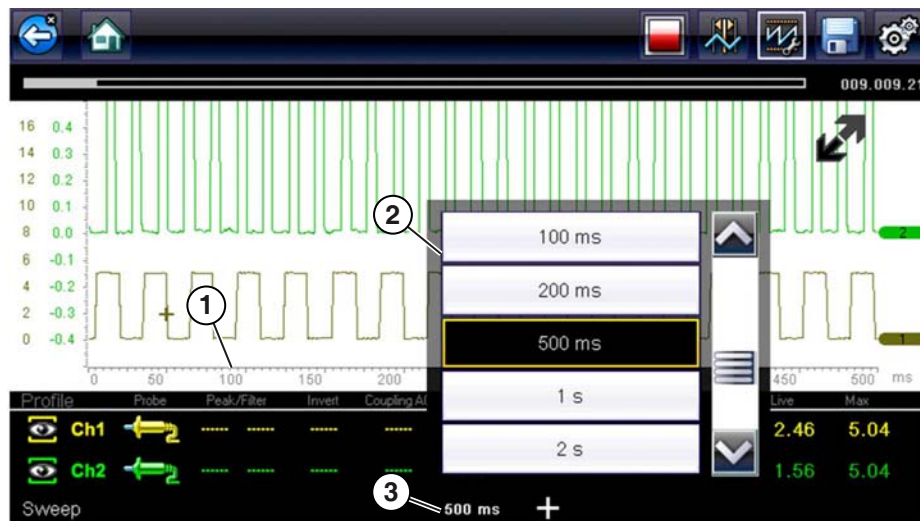
The horizontal scale (X-axis) represents time, and the unit of measurement it is being measured in. The horizontal scale is “always” divided into 10 major divisions, how these divisions are defined, sets the scale of measurement. The value displayed in the sweep Scale icon indicates the active sweep setting.



NOTE:

The sweep setting applies to all channels and cannot be set independently per channel.

To adjust the sweep scale unit of measurement value, select the Sweep Scale icon to open the sweep scale menu. Select a value then press the **N/X** button, to exit the menu.



- 1— Sweep Scale
- 2— Sweep Scale Menu
- 3— Sweep Scale Icon

Figure 8-17

Example: Selecting 500ms, changes the sweep scale to a 500ms scale. The scale is “always” divided by 10, therefore each division is incremented by 50ms.

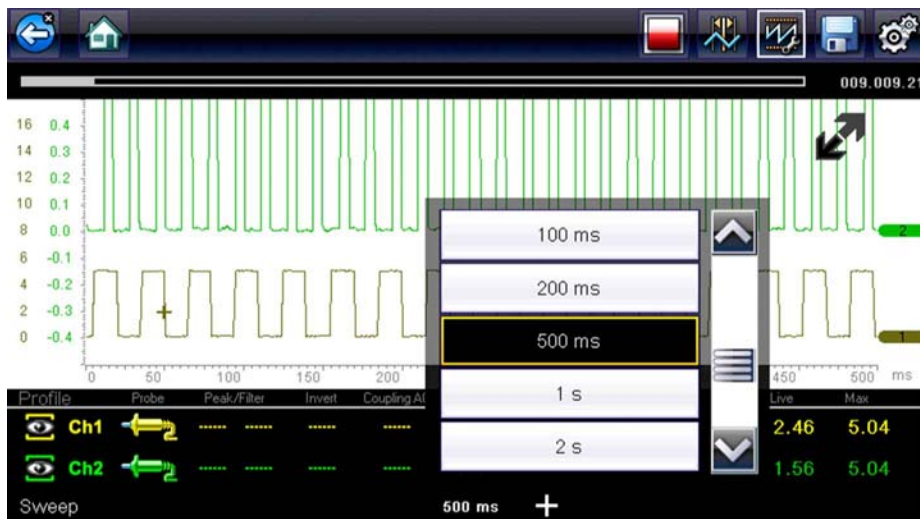


Figure 8-18

Probe (Probe type “test” selection)

Different types of Probes are available from the probe option menu, depending on which type of test you are performing. Changing the probe selection, also changes the vertical scale to the applicable type of measurement.

To select a Probe type, select the **Probe** icon to open the probe option menu, then select a probe. The probe icon will change to the selected probe. Select **Close** from the menu to close the menu.

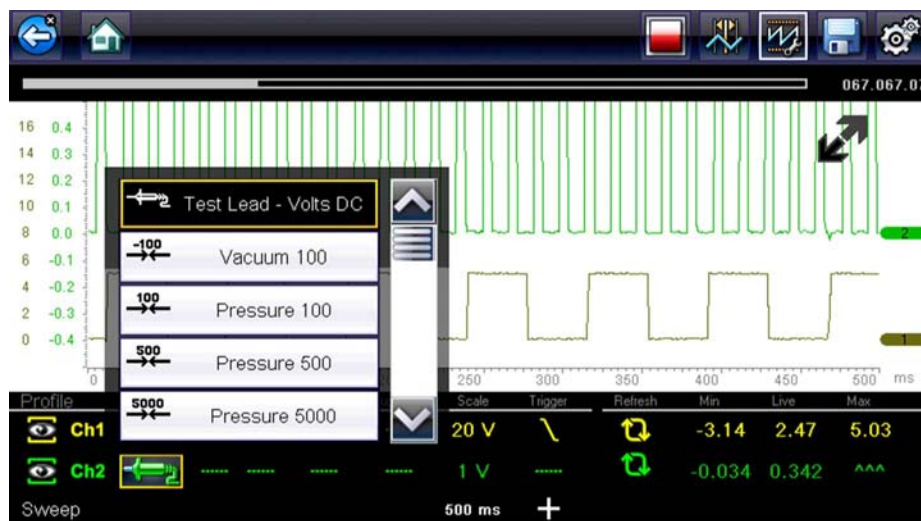


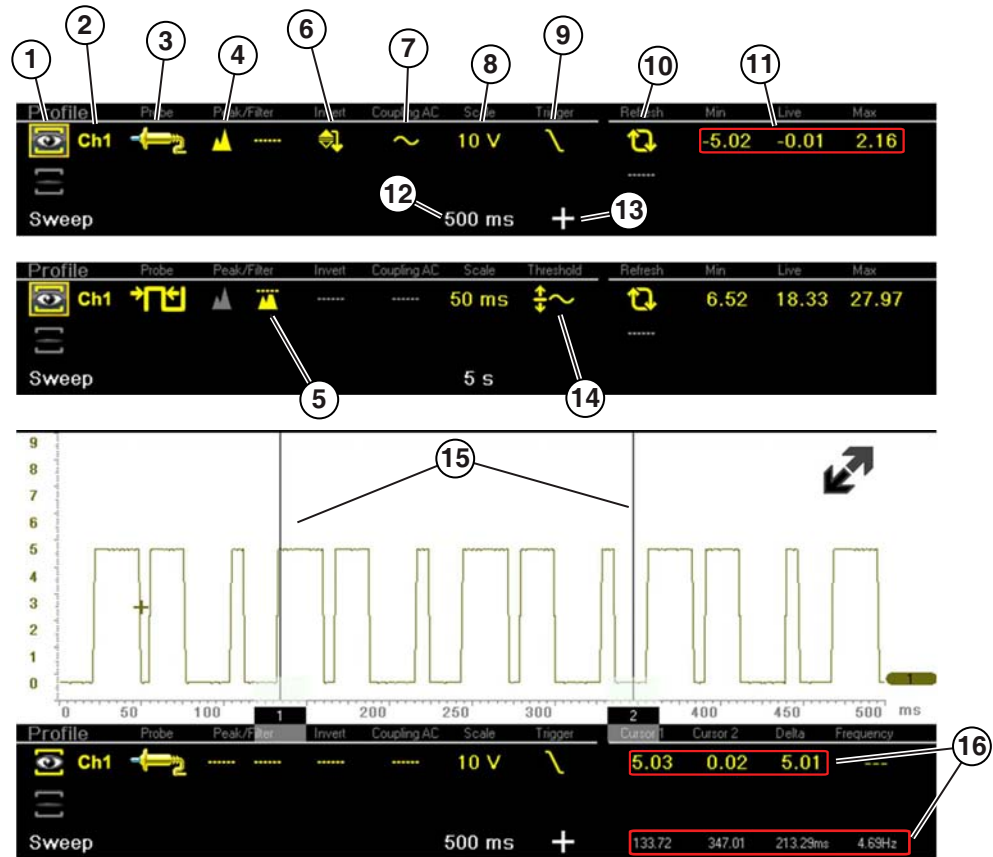
Figure 8-19 Probe option menu

For probe calibration information, see [Test Lead / Probe Calibration](#), on page 80.

| Probe “test” Options | |
|----------------------|-----------------------------------------------------------------------------------------|
| Menu Option | Probe / Device Used |
| Test Lead - Volts DC | Standard Channel 1 and 2 test leads with alligator clips or test probes |
| Vacuum 100 | (optional) 0-100 psi pressure transducer with pressure adapter |
| Pressure 100 | |
| Pressure 500 | (optional) 0-500 psi pressure transducer with pressure adapter |
| Pressure 5000 | (optional) 0-5000 psi pressure transducer with pressure adapter |
| Low Amps 20 | (optional) Low Amp Probe |
| Low Amps 40 | |
| Low Amps 60 | |
| Ignition | (optional) Secondary ignition adapter lead with desired secondary ignition coil adapter |
| EEDM506D Temperature | (optional) Part number - EEDM506D temperature adapter |
| MT5030 Vacuum | (optional) Part number - EEDM5030 0-500 pressure adapter |
| MT5030 Pressure | |

Channel Settings

The majority of the channel (trace) settings and controls are located in the Control Panel. Each setting is represented by an icon, or a value. Icons are used to make adjustments, and the displayed values represent an individual characteristic. Depending on the test, applicable settings are displayed. The following image shows different views of the control panels to identify the different controls.





- 1— **Show/Hide (Channel display on/off)**—turns channel on/off
- 2— **Trace (Zero Baseline position adjustment)**—adjusts zero baseline position
- 3— **Probe (Probe type “test” selection)**—changes test probe function
- 4— **Peak Detect**—maximizes sampling rate
- 5— **Filter**—removes signal noise or interference
- 6— **Invert**—switches signal polarity
- 7— **Coupling AC**—blocks the DC portion of signal
- 8— **Scale (Vertical scale adjustment)**—adjusts vertical scale
- 9— **Trigger**—turns triggering on/off, and sets direction of trigger slope
- 10— **Refresh**—clears Min, Max and Live values and resets to zero
- 11— **Min, Live and Max Display Panel**—displays lowest, highest and current trace measurements set since the test was activated
- 12— **Sweep (Horizontal or Time scale adjustment)**—adjusts horizontal scale
- 13— **Trigger Position Icon**—opens trigger position control panel
- 14— **Threshold**—turns auto threshold on, to provide a more accurate measurement on select tests where noise is present (GMM only)
- 15— **Cursors**—used to measure time, amplitude and frequency
- 16— **Cursor Measurements Panel**—displays signal amplitude at cursor and cursor position in time

Figure 8-20

Show/Hide (Channel display on/off)

The Show/Hide icons allow you to turn the channels on and off.

To turn a channel on and off, select the applicable channel's **Show/Hide** icon.


| Show/Hide Icons | |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| On (Channel displayed) | Off (Channel not displayed) |
|  |  |

Trace (Zero Baseline position adjustment)

The Trace icon identifies the channel number and is used to open the zero baseline adjustment controls.

To adjust the vertical position of the zero baseline (0 value) of a trace (for either channel), select the **Trace** icon or to open the zero baseline adjustment controls. Select the up/down arrows to make adjustments or press the up/down directional buttons. Tap the main body screen section or press the **N/X** button, to exit.

The zero baseline can also be repositioned by touching and dragging the baseline marker up/down on the screen.

| Trace Icon |
|-----------------------------------------------------------------------------------|
|  |

Peak Detect**Peak Detect Off**

When peak detect is off, the scope samples at a high rate but saves just enough sample points to the data buffer memory to plot a waveform across the screen. No preference is given to any point during the selection process.

**NOTES:**

- Turning peak detect “off” is suitable for basic measurements, and viewing waveforms (e.g. oxygen (O₂) or Cam sensor) when capturing fast events is not necessary.
- The longer the time sweep, the greater the chance a glitch could be missed because it occurred in between the sample points saved to the data buffer memory. To increase the chance of capturing a glitch with peak detect “off”, a shorter time sweep should be selected.
- Turning peak detect “off” avoids the need for an external filter to decrease the display of unwanted noise, which can make diagnosis more difficult.

Example: *With a time sweep of 10 seconds on a screen 100 points wide, the effective sample rate would be 10 times a second. Decreasing the time sweep to 1 second, increases the effective sample rate to 100 times a second. At this time setting, a fast occurring event is more likely to be captured due to the increased rate. This is the standard mode of operation for many scopes.*

Peak Detect On

When peak detect is “on”, all sample points are evaluated. The points stored to the data buffer memory are intelligently selected to capture fast events that might be missed at slower effective sample rates. Peak Detect captures fast events, spikes and glitches for signals going in both positive and negative directions.





NOTES:

— Turn peak detect "on" when capturing fast events (e.g. ignition firing voltage, glitches, and intermittent events).

— Turning peak detect “on” may capture unwanted noise, therefore, using peak detect may not be suitable for some tests (e.g. oxygen (O₂) sensor), as the waveform may be more difficult to evaluate due to the additional noise that may be displayed.

— Peak Detect decreases the possibility of waveform aliasing.

To turn peak detect on and off, select the **Peak Detect** icon.

| Peak Detect Icons | |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| On (Sampling maximized) | Off (Sampling not maximized) |
|  |  |

Filter

Using the filter feature can minimize or smooth out signal spikes and fast variations, depending on which function is its used with.

Filter - Lab Scope

Using the filter with the lab scope, smooths out fast spikes, which helps to provide a good balance between noise suppression and signal integrity.

Using the filter is useful when working with scales of 5 volts and below, as the lower the voltage scale, the more likely noise can occur.

Example: *Using the filter is helpful when testing components such as, an O2 sensor (1 or 2 volt scale), or when performing a throttle position (TP) sensor sweep test (5 volt scale).*

In addition, the filter is also helpful for low amp probe tests, as a low voltage scale is used to measure the output of the probe (due to the conversion factors of the probe).



Example: *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.*

Filter - GMM

Using the filter with the GMM, the filter minimizes noise by ignoring or smoothing out fast signal spikes.

- 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 μ S and faster) from sources like the ignition system are ignored when filter is active.

To turn the filter on and off, select the **Filter** icon.



| Filter Icons | |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| On (Interference is suppressed) | Off (Interference is not suppressed) |
|  |  |

Invert

The Invert feature is used to switch signal polarity, so the trace appears upside down (inverted) on the screen. This is typically used when measuring amperage using the low amp probe, or high-voltage signals like, secondary ignition.

Example: *A signal that normally rises from 0 to +5 volts, if inverted would show falling from 0 to -5 volts.*

To turn inversion on/off, select the **Invert** icon.



| Invert Icons | |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| On (Polarity is inverted) | Off (Polarity is not inverted) |
|  |  |

Coupling AC

Coupling AC subtracts the average value of a signal so that small variations can be displayed in the waveform. This is accomplished by blocking the direct current (DC) portions of a signal in order to amplify (show) the alternating current (AC) portions of the signal, without driving the trace off of the screen.

Using coupling AC can be helpful when testing and diagnosing alternator ripple or fuel pump amperage, by allowing you to see any abnormal small variations or events.

To turn coupling AC on and off, select the **Coupling AC** icon.

| Coupling AC Icons | |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| On (DC signal portion blocked) | Off (DC signal portion not blocked) |
|  |  |

Trigger



NOTE:

The Trigger feature is only available in the lab scope function.

A trigger can be used to stabilize a changing or erratic signal (a signal that may flicker or drift as it refreshes), so that it is easier to view or diagnose. This stabilization effect is accomplished by basically displaying the same part of the trace repeatedly from the same starting point, thus the flicker or drift is minimized which makes the trace appear more consistent or static.

A trigger is basically a “specific point” on the display, at which a trace will start to display (start the sweep) if it crosses that point.

The trigger feature allows you to set the conditions of that “specific point” also called a “trigger point”. When the trigger conditions are set, and a trace “meets” those conditions (crosses the trigger point), the trace will start.

Trigger conditions:

- **Vertical scale position (amplitude)**
- **Sweep position** - the horizontal scale position, or position in time
- **Slope direction** - the direction the trace must be moving (up/rising or positive) or (down/falling or negative) when crossing the trigger point.



NOTES:

Triggers can be set on any channel, however only one trigger can be activated (used) at a time.

If a trigger is set outside the range of the scales, a yellow marker (e.g. arrow with plus symbol) will be displayed ([Figure 8-22](#)) indicating the trigger is out of range and a confirmation screen will display.




When a trigger is set on a channel, and more than one channel is active (displayed), trigger conditions must be met for that channel in order to display all the other channels.



To turn a trigger on/off:

A trigger is activated by selecting the trigger icon from the control panel, which then automatically initiates trigger slope setup.

1. Select the desired channel's **Trigger** icon.
Each tap of the icon sets the trigger to a different slope setting, or turns the trigger off.
2. Select the desired slope setting, to turn the trigger on.

| Trigger Icon | Description |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|  | Rising (up or positive) - Trigger is turned on to start the trace on the rising edge (as signal begins to rise) |
|  | Falling (down or negative) - Trigger is turned on to start the trace on the falling edge (as signal begins to fall) |
|  | Off - Trigger is turned off. |

3. Proceed to **"To set trigger position"** next to complete the trigger set up.



To set trigger position:

Trigger position (also called trigger level) can be adjusted in two ways:

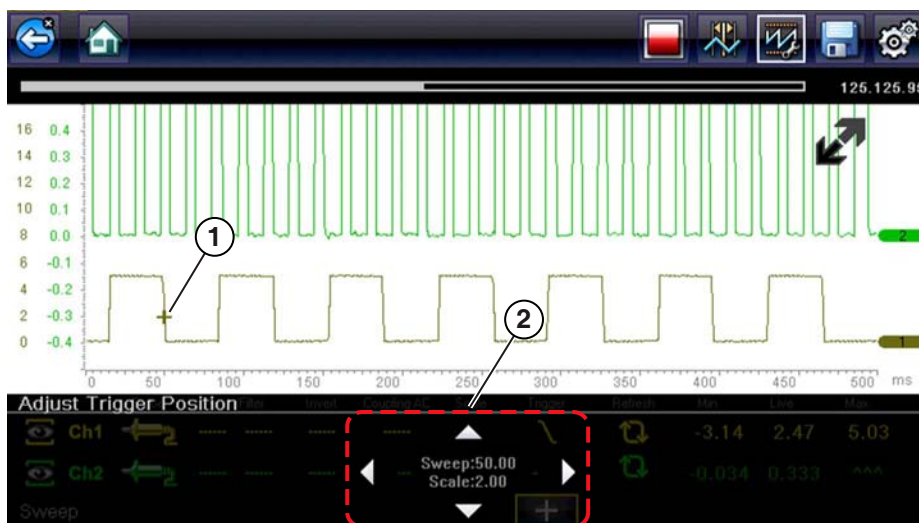
- Dragging the trigger marker ([Figure 8-21](#)) on the touch screen - rough adjustment
- Using the trigger position control panel ([Figure 8-21](#)) - fine adjustment

The trigger marker is indicated by a plus symbol (+) on the display ([Figure 8-22](#)). The trigger marker represents the trigger point and is displayed on the screen when the trigger is turned on.

To roughly position the trigger marker, select and drag it into position using the touch screen.

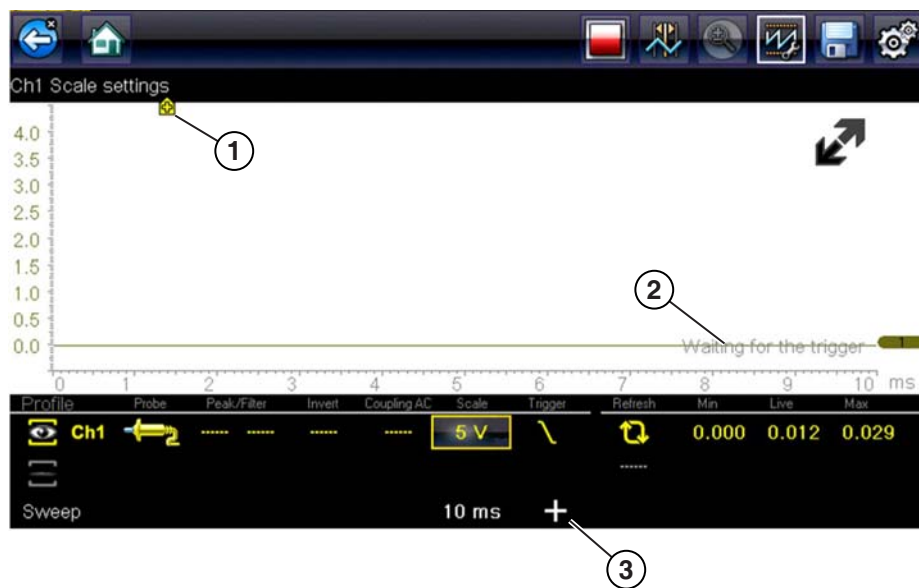
4. To more accurately position the trigger marker, select the **Trigger Position Control** icon ([Figure 8-22](#)).
The trigger position control panel opens.
5. Use the directional controls provided, or the thumbpad directional controls to move the trigger marker into position ([Figure 8-21](#)). Sweep and vertical scale values are provided in the trigger position control panel, which gives you the precise position of the trigger marker.

6. Press the **N/X** button, to exit.



- 1— Trigger Marker
- 2— Trigger Position Control Panel

Figure 8-21 Trigger marker and position controls



- 1— Trigger Marker (out of range symbol)
- 2— Waiting for Trigger Message
- 3— Trigger Position Control Icon

Figure 8-22

Trigger Auto/Manual Mode (Optional Setting)

**NOTE:**

The Auto and Manual Trigger modes allow you to set the criteria used to display signals on the screen. To change the trigger mode, the trigger must be set on one of the channels.

In both Auto and Manual Trigger mode the screen is updated when the signal crosses the trigger point in the selected direction (rising or falling), however:

- **Auto Trigger**—(default mode)
 - when Auto Trigger is on, even if the signal does not cross the trigger point, the screen automatically updates after a short period (allowing you to see the waveform). When this occurs, the message "Waiting for the trigger" (Figure 8-22) is displayed on the screen. The trigger point can then be set to optimize viewing.
 - **Manual Trigger**
 - when Manual Trigger is on, if the signal does not cross the trigger point the screen will not update. This allows you to capture intermittent events, as the screen only updates when the signal meets your trigger selection.
-

**NOTE:**

When using Manual Trigger, it may be easier to initially set the trigger point using Auto Trigger, as the screen will update regardless if the signal crosses the trigger point. Once the trigger point is set, then switch to Manual Trigger mode.

**Selecting Trigger Auto/Manual Mode:**

1. From the Control Panel (on the test meter screen), turn the trigger on for the desired channel.
2. Select the **Settings** icon from the toolbar.
3. Select **Settings > Configure Scope / Meter > Trigger Mode** from the menu selections.
4. Select either **Auto Trigger** or **Manual Trigger**.
5. Select **Back** or press the **N/X** button to navigate back to the test meter screen.

Threshold

**NOTE:**

The Threshold function is only available in the Graphing Meter function for specific tests. This function may also be referred to as Auto Threshold Select (ATS).

The Threshold function can be used, to display and obtain a more accurate measurement when measuring signals (e.g. Frequency, Duty Cycle, MC Dwell and Pulse Width) that may be difficult to display or have noise or other undesirable variations in the signal. When selected, the Threshold function automatically sets a trigger and determines a threshold level in the middle of the signal range (calculated from the Min and Max measurements) to be used as a reference point to calculate the measurement. The falling edge (slope) of the signal is used in determining the threshold level.

To activate the Threshold function, select the **Threshold** icon, then select **Continue** from the confirmation screen (Figure 8-23). Once selected, the Threshold function remains active until the test is exited.



Figure 8-23 Auto Threshold Confirmation Screen

If after enabling the Threshold function, if the signal is still not displayed, reduce the vertical scale setting. Sometimes a low frequency signal may not display if the vertical scale is set too high. If the signal still seems incorrect use the lab scope to verify the signal integrity and signal spacing. Slow or unequal spacing will display as a band or ragged signal, depending on the sweep setting.

Refresh

Selecting the **Refresh** icon (Figure 8-24) clears the active trace(s) displayed and restarts the signal tracking from zero. It also clears the minimum, maximum and live measurements displayed for both channels.

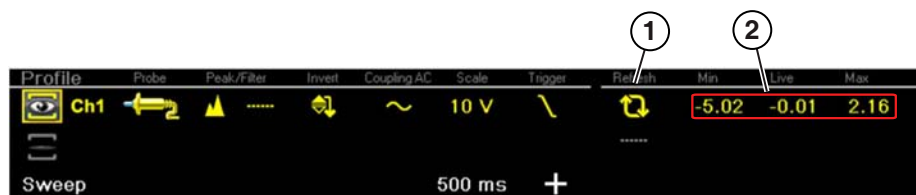
Use the Refresh feature to:

- Track the variation in a component or circuit under a certain condition. If the condition changes, Refresh lets you start tracking again to see the change.
- Verify that a connection problem you found by looking for a dropout or spike in min/max values has been fixed.

Min, Live and Max Display Panel

When Cursors are turned off, the Min, Live and Max display panel (Figure 8-24) is turned on displaying each channel's active signal minimum and maximum recorded measurements and live measurement.

- **Min** - lowest measurement recorded for the signal since the test was activated, or from the last time Refresh was selected
- **Max** - highest measurement recorded for the signal since the test was activated, or from the last time Refresh was selected
- **Live** - represents the "live" running average measurement of the signal being measured



1— Refresh Icon

2— Min, Live, Max Display Panel

Figure 8-24

Cursors



NOTE:

The Cursors feature is only available in the lab scope and Graphing Meter functions.

Two vertical cursors are provided that allow you to make precise signal measurements, when determining signal characteristics such as, amplitude at specific points, and cycle time (duration) or frequency.

Using cursors can also be helpful when performing certain diagnostic tests, such as:

- O2 sensor rich/lean switch time
- fuel injector pulse width frequency
- secondary ignition spark duration
- crankshaft position sensor frequency

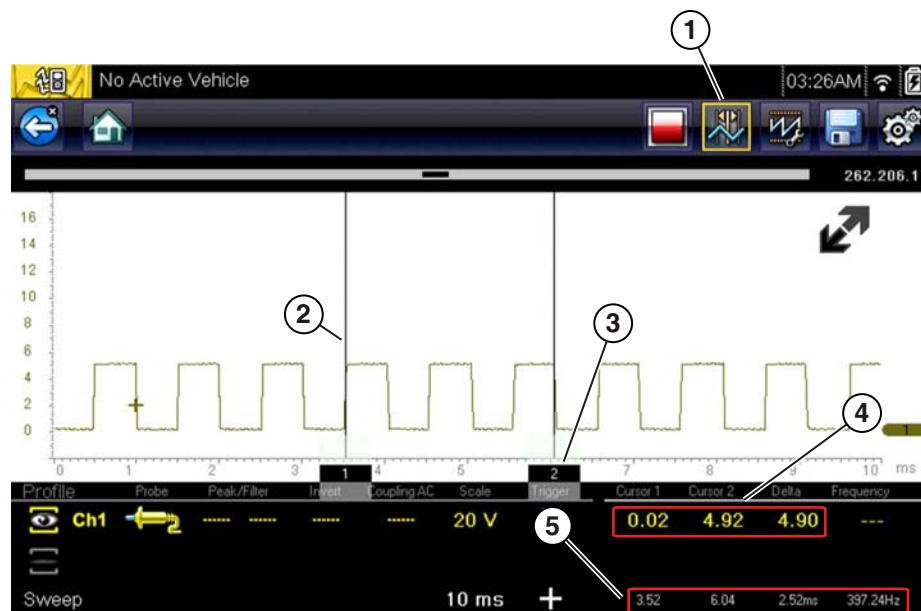
Measurements can quickly be taken between the two cursors, when measuring a single cycle or across multiple cycles by positioning the cursors at the start and end of the cycle or multiple cycles.

The cursor measurements panel is displayed when using the cursors, providing you digital values of the cursor measurements. See [Cursor Measurements Panel](#), on page 97 for additional information on the values displayed in the cursor measurements panel.



To turn the cursors on/off:

- To turn the Cursors on (display), select the **Cursor** icon from the toolbar.
Two cursors are displayed on the test screen, and the Refresh, Min, Live, Max display panel is switched off and replaced by the cursor measurements panel. See [Cursor Measurements Panel](#), on page 97 for additional information on the cursor measurements panel.
- To turn the Cursors off, select the **Cursor** icon again from the toolbar.



- 1— Cursors Icon
- 2— Cursor (no. 1)
- 3— Cursor Marker (no. 2)
- 4— Cursor Measurement Panel - amplitude and delta display
- 5— Cursor Measurement Panel - time and delta display

Figure 8-25



To position the cursors:

The cursors can be positioned anywhere within the range of the sweep scale ([Figure 8-25](#)).

- Turn the Cursors on.
- Using the touch screen, select either cursor marker (base) and drag it to the desired position.

Cursor Measurements Panel

When the cursors are turned on, the Refresh, Min, Live, Max display panel is switched off and replaced by the Cursor Measurements Panel.

The cursor measurements panel displays the following signal and cursor measurements:

- Signal amplitude at two points
- Signal amplitude difference (delta) between two points
- Cursor position in time at two points
- Difference (delta) in time between the cursors
- Frequency - frequency of the signal for the time period between cursor 1 and 2

The cursor measurements panel contains values for each channel in two displays.

The amplitude and delta display is provided in the channel specific color and includes:

- **Cursor 1** - signal amplitude at cursor 1 position
- **Cursor 2** - signal amplitude at cursor 2 position
- **Delta** - signal amplitude difference between cursor 1 and 2

The time and delta display is gray in color and includes:

- **Cursor 1** - cursor position in time at cursor 1
- **Cursor 2** - cursor position in time at cursor 2
- **Delta** - difference in time between cursor 1 and 2
- **Frequency** - the frequency value (Hz) of the signal for the time period between cursor 1 and 2



NOTE:

Frequency is the number of times a signal repeats itself per second and is measured in hertz (Hz).

The frequency value displayed, is the inverse of the Delta value, and can also be calculated as 1 divided by Delta. The frequency value (Hz) shown is automatically calculated by the scope.

Example 1: Delta = 20.46ms, to get frequency divide 1 by .02046 ($1/.02046 = 48.87\text{Hz}$)

Example 2: Delta = 2.53ms, to get frequency divide 1 by .00253 ($1/.00253 = 395.27\text{Hz}$)

Use applicable decimal point placement during division as the Delta value changes.

8.5.4 Secondary Ignition Testing

The lab scope function can be used to display secondary ignition waveforms for conventional and select CIC and COP systems. To display secondary ignition waveforms, optional secondary ignition coil adapter(s) and a coil adapter lead assembly are required.

Contact your sales representative to purchase the optional adapter leads and/or Secondary Ignition Clip-on or COP/CIC Adapters.

- Adapter lead assembly needed:
 - Secondary Coil Adapter Lead Assembly - connects the diagnostic tool to a secondary ignition adapter (yellow and black scope connectors and black RCA type adapter connector). See [Secondary Ignition Coil Adapter Lead and Clip-on Adapter \(optional\)](#), on page 73.
- Secondary Ignition Adapters available:

Different secondary ignition coil adapters are available as optional equipment. These adapters attach to either the secondary lead (spark plug lead) or directly to the secondary ignition coil in order to pick up the secondary ignition signal.

- Universal kV Ignition Clip-on adapter - clips over a spark plug or coil lead. See [Secondary Ignition Coil Adapter Lead and Clip-on Adapter \(optional\)](#), on page 73.
- Universal stick and flag type adapters - are loosely positioned next to or on a secondary ignition coil.
 - General purpose single flag pick-up.
 - General purpose stick pick-up.
- Vehicle specific Clip-on adapters - are directly attached to (or next to) a secondary ignition coil (COP type) or to a distributor cap (CIC type). Secondary ignition coil-on-plug (COP) and coil-in-cap (CIC) adapters are available for universal and engine specific applications. All the adapters listed are available individually.
 - OEM specific COP adapters:
 - *Ford (COP-1)*
 - *Chrysler (COP-2)*
 - *VW/Audi (COP-3)*
 - *Acura/Honda/Isuzu (COP-4)*
 - *Volvo/BMW (COP-5)*
 - *Mercedes-Benz (COP-6)*
 - *Mercedes-Benz Dual Type (COP-7)*
 - *BMW (COP-8)*
 - *Lexus (COP-9)*
 - *Chrysler/Jeep/Lexus/Toyota (COP-11)*
 - OEM specific CIC adapters:
 - *GM HEI (CIC-1)*
 - *Toyota/Honda (CIC-2)*



Connecting the Secondary Coil Adapter Leads:

1. Connect the black (ground) lead into the diagnostic tool test lead ground jack.
2. Connect the yellow lead into the diagnostic tool test lead channel 1 jack.
3. Connect the adapter lead ground clamp to vehicle ground. If a jumper wire is used to extend the length of the adapter lead ground clamp lead, keep it as short as possible.
4. Connect the adapter lead RCA plug into the secondary ignition "clip-on" or COP/CIC coil adapter as needed.
5. Clamp the secondary clip-on adapter over a spark plug or coil lead, or attach the applicable COP/CIC coil adapter to the vehicle ignition coil.
6. Isolate the leads from other components, to avoid any unwanted noise that could be induced onto the signal.
7. From the lab scope function, select the Ignition Probe (probe setting).
8. If needed, turn the Invert function on.

Once a signal is displayed, further channel settings may be required to display the pattern characteristics you are looking for.

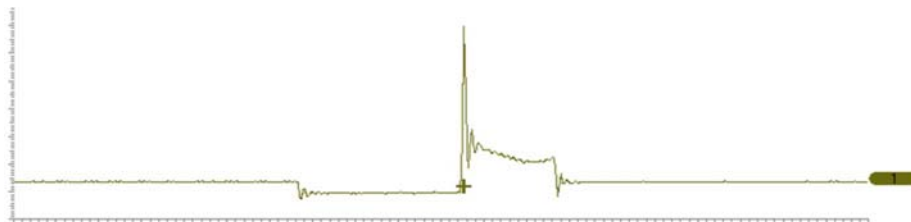


Figure 8-26 Typical Secondary Ignition Signal

8.6 Optional Settings

The following optional Scope/Meter settings are available, and can be set to your preference:

- [Trigger Auto/Manual Mode \(Optional Setting\)](#), on page 93
- [Display \(Grid on/off\)](#), on page 99
- [Divisions](#), on page 100

All optional settings are available from the Tools icon located on the Home screen. Select **Tools > Settings > Configure Scope/Meter** to access the options menu.

8.6.1 Display (Grid on/off)

The Display option allows you to turn the screen grid on/off.

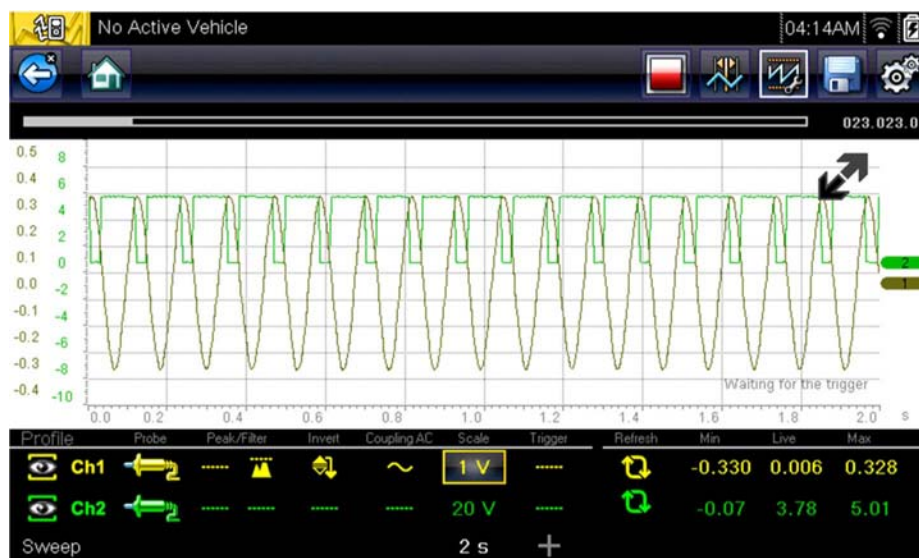


Figure 8-27 Grid on



Changing the Display (grid on/off):

1. Select the **Tools** icon from the Home screen.
2. Select **Settings > Configure Scope/Meter > Display** from the menu options.
3. Select the desired option:
 - **Show Grid**—turns grid lines on
 - **Hide Grid**—turns grid lines off
4. Select the **Back** icon or press the **N/X** button to return to the Settings menu.

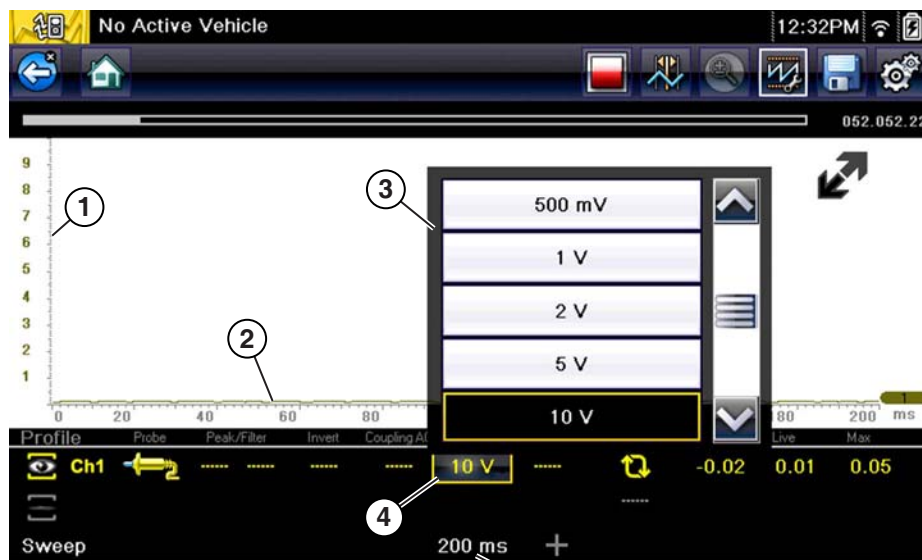
8.6.2 Divisions

The Divisions options allow you to change (to your preference) how the Vertical Scale Menu selections are represented, and the type of value that displays in the Vertical Scale icon.

This section describes the following settings:

- **Trace**
 - Trace Full Scale
 - Trace Per Division
- **Display**
 - Display Full Scale
 - Display Per Division

The following illustration is for reference, and identifies key terms and features used in this manual.



- 1— Vertical Scale
- 2— Sweep (horizontal or time) Scale
- 3— Vertical Scale Menu
- 4— Vertical Scale Icon

Figure 8-28



To access the divisions option menu:

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.
5. Select either option:
 - **Trace Settings** - see [Trace Settings](#), on page 101
 - **Display Settings** - see [Display Settings](#), on page 103
6. Select the **Back** icon or press the **N/X** button to return to the Settings menu.

Trace Settings

The Trace Settings option allows you to change how the vertical scale menu selections are represented.



NOTE:

This setting **ONLY** changes the vertical scale, the sweep (horizontal) scale is **NOT** changed.



NOTE:

When adjusting the vertical scale setting, it is important to remember that the vertical scale is divided into 10 major divisions, and all scale adjustments reflect this factor of 10. The division set of 10 cannot be changed, divisions cannot be added or removed.

Trace Full Scale - changes the dropdown vertical scale menu selections to full scale mode, which represents the selected unit of measurement over the entire (full) scale.

Example (Figure 8-29): Selecting 10V, changes the vertical scale to a 10V volt scale. The vertical scale is “always” divided by 10, therefore each division is incremented by 1V.

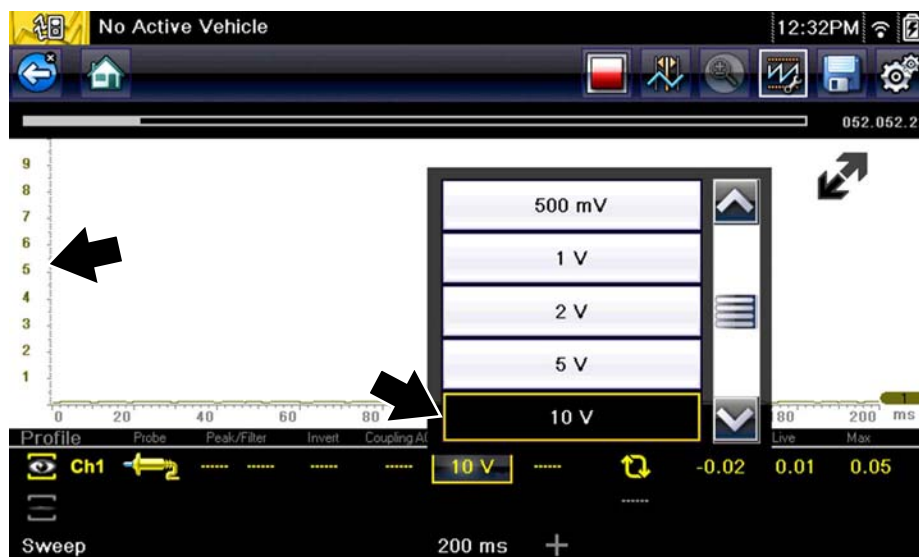


Figure 8-29

Trace Per Division - changes the dropdown vertical scale menu selections to **##/div** mode, which in turn changes the vertical scale to represent **##** by division.

- represents (variable) what is being measured (voltage, amperage, pressure etc.)

Example (Figure 8-30): Selecting 1.0V/div, displays a vertical scale divided by 10. The vertical scale is “always” divided by 10, therefore each division is incremented by 1.0V, thus a 10V scale.

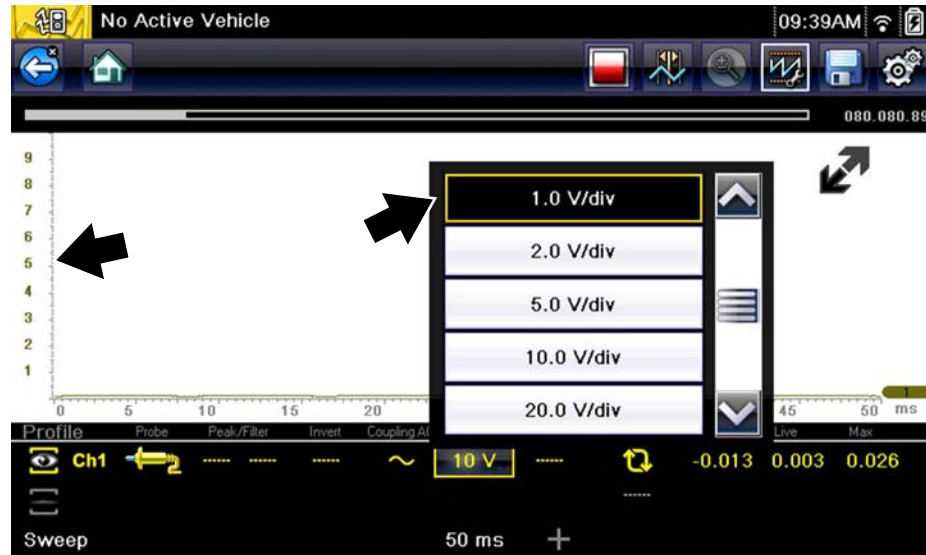


Figure 8-30

Display Settings

The Display setting allows you to change the displayed value in the Vertical Scale icon to your preference.



NOTE:

This setting **ONLY** changes the value displayed in the Vertical Scale icon.

Display Full Scale - displays the value of the entire (full) scale

Example (Figure 8-31): If the vertical scale is set to 1V, the value displayed is 1V.

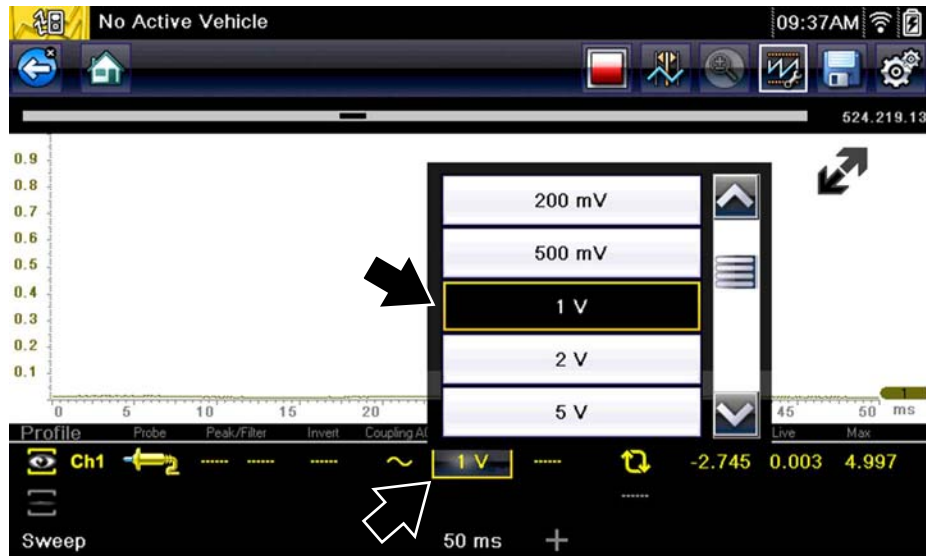


Figure 8-31

Display Per Division - displays the graduation value of the major scale divisions

Example (Figure 8-32): If the vertical scale is set to 1V, the value displayed is 0.1V.

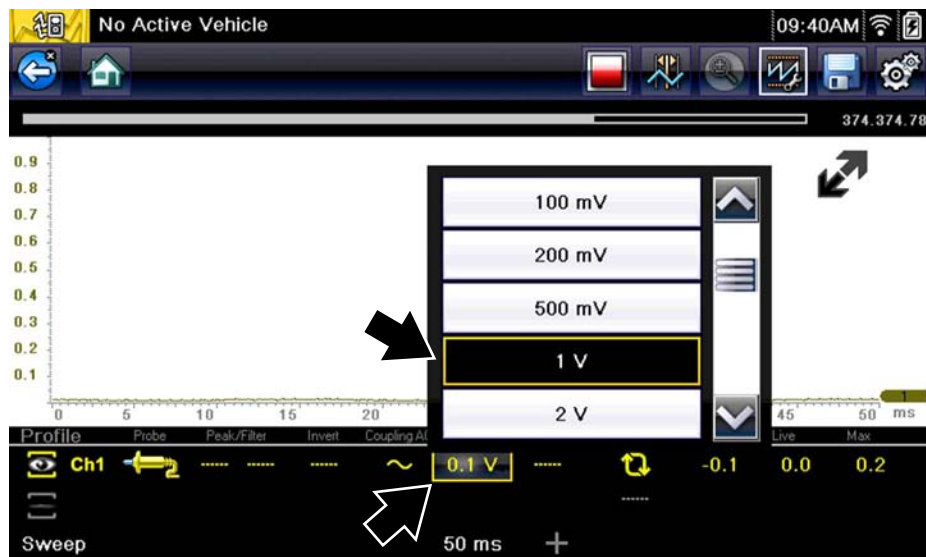


Figure 8-32

8.7 Saving and Reviewing Scope / Multimeter Data Files

The following section describes the procedures used to save and review Scope/Multimeter and Guided Component Tests data files.

8.7.1 Data Buffer

The graphing multimeter and lab scope functions have the capability to save, store and playback, data (test signals) utilizing internal storage memory and buffer memory.

When a test function (e.g. Lab Scope > DC Volts) is selected and displays onscreen, a data buffer automatically starts to store data in buffer memory. The data buffer runs continuously (storing data) until the Stop icon is selected.



NOTE:

The data buffer starts and runs continuously with or without an active input test signal, when a test function is selected.

The Data Buffer Indicator can be used to visually see the amount of stored buffer data. This graphical indicator contains a slider within a bar graph. The bar graph shows how much stored data is in the memory buffer. The slider indicates the position of the current screen in relation to the entire memory buffer contents.

The Data Buffer Position Counter displays a numerical value, indicating the position of the current displayed frame of data within buffer memory.



- 1— Data Buffer Indicator Slider
- 2— Data Buffer Indicator Bar Graph
- 3— Data Buffer Position Counter

Figure 8-33

Buffer memory is limited to a predetermined “total” size. When buffer memory reaches it’s full capacity, the data buffer will continue to store new data, however earlier stored data will be removed to allow room for the new data being stored.

The most recent data is always available for review when the scope is stopped, and can be reviewed using the toolbar controls.

8.7.2 Saving Files

Selecting the **Save** icon writes the data stored in buffer memory to a file. Saving data files is useful when trying to isolate an intermittent problem or to verify a repair during a road test. The saved file can be played back (similar to a movie clip) by selecting **Previous Vehicles and Data > View Saved Data**. See [View Saved Data](#), on page 119 for additional information.

**NOTE:**

The **Save icon** performs the same function as “Save Movie” function choice for the programmable **Shortcut** button, see [Configure Shortcut Key](#), on page 123 for details.

The saved file can also be downloaded to a personal computer (PC) using the Mini USB jack. Once connected to the PC, the files can be printed, transferred, and copied using ShopStream Connect. ShopStream Connect is a companion application that interfaces the diagnostic tool with a PC. ShopStream Connect is available at no cost, and can be downloaded online. See the ShopStream Connect website information at the front of this manual for additional information.

The toolbar control icons are described in [Scope Multimeter Control Icons](#), on page 77 and [Common Toolbar Control Icons](#), on page 14.

**To save files:**

- Select the **Save** icon from the toolbar.

A save dialog box displays while files are being saved. The file is saved when the message box disappears.

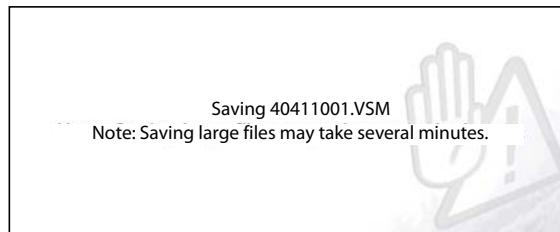


Figure 8-34 Save dialog box

8.7.3 Stopping and Reviewing Data Files

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



NOTE:

Glitches may cause drivability problems and may not turn on the MIL or set DTCs. As a general guide when looking for a suspected signal glitch, always try to verify the problem by duplicating the conditions while capturing data. Utilize the GMM to monitor the signal over longer time periods and review the histogram for possible faults.



To stop and review data files

Playback control icons are described in [Scope Multimeter Control Icons](#), on page 77 and [Common Toolbar Control Icons](#), on page 14.

1. While viewing a waveform (capturing data), select the **Stop** icon.
The playback control icons are displayed.
2. Select the desired playback control icon to step forward or backward through the data.
You can also use the data buffer indicator slider to quickly scroll through the captured data in buffer memory ([Figure 8-35](#)).



1— Skip Back

2— Skip Forward

3— Step Back

4— Step Forward

5— Record

6— Data Buffer Indicator Slider

Figure 8-35

**To resume:**

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

**NOTE:**

The **Shortcut** button can be set to perform the Pause/Play function. See [Configure Shortcut Key](#), on page 123 for additional information.

8.7.4 Saving Screens

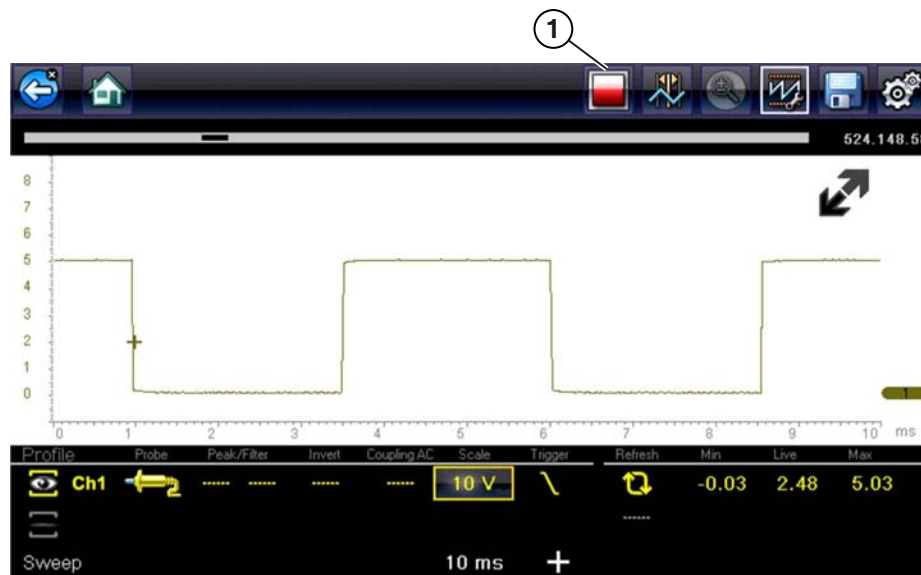
The **Shortcut** button can be programmed to save a snapshot (screen shot) of a visible screen as a bitmap file, see [Configure Shortcut Key](#), on page 123 for details. The saved file can be viewed by selecting **Previous Vehicles and Data > View Saved Data**, see [View Saved Data](#), on page 119 for additional information.

8.7.5 Using the Zoom Function

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

Example: While monitoring a MAF (Mass Air Flow Sensor) signal, the waveform displays normally. As the signal is being monitored, an erratic “condition” suddenly develops, then goes away, but may have not been observed on the screen. Stopping the data capture (when such an event occurs) allows you to analyze the waveform using a higher zoom level (wider view) to look for a glitch in the signal.

During data capture, the default magnification level is 1x. The zoom function is not available until data capture is stopped by pressing the **Stop** icon ([Figure 8-37](#)).



1— Stop Control Icon

Figure 8-36

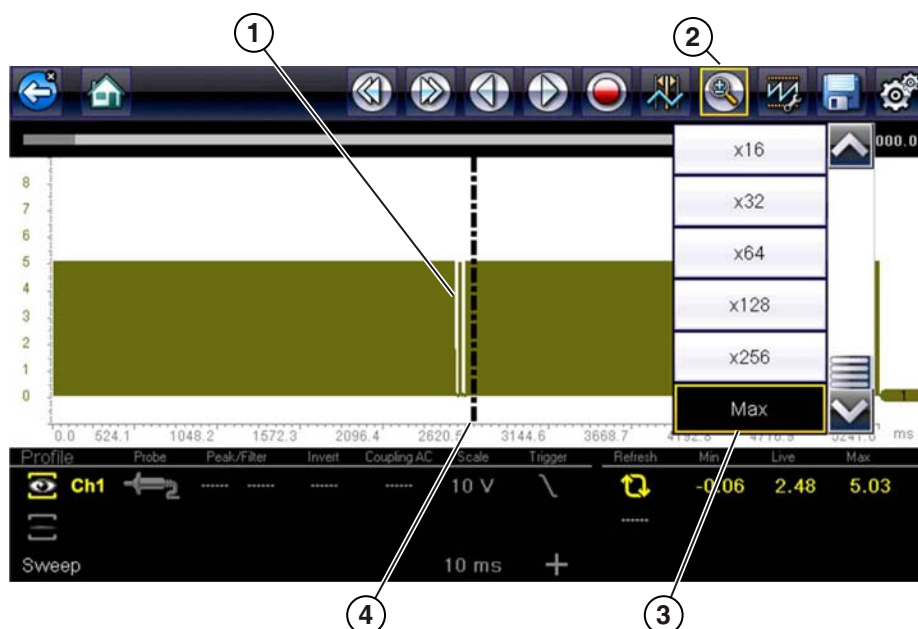
**NOTE:**

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

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

Additional information on playback control icons are described in [Scope Multimeter Control Icons](#), on page 77 and [Common Toolbar Control Icons](#), on page 14.

When the **Zoom** icon is selected the display defaults to the "Max" magnification level and a dropdown scroll menu displays. The dropdown menu allows you to select the display magnification level from a range of 1X to 256X. The "Max" (maximum) option displays all data captured on one screen ([Figure 8-37](#)).



1— Waveform Glitches

2— Zoom Icon

3— Zoom Magnification Level
(Max shown)

4— Zoom Cursor

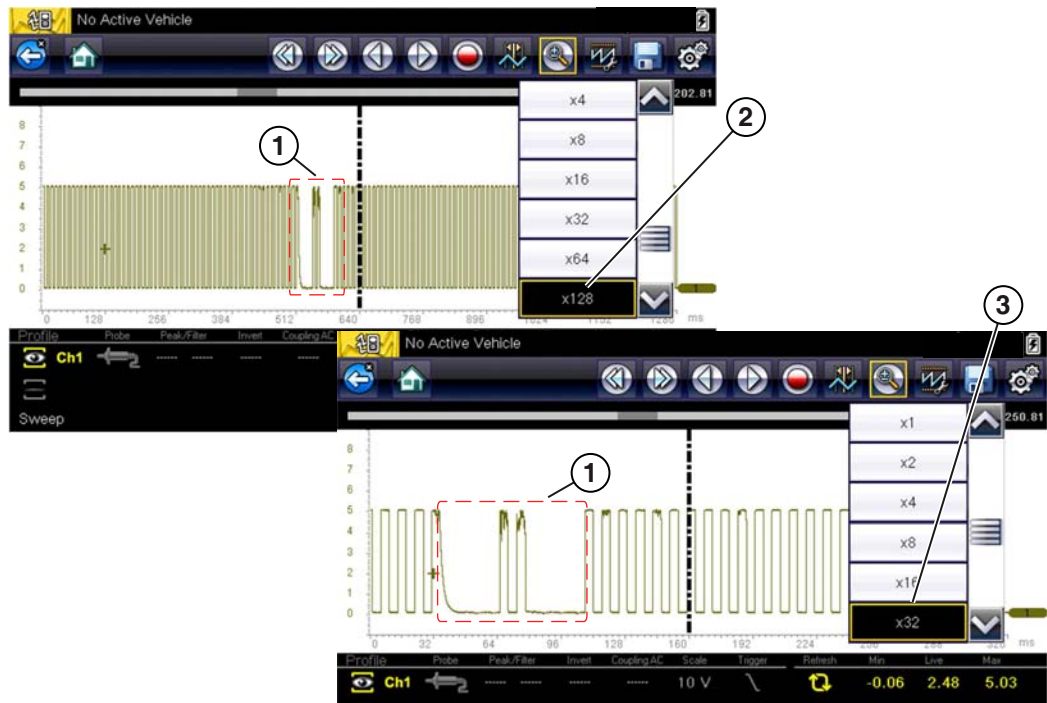
Figure 8-37 "Max" Magnification Level - displays all captured data

When zoom levels of 2X and higher are selected, a Zoom cursor (vertical dashed line) ([Figure 8-37](#)) displays onscreen. The cursor is used to quickly mark and navigate to points of interest or glitch in a captured waveform.

The Zoom cursor can be used to mark the approximate position of a glitch and can be manually dragged onscreen to the desired position. The new cursor position will be centered on the screen when a lower magnification level is selected. [Figure 8-38](#) shows examples at 32X and 64X with the Zoom cursor positioned in the area of a signal drop glitch.

**NOTE:**

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



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

Figure 8-38 Examples of Magnification Level at 32X and 128X

Figure 8-39 shows an example at 16X of the same waveform shown in Figure 8-37 and Figure 8-38. In Figure 8-39 at 16X the glitches are easily seen as compared to higher magnification levels.

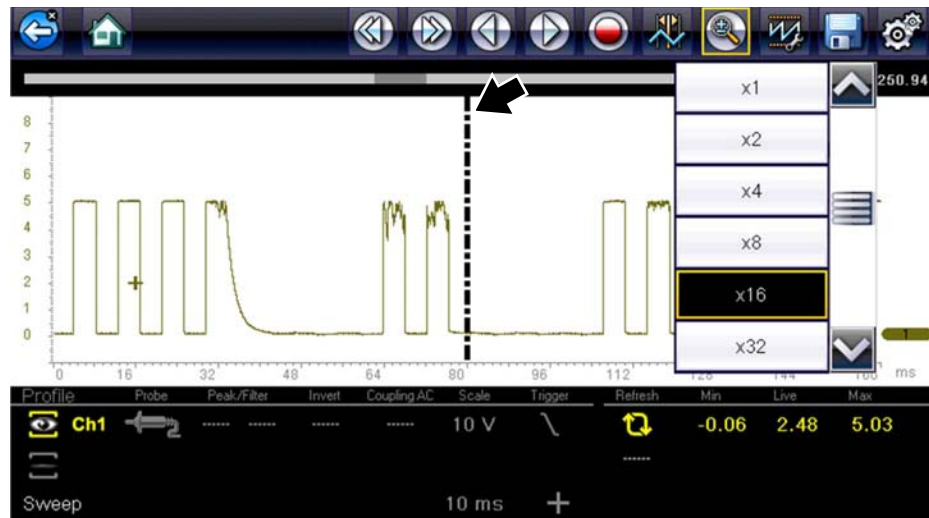


Figure 8-39 Example of Magnification Level at 16X. (For illustration purposes, the Zoom cursor has been positioned in the area near the glitches.)

8.8 General Reference

8.8.1 Basic Setup Tips (unknown signal type)

When conducting automotive diagnostics, situations may arise when you need to capture and analyze a signal that you are not familiar with, or know what the intended waveform pattern should look like, or even how to set the scope to acquire the signal.

The following tips are intended to provide guidance, at the most basic level to assist you in your lab scope diagnostics.

Testing information and/or procedures for testing certain components may be available in the Guided Component Test function, see [Guided Component Tests](#), on page 60 for additional information. If you have already narrowed down the system and/or component to test, ID the vehicle within the Guided Component Test function, and check the available tests first, as this may save you some time.

If the Guided Component Test function, does not have the test you are looking for, you need to determine a few things about what you are testing to get the scope / meter set up to capture a signal or make a measurement.



NOTE:

Testing information and known good waveform libraries may also be available from other sources. Obtaining correct testing reference information can be a key advantage in making sound repair decisions.

Listed below are a few basic questions to help narrow down the testing direction to follow.

- Are you looking to make or test a simple voltage or current level or maybe check resistance or continuity? Then you may want to use the DMM.
- Are you looking to check a circuit/component for an erratic dropout or make a frequency test? You may want to use the GMM.
- Do you need to see signal details (level, shape, frequency etc.)? The lab scope may be the best choice.
- Are you testing a DC or AC signal?
- What is the operating range of the circuit?
- Do you know what type or shape the intended waveform should be?

After answering the questions above (at a minimum), you need to determine which Scope / Multimeter test function you are going to use (e.g. Lab Scope, DMM or GMM). See [Tests and Capabilities \(Quick Reference\)](#), on page 70.

Once your test function is selected, you can now connect the test leads and select the applicable probe and scales:

Probe (test) type, see [Probe \(Probe type “test” selection\)](#), on page 85

Vertical scale, see [Scale \(Vertical scale adjustment\)](#), on page 82

Sweep scale, see [Sweep \(Horizontal or Time scale adjustment\)](#), on page 84

Connect the test leads or probe, to the applicable test point(s). Always use the correct lead or probe designed for the test and ensure the signal and ground connections are clean and secure.

For the initial setup, you may wish to turn other channel settings off (e.g. Peak, Filter, Invert, AC Coupling, Threshold etc.), as these may affect the signal display. See [Channel Settings](#), on page 86.

As a default setting, trigger is normally off. The scope/meter uses internal circuitry to display a signal if present. However, in certain circumstances additional channel adjustments may be required, or the trigger mode may have to be turned on, for a signal that is present but is not displayed. You may also need to readjust the vertical scale if set to low, in order to bring the signal into the viewable display area.

At this point you should have a visible signal on the screen. An ideal signal should be displayed within the area of the display.

- If the signal goes beyond the top and bottom of the display, try and readjust the vertical scale to a higher setting, to bring the signal into the viewable display area.

Use the zero baseline controls or move the zero baseline marker onscreen to move the zero baseline of the signal vertically on the screen to the desired position. See [Trace \(Zero Baseline position adjustment\)](#), on page 87.

- If the signal cycles are compressed (close to each other), try and readjust the sweep scale (horizontal scale) to a lower setting to display less cycles.

Once you have a usable signal displayed, if needed use the trigger function to stabilize a changing or erratic signal (a signal that may flicker or drift), so that it is easier to view. Try and set the trigger at the mid-point of the signal, and then adjust as needed from there. See [Trigger](#), on page 90.

As all signals are different, and due to other variables, additional adjustments may be needed to get the signal displayed exactly how you need. Review the channel settings section in this manual for additional information on using the settings. See [Channel Settings](#), on page 86.

At this point you should have a signal displayed that will allow you to see the overall signal characteristics, and allow you to begin your diagnosis.

Comparing your captured waveforms to known good waveforms, can be a time saver and provide supporting evidence when trying to determine a fault. See [Using Known Good Waveforms](#), on page 111 for additional information.

8.8.2 Using Known Good Waveforms

In some cases captured waveforms may not provide enough information to determine if a suspected sensor or circuit is at fault. Comparing the test vehicle waveforms to known good waveforms, can help to provide supporting evidence when trying to determine a fault.

Known good waveform examples may be available from different sources including the Guided Component Tests function, or from other sources.

As good practice, capturing waveforms before and after the repair will help you to build your own library of waveforms for future troubleshooting.

8.8.3 Troubleshooting Signals

When capturing signals, you may occasionally encounter problems with the way the signal initially displays. Noise, hash, fuzz are some of the terms used to describe, unwanted signals displaying in or on the signal you are trying to capture, basically making the signal unclear. The following tips are intended to provide some basic guidance, to help resolve these types of issues if encountered.

- Make sure you have the correct test leads connected to the applicable test point(s) and test lead jacks on the diagnostic tool.
- Ensure the signal and ground connections are clean and secure, at the test points and diagnostic tool.
- Ensure the polarity of the test leads connections are correct.
- If using stackable connectors, try to isolate or only connect the leads being used to capture the signal.
- Make sure the ground lead is providing a direct ground from the circuit to the diagnostic tool test lead jack.
- Isolate the test leads from other components, leads, or systems that may induce unwanted noise into the signal being tested (e.g. electric motors, secondary ignition components, relays, alternators, etc.)
- Use the shortest test leads possible.
- Try different test leads, to verify the issue. Use the recommended snap-on leads or probes available for the diagnostic tool or equivalent. Shielded test leads are recommended.
- Check the test lead or probes for damage.
- Enable or disable channel controls also to help try and clean the signal:
 - [Peak Detect](#)—maximizes sampling rate, but may pickup unwanted noise
 - [Filter](#)—removes signal noise or interference
 - [Invert](#)—switches signal polarity
 - [Coupling AC](#)—blocks the DC portion of signal
 - [Threshold](#)—provides a more accurate measurement on select GMM tests where noise is present
 - [Scale \(Vertical scale adjustment\)](#)—adjusts vertical scale. Using a higher setting may provide a cleaner signal in some situations.

For signals that do not display or display off the screen, erratic, compressed etc.:

- Use a trigger to help stabilize the signal. Try and set the trigger at the mid-point of the signal, and then adjust as needed from there. See [Trigger](#), on page 90.
- If the signal wraps off the top and bottom of the display, try and readjust the vertical scale to a higher setting, to bring the signal into the viewable display area. See [Scale \(Vertical scale adjustment\)](#).
- If the signal cycles are compressed (close to each other), try and readjust the sweep scale (horizontal scale) to a lower setting to display less cycles. Try a higher setting if the cycles are spread too far across the screen and seem flat. See [Sweep \(Horizontal or Time scale adjustment\)](#), on page 84.
- Move the zero baseline marker to move the zero baseline of the signal vertically on the screen to the desired position. See [Trace \(Zero Baseline position adjustment\)](#), on page 87.
- Check calibration of test leads or probe(s) if applicable. See [Test Lead / Probe Calibration](#), on page 80.

8.8.4 Units of Measurement / Conversions

| Base Units | |
|------------------------|--------------------------------------|
| (Symbol) / Unit Prefix | Typical Expressions |
| (μ) micro | 0.000001 or 10^{-6} or 1/1,000,000 |
| (m) milli | 0.001 or 10^{-3} or 1/1,000 |
| (c) centi | 0.01 or 10^{-2} or 1/100 |
| (k) kilo | 10^3 or 1,000 |
| (M) mega | 10^6 or 1,000,000 |

| Electrical Units | |
|--------------------------------|-----------------------------------------------------------------|
| (Symbol) / Description | Equivalents |
| (V) Voltage | $V = I \times R$ |
| (I) Current | $I = V \div R$ |
| (R) or (Ω) Resistance | $R = V \div I$ |
| (Hz) Frequency | $f(\text{freq.}) = 1 \div T(\text{time})$ or 1 cycle per second |
| Voltage | |
| (μ V) microvolt | 1 μ V = 0.000001 V |
| (mV) millivolt | 1 mV = 0.001 V |
| (V) volt | 1 V = 1000 mV |
| (kV) kilovolt | 1kV = 1,000 Volts. |
| Ohms | |
| (m Ω) milliohm | 1 m Ω = 0.001 ohms |
| (Ω) ohm | 1 Ω = 1000 m Ω |
| (k Ω) kilohm | 1 k Ω = 1000 Ω |
| (M Ω) megaohm | 1 M Ω = 1,000,000 Ω |
| Amperes | |
| (μ A) microamps | 1 μ A = 0.000001 amps |
| (mA) milliamps | 1 mA = 0.001 amps |
| (A) amps | 1A = 1000 mA |
| (ka) kiloamps | 1 ka = 1000 amps |
| Frequency | |
| (MHz) megahertz | 1 MHz = 1,000,000 Hertz |
| (kHz) kilohertz | 1 kHz = 1000 Hertz |

| Pressure Units | |
|------------------------------|---------------------------------------------------------------------------|
| (Symbol) / Description | Equivalents |
| (psi) pounds per square inch | 1 psi = 6894.757 Pa 1 psi = 0.06894757 bar 1 psi = 2.036021 inHg |
| (bar) | 1 bar = 14.50377 psi 1 bar = 100000 Pa 1 bar = 29.52999 inHg |
| (Mbar) Millibar | 1 Mbar = 0.001 bar |
| (Pa) pascal | 1 Pa = 0.0001450377 psi 1 Pa = 0.00001 bar 1 Pa = 0.0002952999 inHg |

| Pressure Units | |
|--------------------------|---------------------------------------------------------------------------|
| (Symbol) / Description | Equivalents |
| (kPa) KiloPasca | 1 kPa = 1000 Pa |
| (MPa) Megapascal | 1 MPa = 1,000,000 Pa |
| (inHg) inches of mercury | 1 inHg = 0.03386388 bar 1 inHg = 0.4911541 psi 1 inHg = 3386.388 Pa |

| Pressure Conversions |
|------------------------------------------|
| psi x 0.0689 = bar |
| psi x 6.8950 = kPa |
| psi x 0.0703 = kg/cm ² |
| bar x 14.5030 = psi |
| bar x 100.0000 = kPa |
| bar x 29.5300 = inHg (60°F) |
| kPa x 0.1450 = psi |
| kPa x 0.0100 = bar |
| kPa x 0.0102 = kg/cm ² |
| kPa x 0.295299 = inHg |
| kg/cm ² x 98.0700 = psi |
| kg/cm ² x 0.9807 = bar |
| kg/cm ² x 14.2200 = kPa |
| inHg (60°) x 0.0333 = bar |
| inHg (60°) x 3.3770 = kPa |
| inHg (60°) x 0.0344 = kg/cm ² |
| inHg x 25.4 = mmHg |
| mmHg x 0.003994 = inHg |

| Temperature Units | |
|------------------------|------------------------|
| (Symbol) / Description | Conversions |
| (°C) degree Celsius | °C = 0.556 x (°F - 32) |
| (°F) degree Fahrenheit | °F = (1.8 x °C) + 32 |

| Time Units | |
|------------------------|-----------------------------|
| (Symbol) / Description | Equivalents |
| (μs) microsecond | 1 μs = 0.000001 of a second |
| (ms) millisecond | 1 ms = 0.001 of a second |
| (s) second | 1 s = 1000 ms |

| Duty % to Dwell Conversions | | | |
|-----------------------------|-------|-------|-------|
| Duty Cycle | Dwell | | |
| | 4 cyl | 6 cyl | 8 cyl |
| % | | | |
| 10 | 9.0 | 6.0 | 4.5 |
| 20 | 18.0 | 12.0 | 9.0 |
| 30 | 27.0 | 18.0 | 13.5 |

| Duty % to Dwell Conversions | | | |
|------------------------------------|--------------|--------------|--------------|
| Duty Cycle | Dwell | | |
| % | 4 cyl | 6 cyl | 8 cyl |
| 40 | 36.0 | 24.0 | 18.0 |
| 50 | 45.0 | 30.0 | 22.5 |
| 60 | 54.0 | 36.0 | 27.0 |
| 70 | 63.0 | 42.0 | 31.5 |
| 80 | 72.0 | 48.0 | 36.0 |
| 90 | 81.0 | 54.0 | 40.5 |
| 100 | 90.0 | 60.0 | 45.0 |

8.8.5 Glossary of Common Terms

| Term / Abbreviation | Description |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC | Alternating Current - electrical current that switches polarity at regular intervals. |
| Aliasing | An effect that causes an incorrect signal to be displayed and/or causes a trigger to malfunction, due to the input signal exceeding the sample rate of the scope. |
| Amperage | The strength of an electric current, expressed in amperes |
| Amplitude | Vertical magnitude (level or position) of a signal, or the varying quantity from its zero value. |
| Buffer | An electronic reservoir for temporary storage of data |
| Cursor | Onscreen markers used to measure time, amplitude and frequency |
| Coupling AC | Function used to subtract the average value of a signal so that small variations can be displayed in the waveform. |
| DC | Direct Current - electrical current that flows in one direction only |
| Delta | Difference in time between two events. |
| Dropout | An intermittent or unwanted, vertical fall in a signal to zero that may cause an undesired result. |
| Duty cycle | Measurement of the length of a signals on time. Specified as a percentage (ratio), of the total cycle time. |
| Dwell | Used to measure a signals on time in degrees of dwell. Commonly used to measure mixture control solenoids on carbureted feedback engines and specified in duty cycle %. |
| Dwell 60 | Measurement of the length of a signals on time displayed on a 0 to 60 degree scale. 0° = 0%; 30° = 50%; 60° = 100%. |
| Dwell 90 | Measurement of the length of a signals on time displayed on a 0 to 90 degree scale. 0° = 0%; 45° = 50%; 90° = 100%. |
| Filter | Function used to filter or smooth out spikes and fast variations in signals. |
| Frequency | The number of times a signal repeats in one second. Measured in Hertz (cycles per second). |
| Glitch | An intermittent or unwanted, error in a signal that may cause a false or undesired result. |
| Grid | The graph displayed on the scope screen that is made up of the x and y axis scales that aid in the measuring of signal characteristics. |

| Term / Abbreviation | Description |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Horizontal Scale | See Sweep Scale |
| Invert | Function used to switch signal polarity, |
| Lambda (l) | Used to represent a numerical value denoting the actual measured air/fuel ratio with respect to the ideal air/fuel ratio at stoichiometry. Lambda equals one (1) when the actual air/fuel ratio is equal to the theoretical (stoichiometric) air/fuel ratio of 14.7 (14.66) to 1. Lambda less than 1 means excess fuel; greater than 1 means excess air. |
| Megasamples per second (MS/s) | Sample rate unit equal to one million samples per second |
| Noise or Hash | Unwanted voltage, current or signal interference that is imposed on a signal. |
| Parasitic Voltage | Trace voltage in a circuit after the main power source is disconnected. |
| Peak | The maximum amplitude value present in a varying or alternating voltage. This value may be either positive or negative. |
| Peak Detect | Peak detect captures and evaluates all signal sample points, in order to display fast occurring events or glitches. |
| Pressure Transducer | Electronic device that converts pressures (negative/positive) to electrical signals. |
| Pulse | A signal with abrupt (fast) signal direction changes in a positive or negative direction, with consistent level and duration. |
| Pulse Period | One complete on and off cycle or time period. |
| Pulse Train | Collection of signal pulses traveling together. |
| Pulse Width (duration) | Measurement of a signals on time in a circuit that pulses on and off. Specified in units of time. |
| Pulse Width Modulation (PWM) | A signal that continuously cycles on and off while the on-time varies within each cycle. |
| RMS | The RMS (root mean square) value of alternating currents and voltages is the effective current or voltage applied, rather than the peak current or voltage measurable. The AC RMS voltage value can be defined as the equivalent DC voltage of the AC voltage measured. RMS values are commonly used in AC electrical measurement, as they are more representative of DC measurements. |
| Sample Rate | Number of times (frequency) the scope/meter takes a sample of the signal. Specified in mega samples per second (MS/s). |
| Sampling | Process of obtaining a sequence of instantaneous values for a signal at regular or intermittent intervals. When a quantity of samples are collected the operational status of the device is determined. |
| Screen Update Rate | How often the captured data is (updated) displayed on the screen. |
| Signal | Detectable voltage, current, or magnetic field, by which specific information is transmitted in an electronic circuit or system. |
| Square Wave | A square or rectangular waveform (digital) which alternately switches high to low (on/off) for specific lengths of time, that has very fast rise and fall times. |
| Sweep Scale | The horizontal scale on the grid. Also referred to as time scale or x axis. |

| Term / Abbreviation | Description |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Threshold | The threshold function automatically sets a trigger and determines a threshold level in the middle of the signal range (calculated from the Min and Max measurements) to be used as a reference point to calculate the measurement. |
| Trace | The actual visible line displayed on the scope screen. |
| Trigger | A conditional function that initiates if and when a trace is drawn on the screen. |
| Trigger Slope | The slope that a trigger source signal must reach before the trigger circuit initiates a sweep |
| VAC | Volts Alternating Current |
| VDC | Volts Direct Current |
| Vertical Scale | The vertical scale on the grid or (y-axis) represents what is being measured (voltage, amperage, pressure etc.), and the unit of measurement it is being measured in. |
| Volt | Unit of electric potential difference. |
| Voltage | Electromotive force or potential difference, expressed in volts. |
| Voltage (inductive) Kick | A voltage, many times higher than the applied voltage, produced by the collapsing magnetic field in a coil when the current through it is abruptly terminated. |
| Waveform | The graphic representation (form) of a signal over time, which the trace displays on the screen. |
| Zero Base Line | Reference setting or 0% level of a graph scale. |

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 119
- [Delete Saved Data](#), on page 121

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. Scroll to view the entire list.
3. With the vehicle 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.

The System Menu for 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.



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 file to review from the list.

9.3 Viewing Codes and Code Scan Results

When code scan or single system code results are saved, they are saved in (.XML) file format (Figure 9-3).



Figure 9-3 Typical - Code Results (.XML) file

The saved (.XML) file(s) can be viewed using these methods:

- On the diagnostic tool - See [Viewing Code Results on the Diagnostic Tool](#), on page 121.

In report format using:

- ShopStream Connect - see [Printing the Code Scan Report](#), on page 149.

▶ Viewing Code Results on the Diagnostic Tool

Selecting a system code or a code scan results file from your saved file list (Figure 9-3), opens the file onscreen. When opened, the (.XML) file displays basic vehicle information and a list of DTCs with a brief description of each.

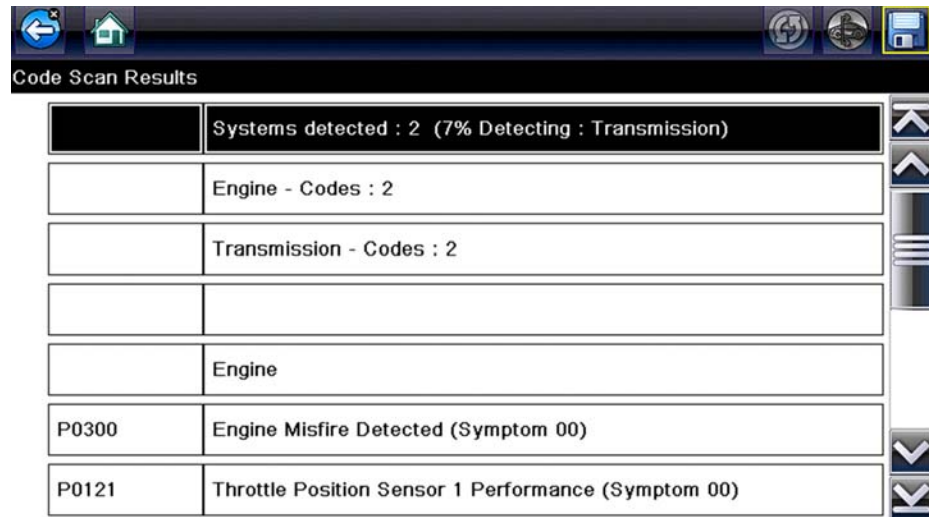


Figure 9-4 Typical - Code Scan Results (.XML file) viewed onscreen

9.4 Delete Saved Data

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

▶ To delete a saved file:

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

A list of saved files displays.



NOTE:

The Select All/Deselect All and Delete 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.

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.

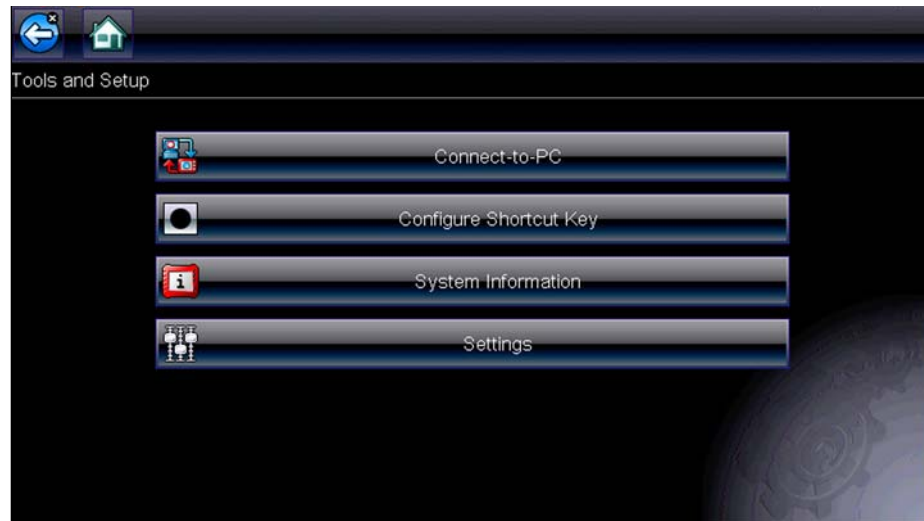


Figure 10-1 Sample Tools menu

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 123—use to change the function of the shortcut key
- [System Information](#), on page 124—use to view configuration information for the diagnostic tool
- [Settings](#), on page 124—use to configure certain characteristics of the diagnostic tool

10.1.1 Connect-to-PC

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

The optional ShopStream Connect™ PC software allows you to view, print and save data files on your PC. In addition, you can download software updates from the PC to the diagnostic tool. These features provide an ideal way to manage saved data files. The ShopStream Connect application is available free online, see [ShopStream Connect](#), on page 145 for additional information.



To connect the diagnostic tool to a PC:

1. Connect the supplied USB cable to the diagnostic tool and then to the PC.
A USB cable, supplied with your diagnostic tool, is used to connect the diagnostic tool to the PC. When the diagnostic tool is connected to the PC a communications icon appears on the right edge of the title bar.
2. Select **Tools** from the Home screen.
3. Select **Connect-to-PC** from the Tools and Setup menu.
A screen message will display to confirm the tool is in Connect-to-PC-mode.



This device is now in Connect-to-PC mode.

Press to exit.



Figure 10-2

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 10-3 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 124
- [Configure Scanner](#), on page 130
- [Configure Scope/Meter](#), on page 130
- [Configure Units](#), on page 132

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 125—adjusts the intensity of the screen back lighting.
- [Color Theme](#), on page 125—changes the background color of the screen display.
- [High Contrast Toolbar](#), on page 126—enhances toolbar graphics for poor lighting conditions.
- [Font Type](#), on page 127—switches between standard and bold text for better visibility.
- [Backlight Time](#), on page 127—adjusts how long the screen stays on with an idle unit.
- [Touch Calibration](#), on page 127—calibrates the touch screen display.

Date & Time options include:

- [Time Zone](#), on page 128—sets the internal clock to the local time standard.
- [Clock Settings](#), on page 128—sets the time on the internal clock.
- [Daylight Savings Time](#), on page 129—configures the clock for Daylight Savings Time.
- [Time Format](#), on page 129—switches the time displays between a 12 or 24 hour clock.
- [Date Format](#), on page 129—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 10-4](#)).

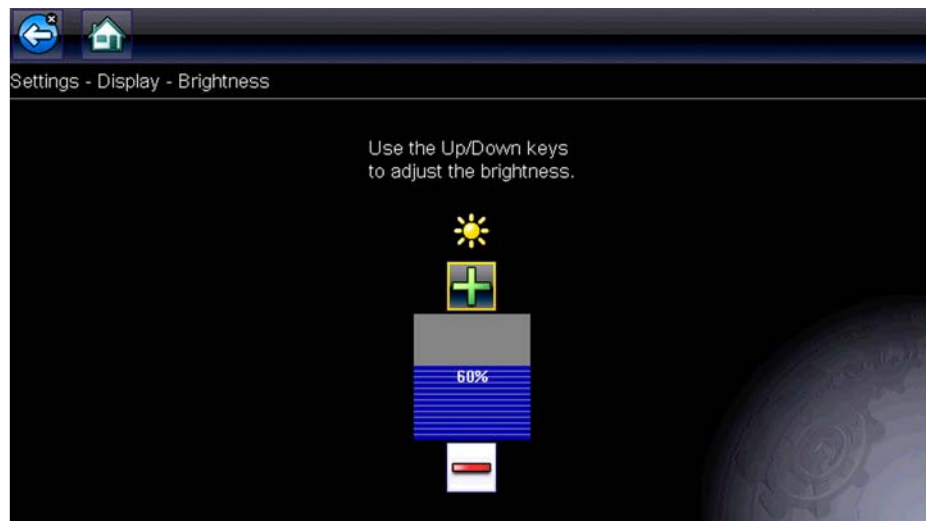


Figure 10-4 Sample brightness setting screen

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.

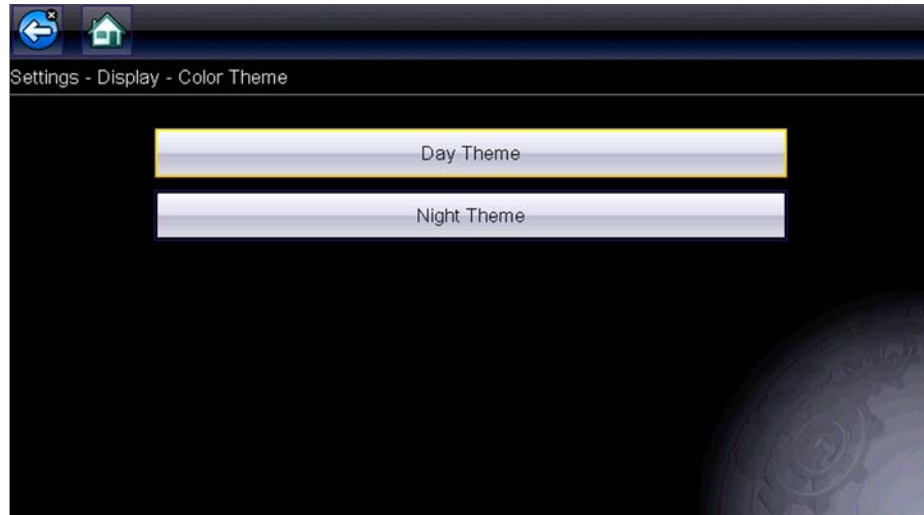


Figure 10-5 Sample Night Theme menu screen

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 10-6 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.

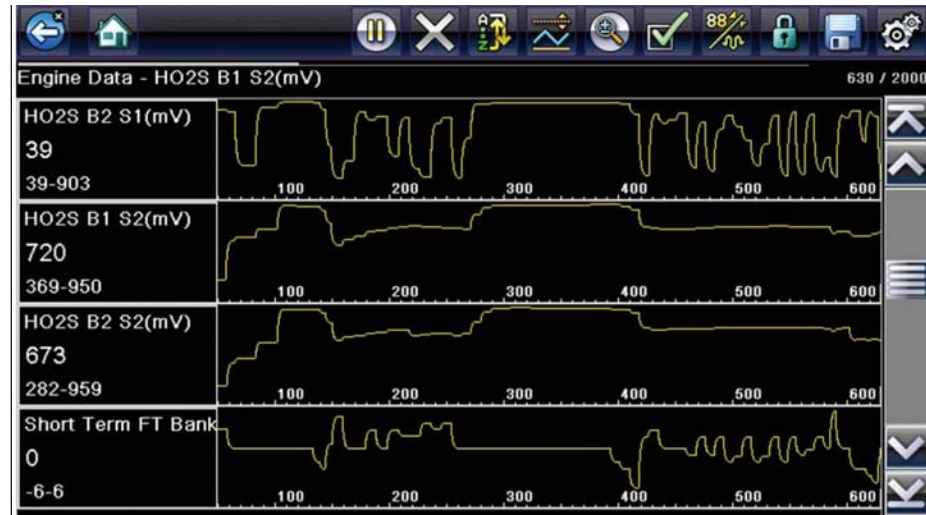


Figure 10-7 Sample bold type on a black background

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 10-8).



Figure 10-8 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 10-9](#)).

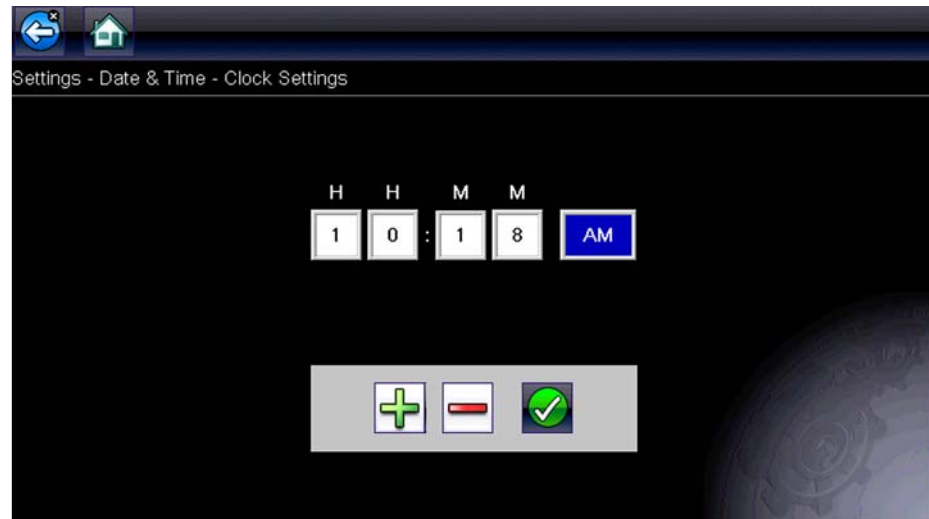


Figure 10-9 Sample Clock Settings screen

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 Wi-Fi

See [Wi-Fi Connection / Troubleshooting](#), on page 137.

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 fills the entire graph area with scales switched off.



Figure 10-10 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 131
- [Display](#), on page 131
- [Divisions](#), on page 132

Trigger Mode

Configure Scope/Meter allows you to choose the type of trigger, see [Trigger](#), on page 84 for additional information. Two triggering choices are available:

- **Auto Trigger**—updates the screen when the signal crosses the trigger threshold in the selected direction (rising or falling).
The screen automatically updates after a short period so you can see the waveform, even if the signal does not cross the trigger threshold. You can set a threshold to optimize viewing.
- **Manual Trigger**—updates the screen when the signal crosses the trigger threshold in the selected direction (rising or falling).
The screen does not update if the signal does not cross the trigger threshold. You can capture intermittent events because the screen only updates when the signal crosses the trigger threshold.

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.



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.

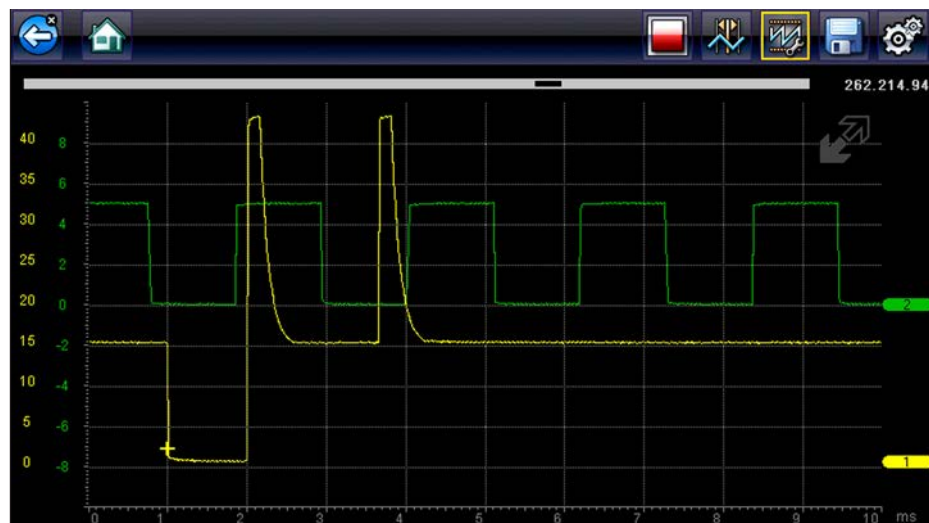


Figure 10-11 Sample Scope multimeter screen grid

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 10-12 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 change the Scale menu selections from Full scale (20V) to Per division values (2.0 V/Div).
 - **Display Settings**—to change the value of the scale selected, which is displayed in the profile area, from Full scale (20V) to Per division values (2.0 V/Div).
 - 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 10-13 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.
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.

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 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

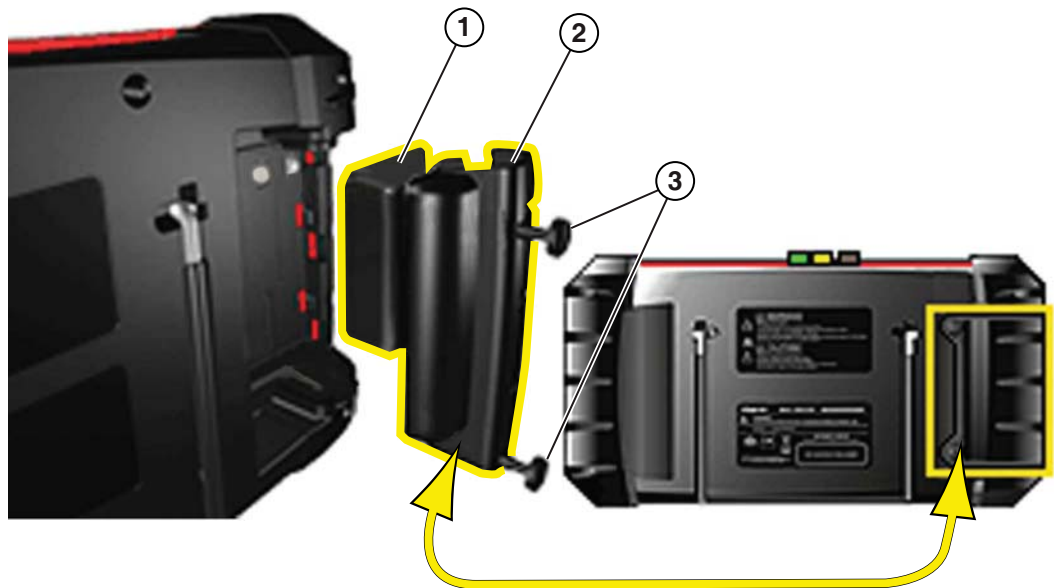
If the battery pack no longer holds a charge, contact your sales representative to order a new one.

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:

- 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.

Wi-Fi Connection / Troubleshooting

The diagnostic tool is equipped with the ability to connect to a Wi-Fi network, however the connection is solely dedicated to the Snap-on Web Services Network.

Connecting to Wi-Fi allows the tool to receive important messages from Snap-on, and if applicable connect to information services.

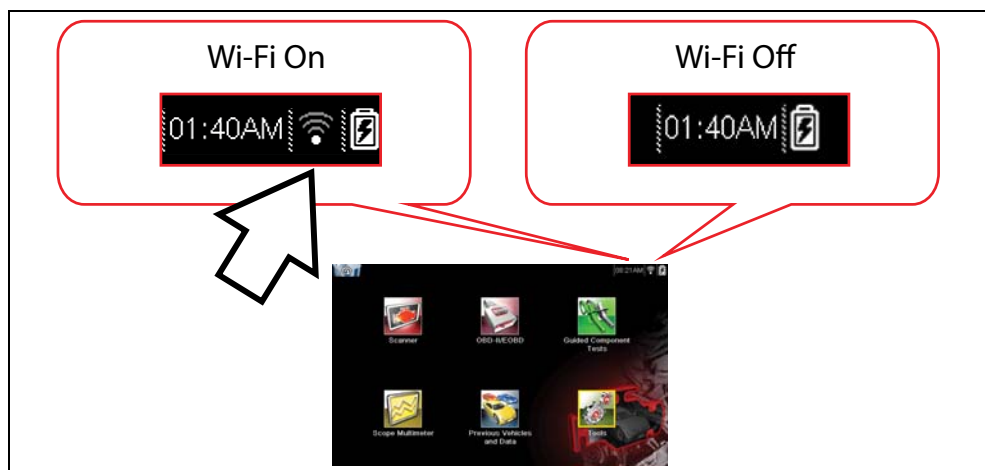
This section includes information on Wi-Fi connection and troubleshooting.

Main Topic Links

- [Checking if Wi-Fi is On/Off](#) page 137
- [Checking if Wi-Fi is Connected](#) page 138
- [Wi-Fi Icons \(Setup\)](#) page 138
- [Turning Wi-Fi On and Connecting to a Network](#) page 138
- [Add Network Advanced \(Connecting to a hidden network\)](#) page 140
- [Wi-Fi Testing](#) page 140
- [Wi-Fi Troubleshooting and Status Messages](#) page 142



12.1 Checking if Wi-Fi is On/Off

If the Wi-Fi indicator is displayed in the title bar, Wi-Fi is on. If Wi-Fi is off, see *Turning On Wi-Fi and Connecting to a Network* to turn it on and connect.








12.2 Checking if Wi-Fi is Connected

Check the Wi-Fi indicator in the title bar:

| | |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|  | Wi-Fi is on and connected to a network (1 to 3 bars). |
|  | Wi-Fi is on, but not connected (zero bars). See Wi-Fi Troubleshooting and Status Messages , on page 142,. |

12.3 Wi-Fi Icons (Setup)

Familiarize yourself with the following Wi-Fi icons and indicators from the Wi-Fi configuration screen.

| Wi-Fi Icon (toggle type) | | Wi-Fi Test Icon | Wi-Fi Signal Strength Indicator | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |
| Select to turn Wi-Fi ON | Select to turn Wi-Fi OFF | Select to open the Wi-Fi Test screen | Zero bars indicates no signal | Three bars indicate full strength signal |
| Displayed on Wi-Fi configuration screen only | | | Displayed on the title bar next to the battery level indicator | |

12.4 Turning Wi-Fi On and Connecting to a Network

1. From the Home screen, select **Tools > Settings > Configure Wi-Fi**.
2. Select the **Wi-Fi** icon (with checkmark) ([Figure 12-1](#)) to turn Wi-Fi on.



Figure 12-1 Wi-Fi Icon (shown off)

3. The Wi-Fi icon will change to the Wi-Fi symbol with “x” mark ([Figure 12-2](#)), indicating Wi-Fi is on.

The screen will change to display available supported network connections.

4. Select your network. Use the scroll feature to show all active connections (Figure 12-2).

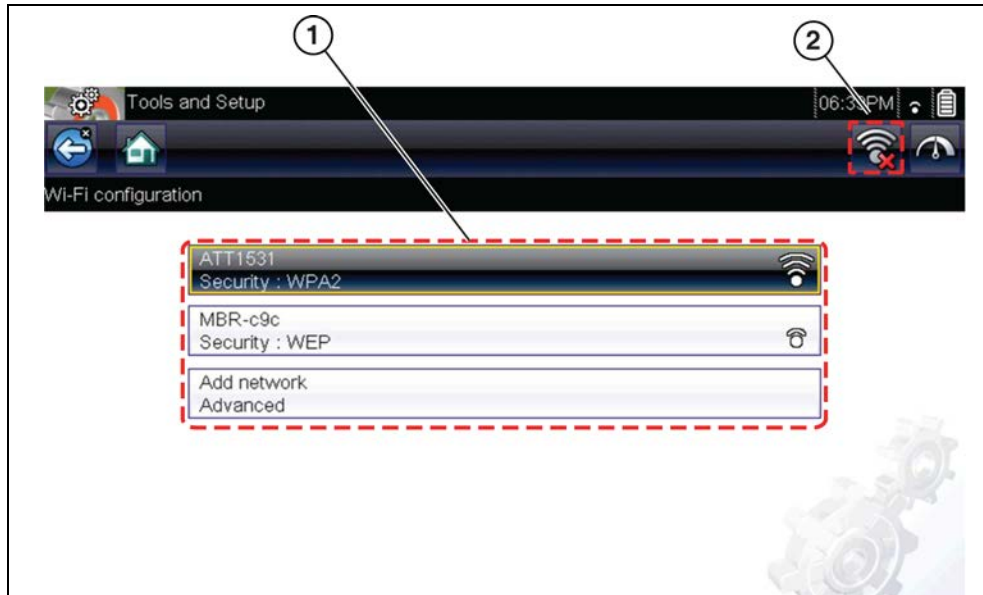


Figure 12-2 Wi-Fi Configuration Screen

1— Available Network Connections

2— Wi-Fi Icon (Wi-Fi shown on)



NOTE:

A password is required when choosing a secured (protected) network. Enter the password using the on-screen keyboard and then select the check mark on the keyboard to continue.

Networks with a proxy, challenge page, or that require the user to accept terms of usage are not supported.

Wi-Fi performance varies depending on your wireless network equipment and ISP.

5. Select **Connect** to connect to your desired network or **Cancel** to cancel the request.
6. From the Connect confirmation screen select **OK** to continue using this connection or **Forget** to disconnect this connection.
 - The screen will change to display your confirmed network connection and ALTUS registration information. For ALTUS registration information see [ALTUS \(ALTUSDRIVE.com\) - Cloud Sharing/Storage](#), on page 164,.
 - If the status message “Not Connected” is displayed, retry the configuration process or see [Wi-Fi Testing](#), on page 140 for additional information.

12.5 Add Network Advanced (Connecting to a hidden network)

The Add Network selection allows you to connect to a network that is not broadcasting its name (not visible in the displayed network list). These networks are also known as "hidden" networks.

To connect to a hidden network you will first need to know the following:

- Network Security Type
 - Open (only need SSID)
 - WPA or WPA2 (Pre-shared key)
 - WEP (WEP key)
- Network name or SSID (Service Set Identifier)
- Network Password



Connecting to a Hidden Wi-Fi Network

1. From the Home screen, navigate to **Tools > Settings > Configure Wi-Fi**.
2. Select **Add Network Advanced** from the network list (scroll to end of list).
3. Select security type Open, WPA, WPA2, or WEP. Refer to the router user manual or your IT administrator to determine the type.
4. Enter the network name or SSID
5. Enter the network password.
6. Select **Connect** at the prompt to connect to the network.
7. Select **OK** at the confirmation screen to continue using this connection, or Forget to disconnect this connection.

12.6 Wi-Fi Testing

If you are experiencing network connection issues, an automated testing feature is available to quickly test your network connection.



Testing Connections

1. Before you start the automated testing procedure, turn off the diagnostic tool and then turn it on. This clears previous testing messages from memory.
2. Connect to your desired network, see [Turning Wi-Fi On and Connecting to a Network](#), on page 138.
3. From the Wi-Fi configuration screen, select the **Wi-Fi Test** icon to open the network connection test screen ([Figure 12-3](#)).



Figure 12-3 Wi-Fi Test Icon

The network connection test is an automated test that begins when the screen is displayed. Network connection systems are tested in sequence and display a status indicator (Red = test failed, Yellow = test is process, or Green = test completed satisfactorily) when finished (Figure 12-4).

Connectivity of the following systems are checked:

- **Hardware**
- **Router**
- **Internet**
- **HTTP**
- **Web Services Network**

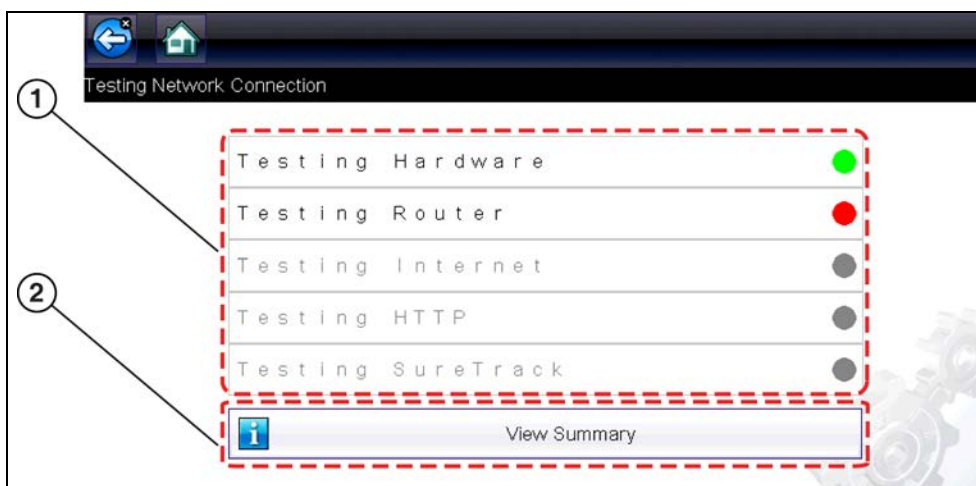


Figure 12-4 Connection Tests

1— Connection Tests

2— View Summary

4. If a connection issue(s) is present, select **View Summary** to review the results. The summary information is helpful if you are experiencing difficulties with your connection (Figure 12-5). Scroll through the summary information to review the test results for each system and Tip messages for the current connection issue. See *Connection Tests - Troubleshooting* chart in [Wi-Fi Troubleshooting and Status Messages](#), on page 142 for additional information.

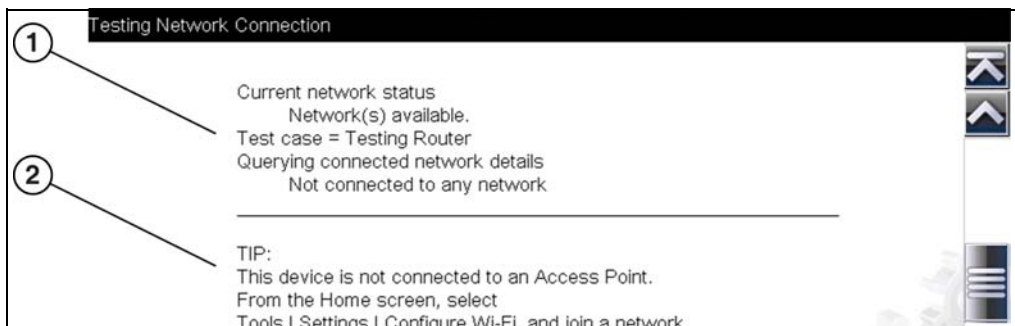


Figure 12-5 View Summary

1— Connection Test Results

2— Connection Issue Tip Message

12.7 Wi-Fi Troubleshooting and Status Messages

The following troubleshooting information is not inclusive and is meant as a guide only. Other issues and solutions may arise that are not stated here. The following description of terms are provided for reference as used in the following troubleshooting chart:

- **Router** - The data transmission device directly connected to your ISP.
- **Remote Wireless Access Point** - A wireless connection device between the router and your diagnostic tool.
- **Wi-Fi Radio** - The internal diagnostic tool radio transmitting and receiving Wi-Fi signals.
- **Network Connection** - Also called Wi-Fi connection. The configured Wi-Fi router connection the diagnostic tool connects to. This connection can be secured (password protected) or unsecured (open).

Router Information

Router compatibility and setup are important factors to check when trying to determine connectivity problems. Although we have tested this device at the factory to verify connectivity, we cannot guaranty its connectivity with your specific equipment. There may be some situations that require your time for router connection troubleshooting and/or additional consultation and equipment. Snap-on Incorporated is not responsible for any costs incurred for any additional equipment, labor or consultation charges or any other costs that may result from correcting non-connectivity issues with this device.

Check Router Settings

Verify the following router settings **BEFORE** you begin troubleshooting a non-connectivity or "No Connection" problem. After each check, make any corrections as necessary then retest for connectivity. **Contact your IT administrator or ISP for assistance.**

1. Check your router connection and if applicable, the remote wireless access point connection.
2. Clear saved Wi-Fi networks, see [Clearing Wi-Fi Networks](#), on page 142,.
3. Verify:
 - (a). Router is configured to use Dynamic Host Configuration Protocol (DHCP), not a static IP address.
 - (b). Router and/or settings for this device are configured to 2.4GHz. 5GHz is not supported.
 - (c). Router is configured to B/G and/or N standard wireless networks to 2.4GHz. 5GHz is not supported. See your router "User Guide" for setup, connection and troubleshooting procedures.
4. Check for router firmware and update to current version, if applicable.
5. Restart or reset the router. See your router "User Guide" for procedures.
6. Connect to a different router.

Clearing Wi-Fi Networks

1. Select the Wi-Fi network that you are trying to connect to from the list of saved networks on the Wi-Fi configuration menu.
The Wi-Fi Summary page displays.
2. Select **FORGET**
The Wi-Fi Configuration menu displays.

3. Repeat steps (1) and (2) for ALL saved Wi-Fi networks.
4. Once all saved Wi-Fi networks have been deleted (forgotten) turn off the diagnostic tool.
5. Turn on the diagnostic tool and connect to the desired Wi-Fi network, see [Turning Wi-Fi On and Connecting to a Network](#), on page 138,.

| General -Troubleshooting | | |
|------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Problem | Possible Cause | Corrective Action |
| Not receiving messages, or (if applicable) Information Services are not available | Access has expired | Contact your sales representative. |
| | Access may be temporarily unavailable | Try accessing at a later time as updates to the service may be in process. |
| | Wi-Fi radio is turned Off | 1. From the Home screen, navigate to Tools > Settings > Configure Wi-Fi . 2. Select the Wi-Fi icon and turn the Wi-Fi radio on. The Wi-Fi icon will change from a green check mark icon to red "X" mark icon indicating Wi-Fi radio is on. 3. Connect to a known good network. |
| | Not connecting to a network | 1. Clear saved Wi-Fi networks, see Clearing Wi-Fi Networks , on page 142,. 2. Connect to a network. 3. From the Configure Wi-Fi screen select the Wi-Fi Test icon and review the results. See Connection Tests - Troubleshooting in the following table. |
| Wi-Fi connection drops off or disconnects intermittently | Wi-Fi Signal strength insufficient | Check Wi-Fi signal strength - out of range or interference. Move closer (within 50 Ft. (15 M) or into a direct open sight-line of the router or if applicable, remote wireless access point. Eliminate interference from overhead lights, windows, walls, other wireless devices, metal objects and devices that emit electrostatic discharge. |
| | Router overloaded | Disconnect/disable other Wi-Fi devices connected to the router. |

| Connection Tests - Troubleshooting | | |
|------------------------------------|-------------------------------------------------------|------------------------------------------|
| Failed Test | Possible Cause (Displayed Tip Message*) | Corrective Action / Checks |
| Hardware | Wi-Fi radio not responding and/or will not turn off | Contact Customer Support for assistance. |
| | Wi-Fi radio not responding and/or will not initialize | |
| | Missing or corrupt firmware file(s) | |

| | | |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router | This device is not connected to a router | Check Wi-Fi signal strength - out of range or interference. Move closer (within 50 Ft. (15 M) or into a direct open sight-line of the router or if applicable, remote wireless access point. Eliminate interference from overhead lights, windows, walls, other wireless devices, metal objects and devices that emit electrostatic discharge. |
| | | Check router connection and setup. See Check Router Settings , on page 142, for procedure. |
| Internet | This device is not connected to the Internet or has no DNS | Check router connection and setup. See Check Router Settings , on page 142, for procedure. |
| | | Domain Name System (DNS) server not connected. Contact your Internet service provider (ISP). |
| HTTP | This device cannot communicate using HTTP | Check if your Internet access uses a "Proxy" or "Accepting terms in a browser" protocol, or uses a challenge page. These protocols are not supported by this device. Contact your IT administrator or ISP for options. |
| Web Services (variable) | Your access has expired | Contact your sales representative. |
| | Web Services may be temporarily unavailable or Not connecting to a network | Try accessing at a later time as updates to the service may be in process. |
| | | Check router connection and setup. See Check Router Settings , on page 142, for procedure. |
| * See Wi-Fi Testing , on page 140, for additional information. | | |

12.7.1 Informative Messages

Messages may be displayed to inform you of pending issues or general status. Depending on your access and connection status, the following are typical messages that may be displayed:

- **Content May Be Available!** - indicates content may be available, however you are not currently connected to the Web Services Network. This message may be caused by a Wi-Fi connection issue, or you do not have access to the feature. See [Wi-Fi Troubleshooting and Status Messages](#), on page 142, for Troubleshooting information.
- **No connection. Please try again later.** - indicates you are not currently connected to the Web Services Network, except when displayed in the OBD/EOBD function as information applications are not accessible in OBD/EOBD mode. If this message is displayed in the Scanner function, it may be caused by a Wi-Fi connection issue, or you do not have access to the feature. See [Wi-Fi Troubleshooting and Status Messages](#), on page 142, for Troubleshooting information.
- **Loading content** - indicates information is being accessed from the Web Services Network.
- **A new diagnostic software upgrade is available. Contact your sales representative for details.**
- **Your access has expired. See your Sales representative to renew.** - indicates your access to the Web Services Network has expired and you should contact your sales representative.

This chapter includes a brief introduction to some of the key features of the ShopStream Connect software. For detailed ShopStream Connect information and instructions, download the ShopStream Connect User Manual from our website:

<https://www.snapon.com/diagnostics/uk/User-Manuals.htm>

The ShopStream Connect™ (SSC) software is PC-based software that extends the capabilities of your diagnostic tool. Using ShopStream Connect software with your diagnostic tool allows you to do the following:

- View, Print, and Manage data saved from your Diagnostic tool.
- Move and copy your data between the diagnostic tool and your PC.
- View and Print trouble codes saved with select diagnostic tools. This allows you to share the data in a report format with vehicle owners or other technicians.
- Add or edit notes and comments to diagnostic tool data files.
- Download and install diagnostic tool software updates and upgrades.

The ShopStream Connect (SSC) software is available (free of charge) at:

ShopStream Connect -

<https://www.snapon.com/diagnostics/UK/Diagnostics/ShopStreamConnect.htm>

13.1 Using SSC (Connecting to your PC)



To connect and use SSC with your diagnostic tool:

1. Download and install SSC on your PC from:
<https://www.snapon.com/diagnostics/UK/Diagnostics/ShopStreamConnect.htm>
2. Turn your diagnostic tool on.
3. Connect the supplied USB cable from the USB jack on your diagnostic tool to your PC:
4. From the diagnostic tool Home screen, select **Tools > Connect-to-PC**.

The “**Device is now in Connect-to-PC mode**” screen message is displayed (Figure 13-1) and the ShopStream Connect software will open automatically on your PC (Figure 13-2).

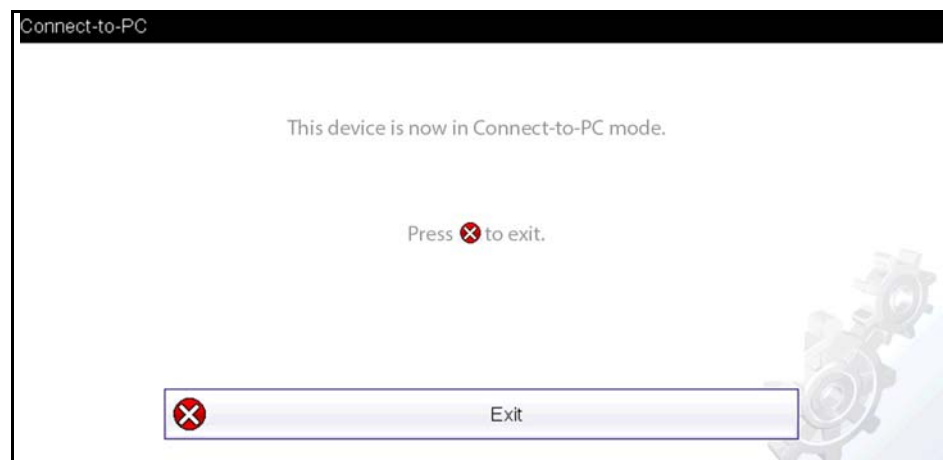


Figure 13-1

If the ShopStream Connect software does not open, open it from the Windows Start menu or use the ShopStream Connect shortcut icon on the Windows desktop (automatically created during installation).

13.2 SSC Main Screen

The ShopStream Connect software will open automatically when you connect the diagnostic tool to your PC USB connection, [Using SSC \(Connecting to your PC\)](#), on page 145,.

The following shows the main screen layout for ShopStream Connect software.

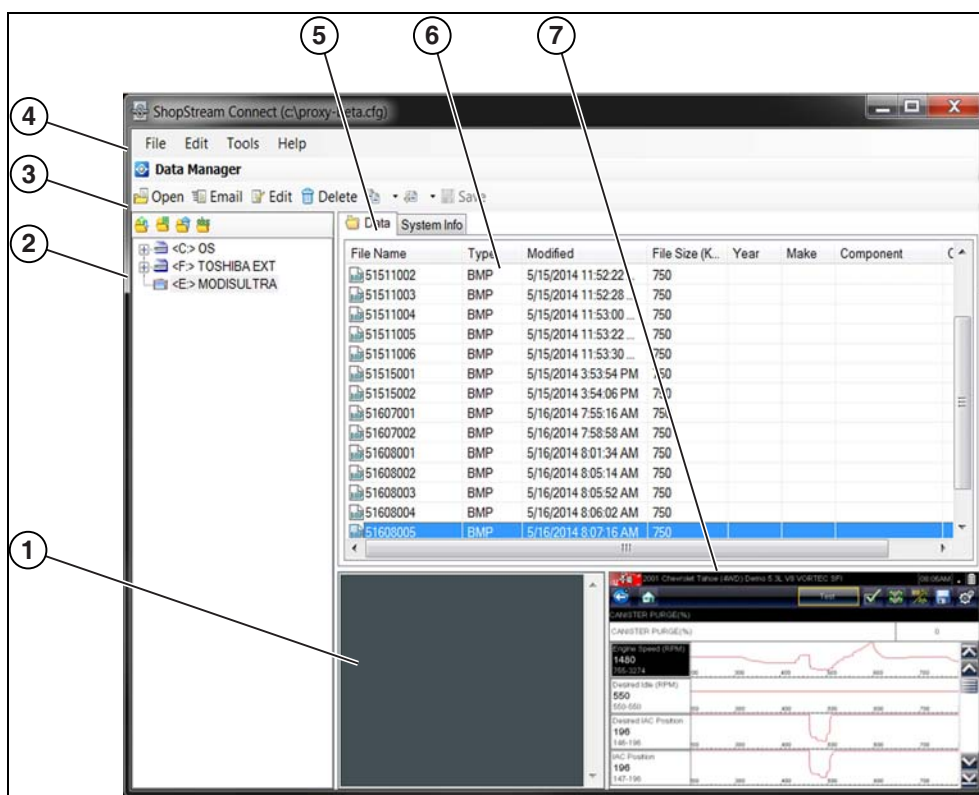


Figure 13-2

- 1— **Notes Window**—allows you add notes to select data files. Select Save from the menu bar to save your notes. *NOTE: Not all file types allow notes, the Notes window will be grayed out when a file type that does not support notes is highlighted. Some image files may display notes for reference purposes (the notes are grayed out and not editable).*
- 2— **File directory structure**—displays the file directory structure of your PC in standard Windows format, and shows any connected diagnostic tools at the bottom of the data list.
- 3— **Data Manager Toolbar**—provides control icons that perform a variety of operations on data files.
- 4— **Main Menu bar**—contains **File**, **Edit**, **Tools**, and **Help** menus.
- 5— **Tabs**—provides access to data files and presets stored on the diagnostic tool or on the PC, and also allows viewing of software revision details of the diagnostic tool.

- 6— **Main display**—shows stored data files details. *NOTE: The files listed are sortable (ascending/descending) by clicking on the column tab at the top (e.g. File Name, Type, etc.) Sort preferences are saved when the ShopStream Connect program is closed.*
- 7— **Preview**—displays a sample of the file if the selected file is a image file.

13.3 Scanner DataViewer

SSC allows you to view data files recorded with your diagnostic tool, on your PC. When a Scanner data file is selected, it opens and displays in the Scanner DataViewer (Figure 13-3). Scanner DataViewer allows you play the data file and custom configure the data in a number of ways.



- 1— Menu bar
- 2— Display toolbar
- 3— Graph display
- 4— Properties icon
- 5— Vertical Scroll bar
- 6— Zoom controls
- 7— Slider bar
- 8— Navigation toolbar
- 9— Parameter text list
- 10—Highlighted PIDs - indicates graphs currently displayed
- 11—Parameter configuration tabs

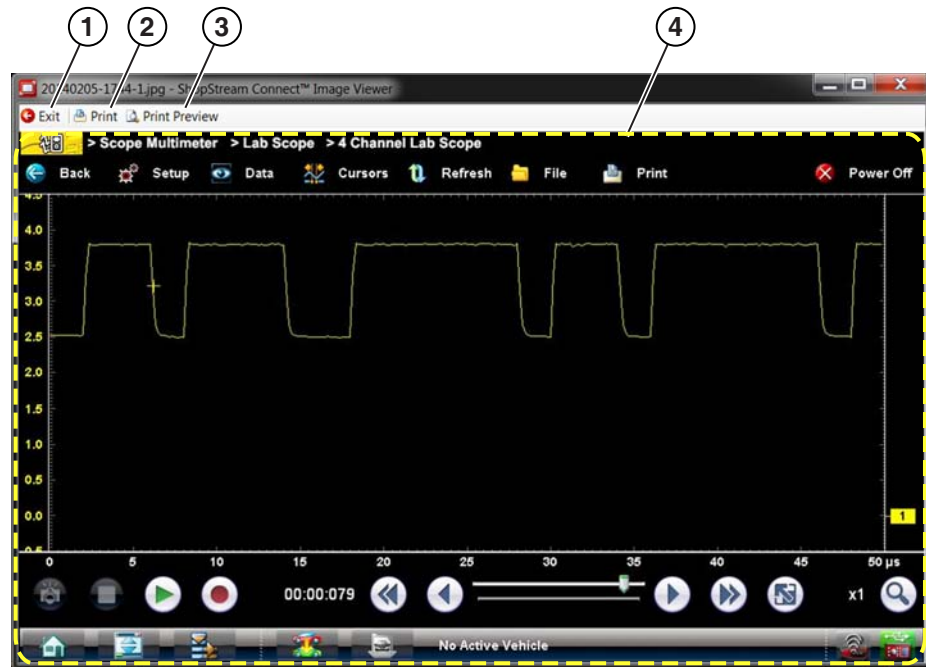
Figure 13-3

13.4 Image Viewer

SSC allows you to view and print .bmp, .jpg and .sps image files (screenshots) saved on your diagnostic tool, with your PC.

**NOTE:**

File extension types vary depending on the diagnostic tool. Not all the file extensions described here may be available on your diagnostic tool.



1— Exit - closes the Image Viewer
2— Print - prints the image

3— Print Preview - allows the image to be previewed before printing
4— Captured Screen Image

Figure 13-4

13.5 Printing the Code Scan Report

To print the Code Scan Report, the saved code scan .XML file must be opened using ShopStream Connect.

To print the Code Scan Report using ShopStream Connect:

1. Double-click the code scan .XML file from the file list to open the report (Figure 13-5) in the Code Scan Viewer (Figure 13-6).

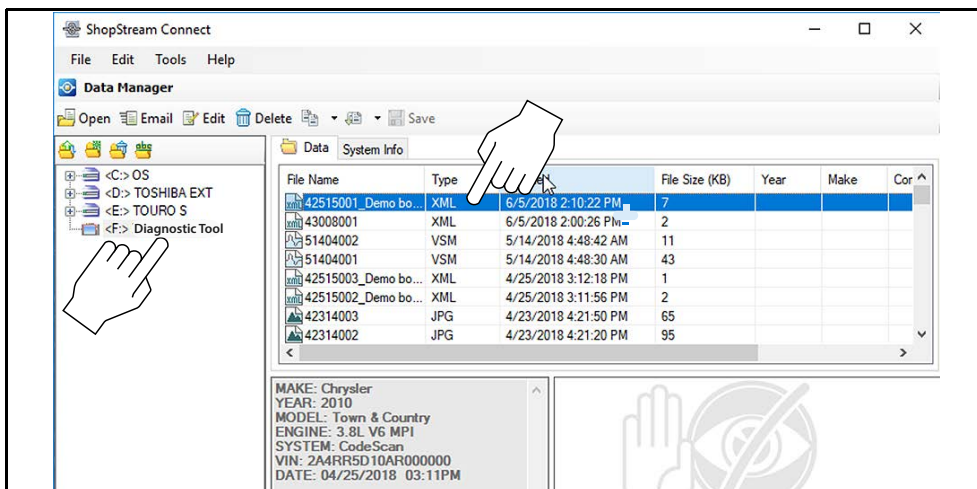


Figure 13-5

2. Select **Print** or **Print Preview** from the Code Scan Viewer menu to print or preview the report (Figure 13-6).

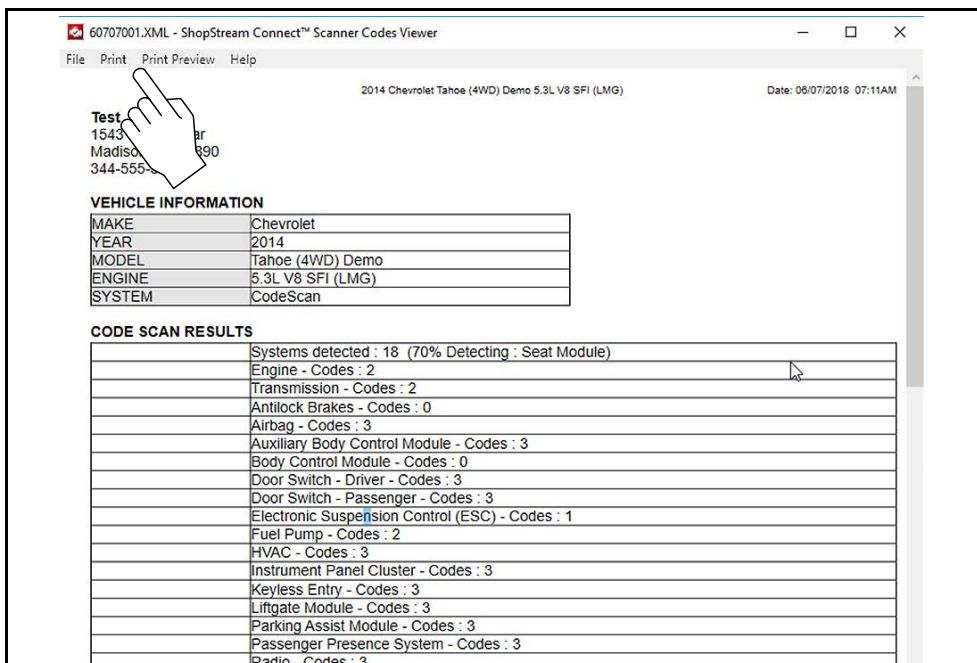


Figure 13-6

Selecting **Print** opens the Windows print dialog window (Figure 13-7). Select your printer from the list, then select **Print** to print the report.

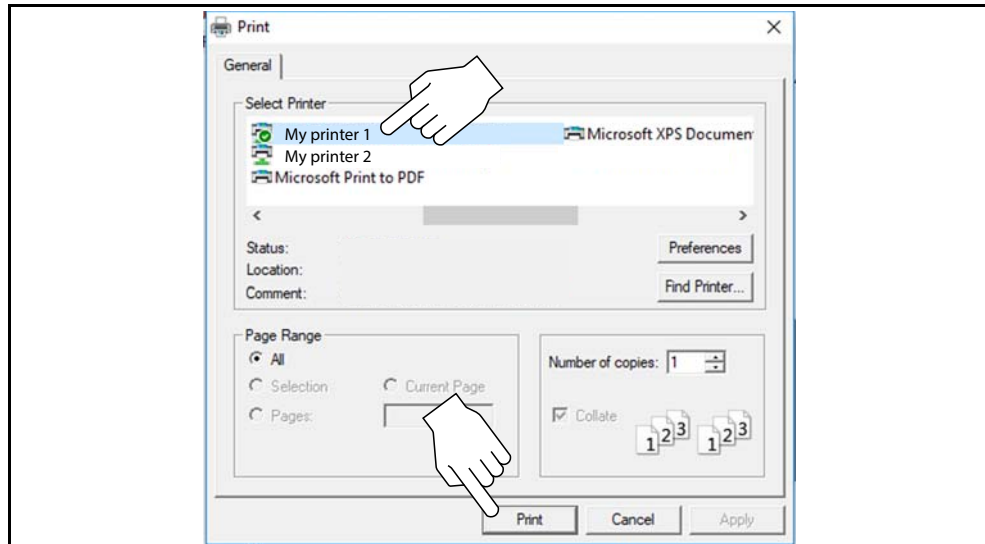


Figure 13-7

13.6 Software Upgrades and Updates

Upgrade/Update Descriptions:

- **Software Upgrade** - a software upgrade is a new software version (contact your sales representative for purchase information).
- **Software Update** - a software update is a service release for installed software. These are available free of charge, and are provided as necessary to update installed software. When your diagnostic tool is connected to a PC using SSC, the SSC software will automatically check for updates, and if an update is available, it will provide installation instructions. Follow the screen prompts to accept, download and install the software.



NOTE:

To receive updates or upgrades, SSC software must be installed on your PC and have connection to the Internet.



Example - Updating diagnostic tool software:

1. Select **Tools > Update Software > (diagnostic tool type - e.g. ETHOS Edge, MODIS Edge, SOLUS Edge, etc.)** from the Menu bar (Figure 13-8).
The software checks the Snap-on web server for available updates.

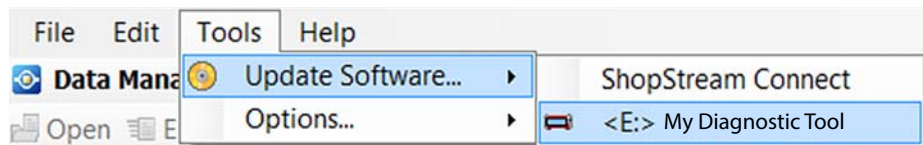


Figure 13-8

2. If service release updates are available, select **Next** to continue, then select **Download** and follow the on-screen instructions to complete the installation (Figure 13-9).

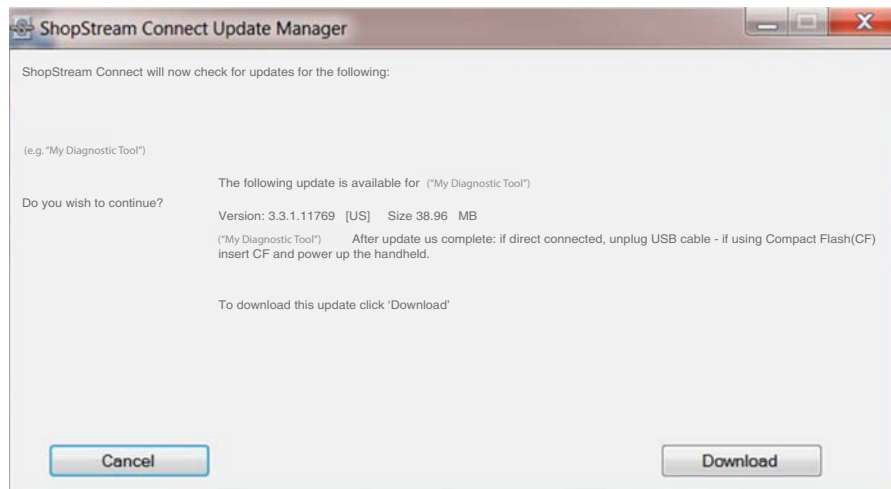


Figure 13-9



NOTE:

For additional information on ShopStream Connect software updates and upgrades, download the ShopStream Connect User Manual from our website:

<https://www.snapon.com/diagnostics/uk/User-Manuals.htm>

13.6.1 End User License Agreement

Before software installation at initial purchase, and before all subsequent software updates/ upgrades installations End User License Agreement (EULA) acceptance is required.

IMPORTANT:

Use of Software is governed by the terms and conditions of the End User License Agreement. The diagnostic tool should not be initially operated until the End User License Agreement is read. Use of the device acknowledges your acceptance of the End User License Agreement. The Snap-on Incorporated Software End User License Agreement is available at:

<https://eula.snapon.com/diagnostics>

To Accept: at the screen prompt (Figure 13-10) click the checkbox on the left side of the window, and then select **Agree and Continue**. The software will be installed automatically.

Figure 13-10 below represents a typical EULA acceptance agreement screen.

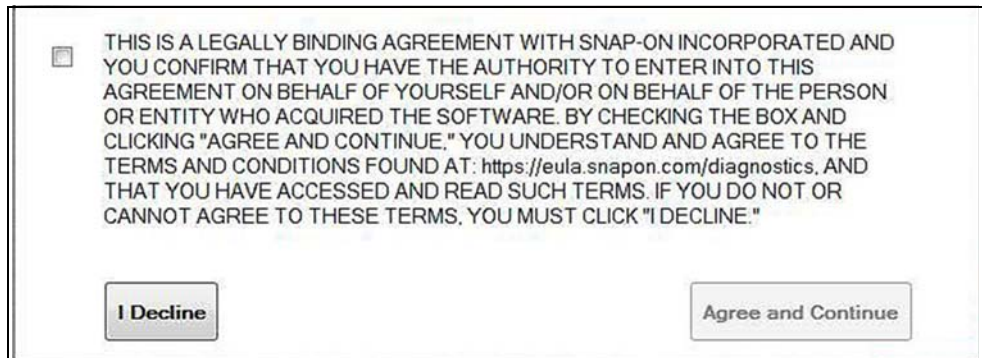


Figure 13-10 Typical EULA acceptance screen

To Decline: at the screen prompt (Figure 13-10) select **I Decline**. A confirmation message is displayed providing options to Go Back or Exit the software installation (Figure 13-11).

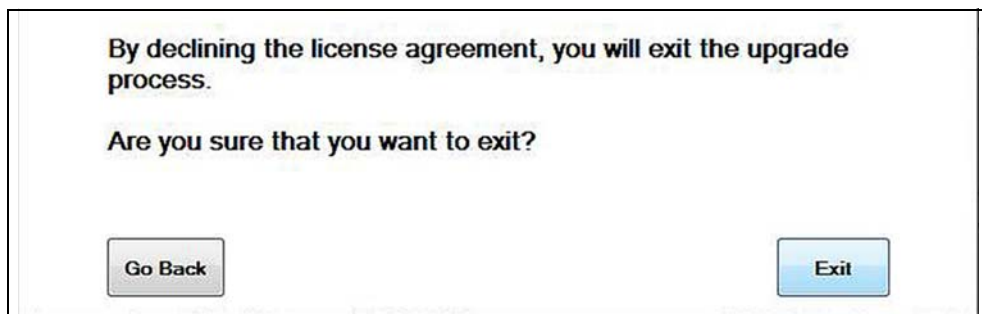


Figure 13-11 Typical EULA acceptance screen