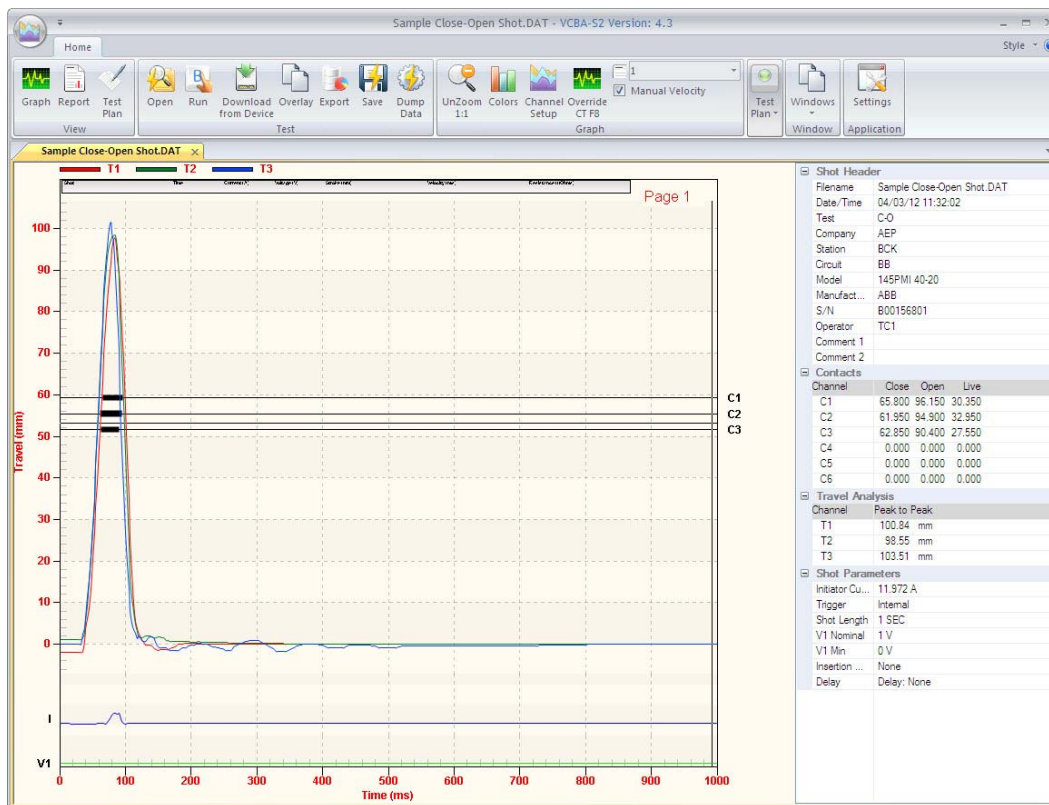# VANGUARD CIRCUIT BREAKER ANALYZER – S2
(VCBA S2)

VERSION 4.xx SOFTWARE MANUAL

For Use with Vanguard's

DigiTMR S2, DigiTMR S2 PC, CT-6500 S2, CT-7000 S2, CT-7500 S2, and CT-8000

Circuit Breaker Analyzers

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TABLE OF CONTENTS

LIST OF FIGURES

CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- Different versions of Microsoft® Windows will be simply referred to as Windows in this manual
- The general term "CB analyzer" used in this manual refers to any of the VCBA S2 compatible Vanguard circuit breaker analyzer models (DigiTMR S2, DigiTMR S2 PC, CT-6500 S2, CT-7000 S2, CT-7500 S2, CT-8000)
- Command Ribbon items are referred to as *Item*
- Dialog boxes and their elements (buttons, options, etc.) are referred to as "Dialog Box Element"
- PC keyboard keys are referred to as **[Key]**. Key combinations are shown as **[Key]+[Key]**.
- File locations, directories, and file names are shown as "*C:\folder\filename*"
- Warning messages are indicated as:

⚠️ Warning message

WARNING

- Important notes are indicated as:

📝 Note details

NOTE

1.0   INTRODUCTION

The Vanguard Circuit Breaker Analyzer S2 (VCBA S2) software is a Windows-based PC software application for use with Vanguard's DigiTMR S2, DigiTMR S2 PC, CT-6500 S2, CT-7000 S2, CT-7500 S2, and CT-8000 circuit breaker analyzers. This software allows users to perform the following tasks:

- Retrieve Timing Records from a CB Analyzer
- Analyze Retrieved Timing Records
- View Test Results in Graphic Format
- Generate Timing Reports
- Create Breaker Test Plans
- Transfer Breaker Test Plans to a CB analyzer
- Export Test Records in PDF, XML, and Excel format
- Control CB analyzers from the PC to perform Timing Tests

1.1   System Requirements

The VCBA-S2 software has the following minimum system requirements:

- PC running Microsoft® Windows® XP, Windows® Vista, or Windows 7
- CD-ROM or DVD-ROM drive
- USB or RS-232C (serial) port

2.0   SOFTWARE INSTALLATION

Follow the steps below to install the VCBA-S2 software on your PC.

1. Insert the installation CD in the PC's CD or DVD drive.

2. From the Windows Desktop, click on the "Start" button to bring up the **Start Menu**.

3. From the **Start Menu**, click on *My Computer* to open the My Computer window.

4. Double click (or single click in some Windows configurations) on your CD/DVD Drive icon to navigate the installation CD. The contents of the CD will be listed as shown below:
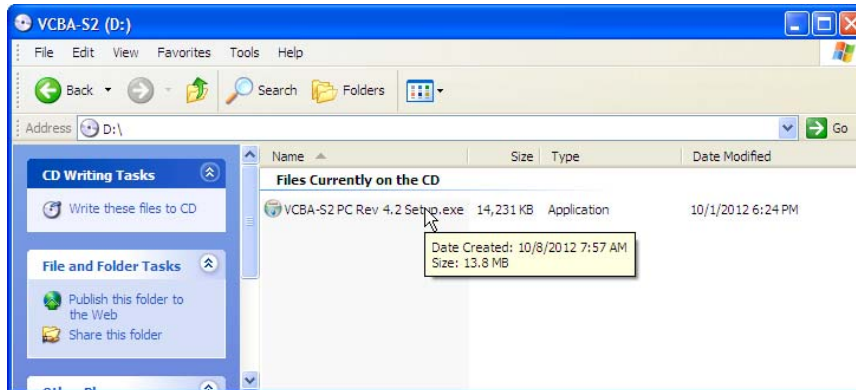
5. Double click (or single click in some Windows configurations) on the "*VCBA-S2 PC Rev 4.xx.exe*" file to start the installation process. The VCBA-S2 InstallShield Wizard will appear as shown below:
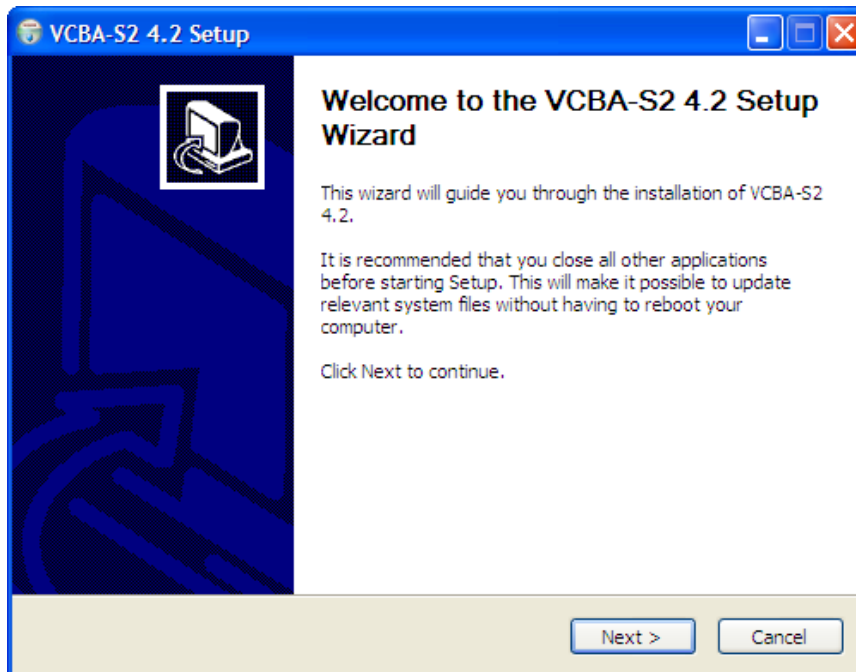
6. Click on the "Next" button to continue. The following screen will be displayed showing the location on your hard drive where the software will be installed (C:\vanguard\VCBA-S2):
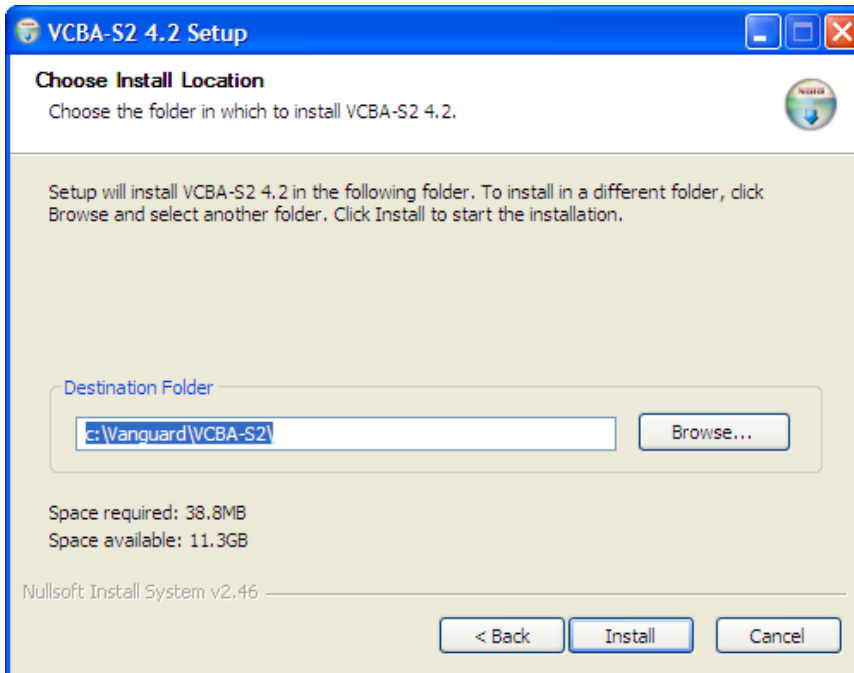
7. You may choose a different installation location by clicking on the "Browse…" button and then browsing to the location on your hard drive where you would like to install the software. If you would like to install the software in the default location, click on the "Install" button to continue. The following screen will be displayed showing the status of the installation:
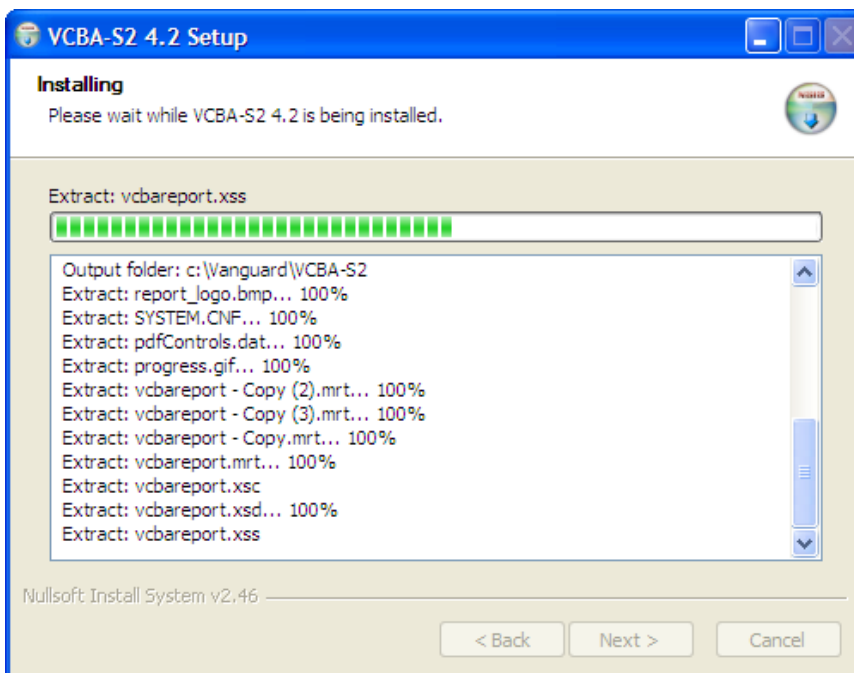
8. The following screen will be displayed once the software has been successfully installed:
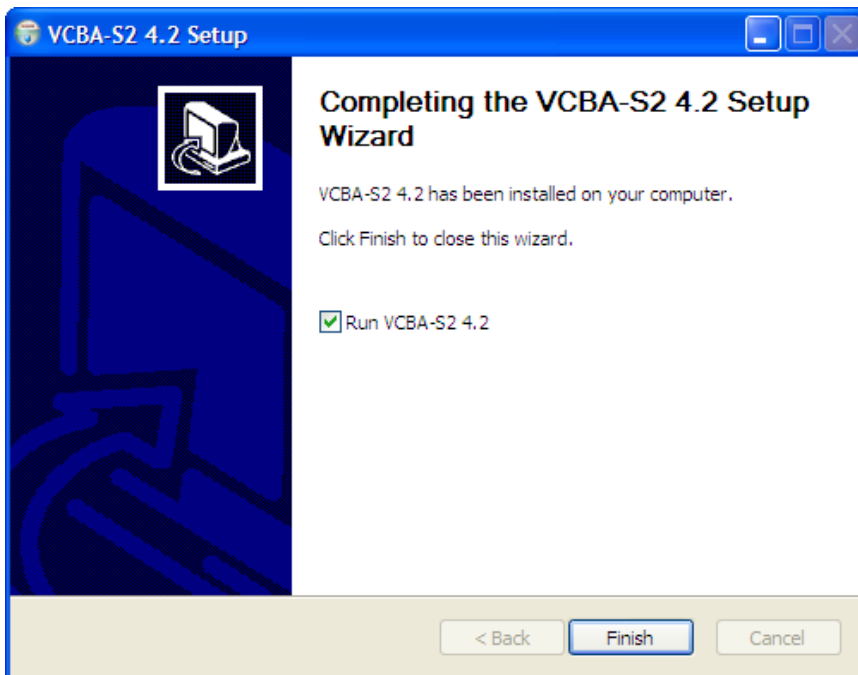
9. Click on the "Finish" button to close the InstallShield Wizard and complete the installation process.

NOTES	• The "Run VCBA-S2 4.x" checkbox will be checked by default. If you leave this box checked, the application will be launched after you click on the "Finish" button.
	• The installation program will create two sub-folders, "*Tests*" and "*TestPlans*", in the main installation folder. By default all test records will be stored in the "*Tests*" folder and all test plans will be stored in the "*TestPlans*" folder.
	• The installation program will also install some sample test data files in the "*Tests*" folder.
	• You can later change the default test record and test plan storage locations. Please see section 3.2.4 for details.

3.0   STARTING THE VCBA-S2 SOFTWARE

During the installation process, a Vanguard program group will be created under the *All Programs* submenu in the Windows *Start* menu. To launch the VCBA-S2 software:

1. Click on the Windows "Start" menu button to open the *Start Menu*.

2. Click on the *All Programs* menu item.

3. Click on the *Vanguard* menu item.

4. Click on the *VCBA-S2* menu item. The VCBA-S2 main application window will appear as shown below:
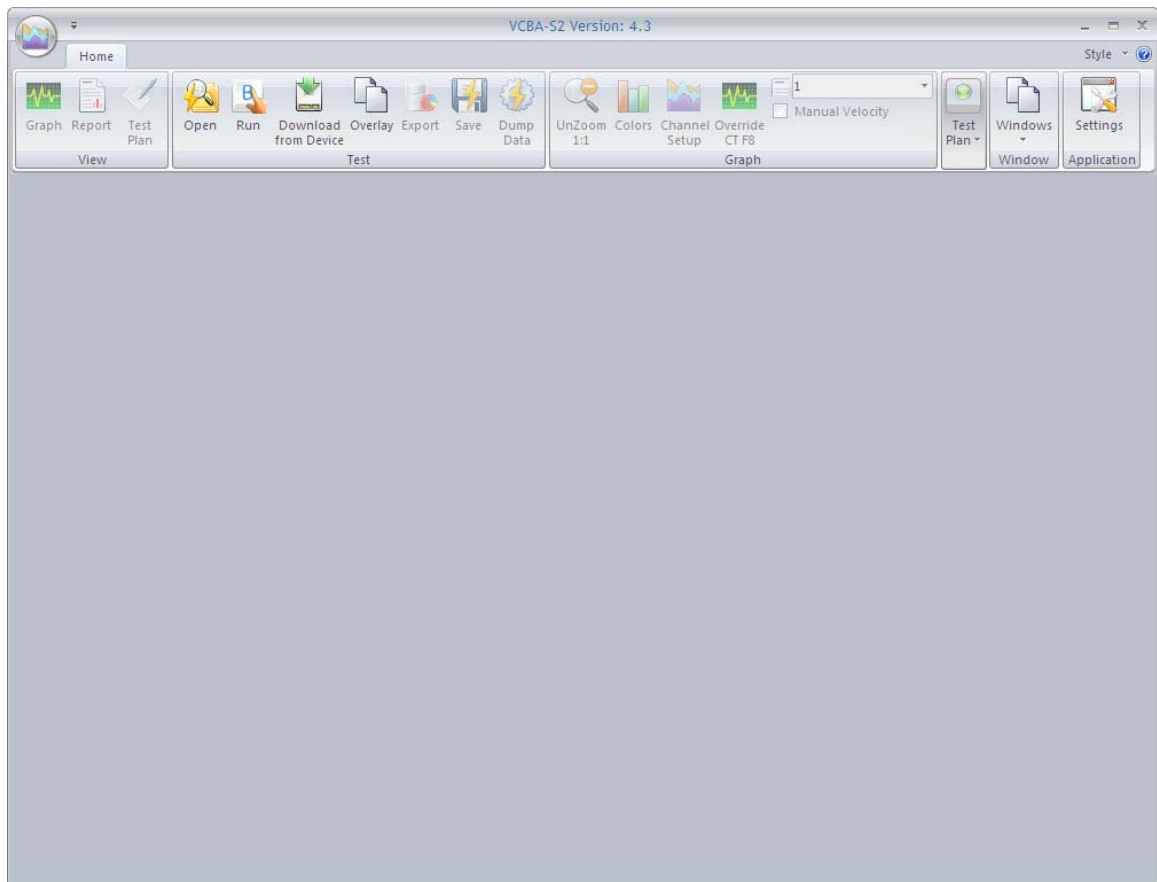
3.1 The VCBA-S2 Application Workspace

Older versions of the VCBA S2 software used a menu bar and drop-down menus. The current version of the application uses a command ribbon for faster access to all the functions and features of the VCBA S2 software, as shown below:
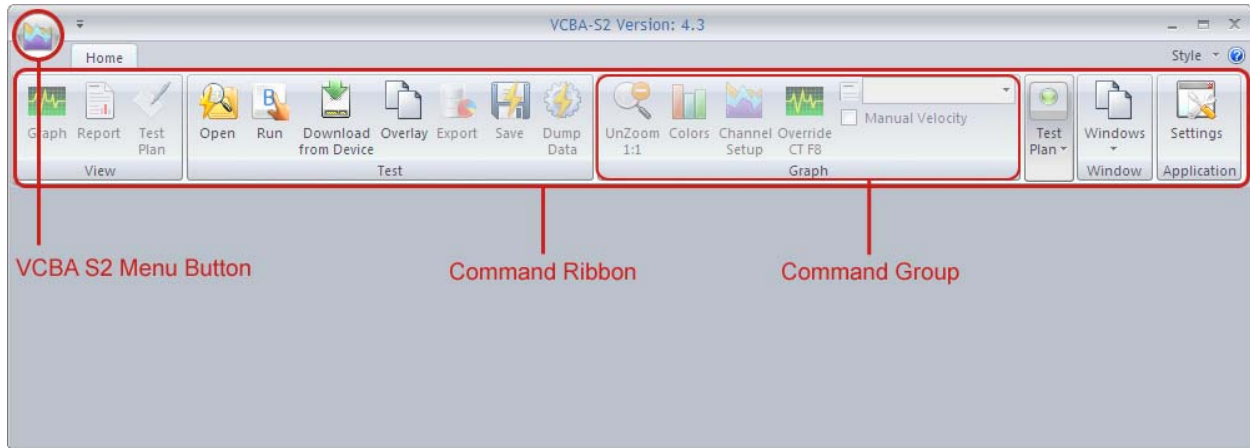
Related commands are grouped together in the command ribbon. If there is not enough space on the screen, some command groups will be collapsed showing only one item. Click on the command group to view all the commands in that group.
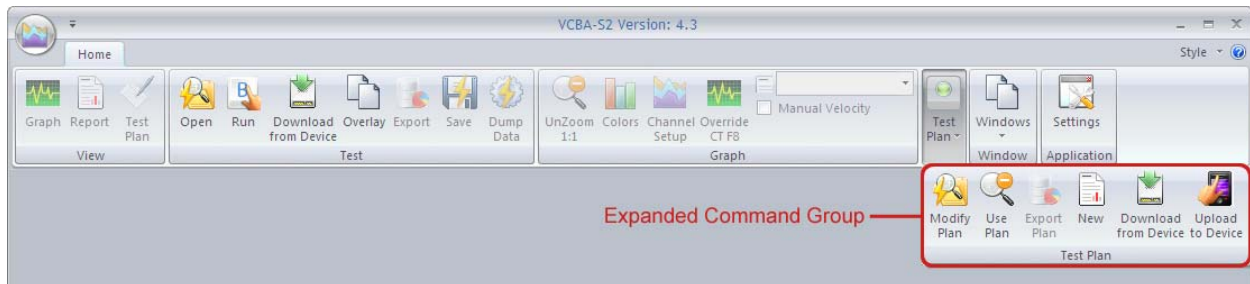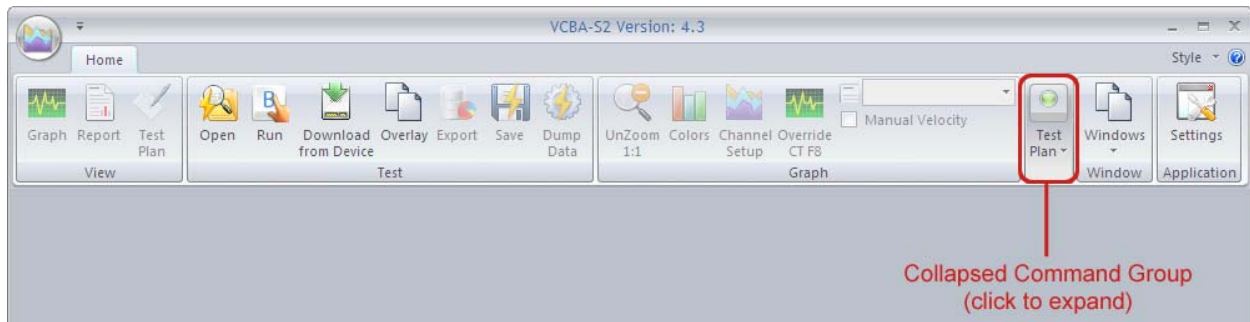
The "File" menu from previous versions has been replaced with the VCBA S2 Menu Button. Click on this button to view the "File" menu options:
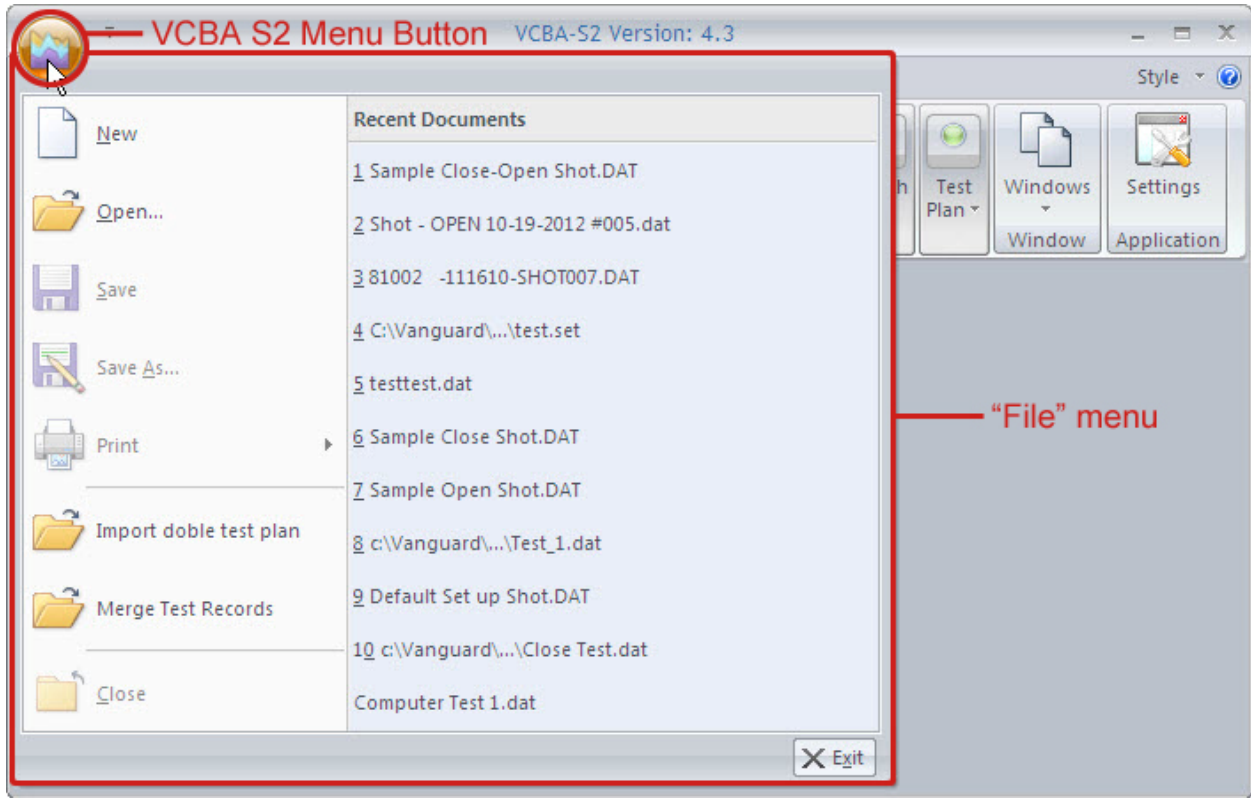
3.2 Configuring Default Application Settings

The VCBA S2 application's default settings should be configured before attempting to use it for the first time with a Vanguard circuit breaker analyzer. Follow the steps in this section to configure the communication parameters, the graph and overlay display preferences, report and export preferences, and file storage location preferences.

To access the application settings, click on the *Settings* icon in the *Application* command group on the command ribbon. The following window will be displayed:

3.2.1. Configuring the Communication Parameters

Follow the steps below to configure the VCBA S2 software so that it can properly communicate with the connected Vanguard circuit breaker analyzer:

1. If the CB Analyzer will be connected via RS-232C, click on the "COM Port:" drop down list and select the COM: port that the CB analyzer is connected to. Make sure the "Use USB Port" checkbox is un-checked.

    If the CB Analyzer will be connected via USB, check the "Use USB Port:" checkbox, if not already checked, to enable the USB interface.

Select the preferred frequency from the "Cycles/Second" drop-down menu.

Click on the "OK" button to save your settings.

2. Connect the CB analyzer to the PC via the RS-232C or USB port and turn on the power. The VCBA-S2 software will automatically enable the Computer Interface Mode and connect to the CB analyzer. When the software communicates with the CB analyzer (for example, when retrieving a test record from the CB analyzer), COMPUTER ITF MODE will be displayed on the CB analyzer's LCD screen.

If you experience any problems enabling the Computer Interface Mode:

1. Turn off both the PC and the CB analyzer.

2. Connect the CB analyzer to the PC via the RS-232C or USB port.

3. Turn on the computer and run the VCBA-S2 software.

4. Turn on the CB analyzer and wait till the startup sequence is finished. The CB analyzer will be ready to communicate with the VCBA-S2 software.
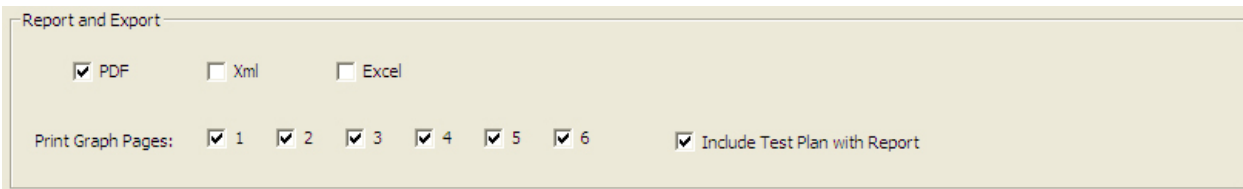
3.2.2. Configuring Graph and Overlay Settings
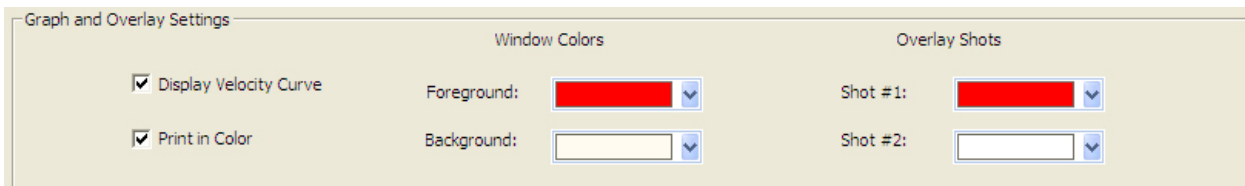
You can customize the VCBA S2's window colors and the colors used for overlaying test shots. You can also configure whether the velocity curve is displayed and whether the application should print in color. Use the steps below to configure these settings:

1. If you would like the velocity curve to be displayed on the test results graph, check the "Display Velocity Curve" checkbox (if not already checked) in the "Graph and Overlay Settings" section in the "Application Settings" window. Un-check this box if you do not want to view the velocity curve on the test results graph.

2. If you have a color printer connected to your computer and prefer to print graphs in color, check the "Print in Color" checkbox (if not already checked) in the "Graph and Overlay Settings" section in the "Application Settings" window.

3. To change the Window colors, click on either the "Foreground" or "Background" drop down menu and select the preferred color, respectively.

4. The VCBA S2 software can overlay two test graphs for comparison. You can configure the color used for each graph by clicking on either the "Shot #1" or "Shot #2" drop-down menu and selecting the preferred color for each graph, respectively.

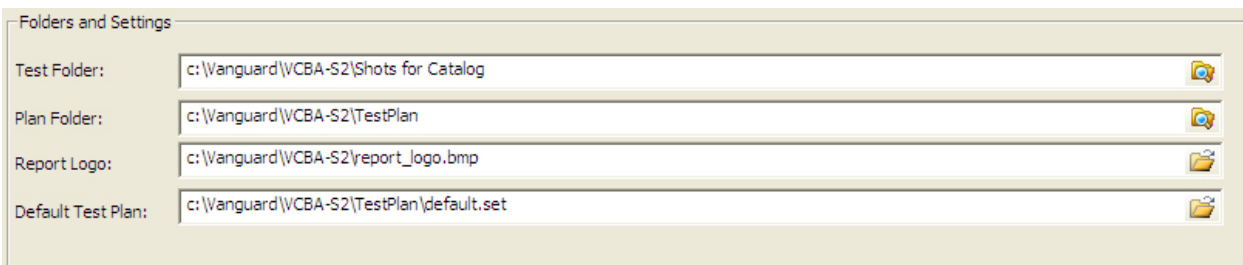### 3.2.3. Configuring Default Report and Export Settings

The VCBA S2 software can export test reports in PDF, XML, and Excel formats. Use the steps below to set your report and export preferences:

1. To enable exporting in PDF, XML, and Excel, check the checkbox for each item, respectively.

2. You can export all or selected pages of a test report by checking or un-checking the checkbox next to each page number from the "Print Graph Pages" checkbox group.

3. If you would like the test plan to be exported with the report, check the "Include Test Plan with Report" checkbox.

3.2.4. Configuring Default Folders and File Locations

Follow the steps below to configure default folders and file locations:

1. The "Test Folder" input field shows the current default folder where test shots are stored. You can change this location by clicking on the folder icon on the right and then selecting the folder that you would like to use as the storage location for test shots.

2. The "Plan Folder" input field shows the current default folder where test plans are stored. You can change this location by clicking on the folder icon on the right and then selecting the folder that you would like to use as the storage location for test plans.

3. The VCBA S2 software can display a custom logo image at the top of reports. The "Report Logo" input field shows the name and location of the default logo image file. You can select a different logo image file by clicking on the folder icon on the right and then locating the logo image file that you would like to use.

4. The VCBA S2 software can use a default test plan for performing tests. The default test plan defines color settings for graph elements, default values for analysis points, etc. The "Default Test Plan" input field shows the name and location of the default test plan file. You can select a different default test plan by clicking on the folder icon on the right and then locating the default test plan file that you would like to use.

4.0   WORKING WITH TEST RECORDS

The VCBA S2 software can be used to retrieve test records from a CB analyzer or from the PC hard drive. Once a test record is retrieved, you can change the record header information, print the test record, change velocity calculation points, change circuit breaker test parameters, and save the record to the hard drive.

4.1   Retrieving Test Records From a CB Analyzer

Follow the steps below to retrieve one or more test records from a connected CB Analyzer:

1. Make sure the VCBA S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port and turn on the power.

2. The CB analyzer should enter Computer Interface Mode. Please see section 3.2.1 for details.

3. Click on the **Download from Device** icon in the **Test** command group in the Command Ribbon.

4. The following window will be displayed listing a directory of all the test records stored in the CB Analyzer's memory:
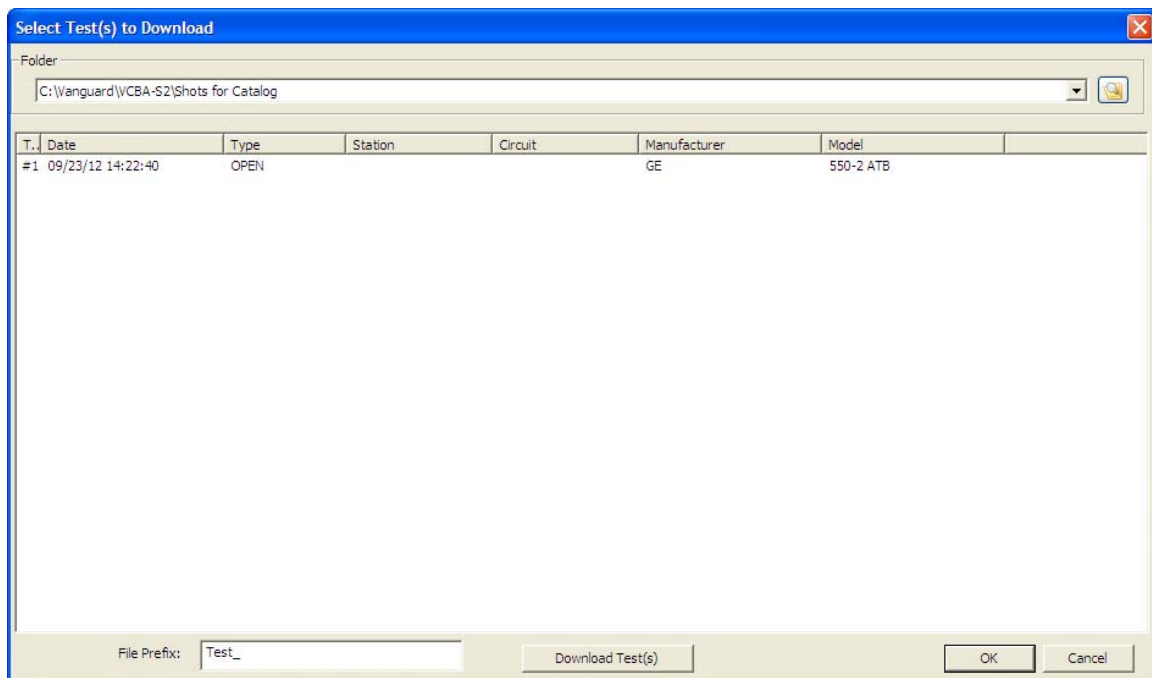
5. You can select a shot to be retrieved by clicking on the shot number. The selected record will be highlighted. You may select multiple records by holding down the **[CTRL]** key and clicking on the shot numbers. All selected records will be highlighted. You may de-select a selected record by holding down the **[CTRL]** key and clicking on the selected shot number a second time.

    The "File Prefix" input field allows you to enter a word that will be used as a prefix for the file name for the stored record on the PC hard drive. When a test record is retrieved

from a CB analyzer and stored on the hard drive, the file name is in the "n.dat" format, where "n" is the record number.

So if you would like the file name to be "*Test_n.DAT*", enter the word "Test_" in the "File Prefix" input field.

6. Click on the "Download Test(s)" button to retrieve the selected test records from the connected CB Analyzer and store them in the default test shot folder. Click on the "OK" button when done retrieving the desired test shots.

## 4.2   Opening Test Records From the PC Hard Drive

Use the steps below to open a test record from the PC hard drive:

1. Click on the **Open** icon in the **Test** command group in the Command Ribbon. The following screen will be displayed listing the test records from the default test record folder:
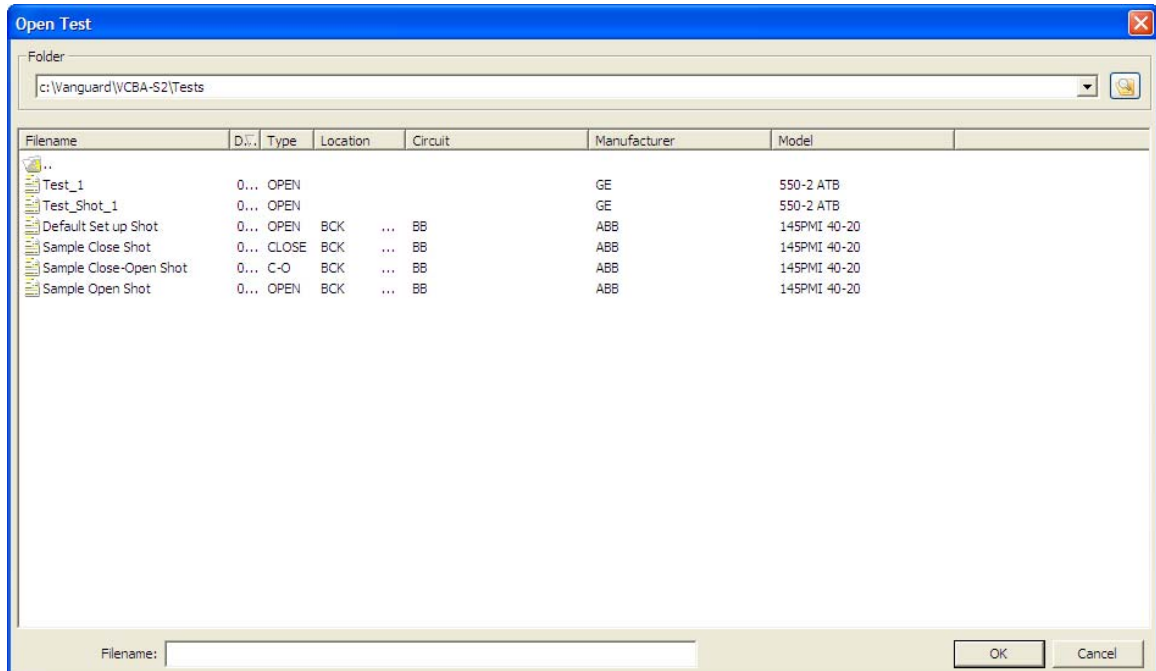
- The top left section of the window displays the name of the directory where the test records are being retrieved from. If you wish to retrieve records from a different directory, click on the folder icon at the top right of the window and browse to the folder containing your test records.

- You can sort the records by Filename, Date, Type of test, Location, Circuit, Manufacturer, or Model. To change the sort order, click on the header label that you would like to sort by. For example, if you would like the records to be sorted by Filename, click on the Filename column heading. You can reverse the sort order by clicking on the heading a second time.

- You can also search for a particular filename. You can start typing in the "Filename" input field and it will actively highlight the first matching filename. For example, in the listing below, typing SAM in the "Filename" field will highlight the "*Sample Open Shot*" filename as shown below:
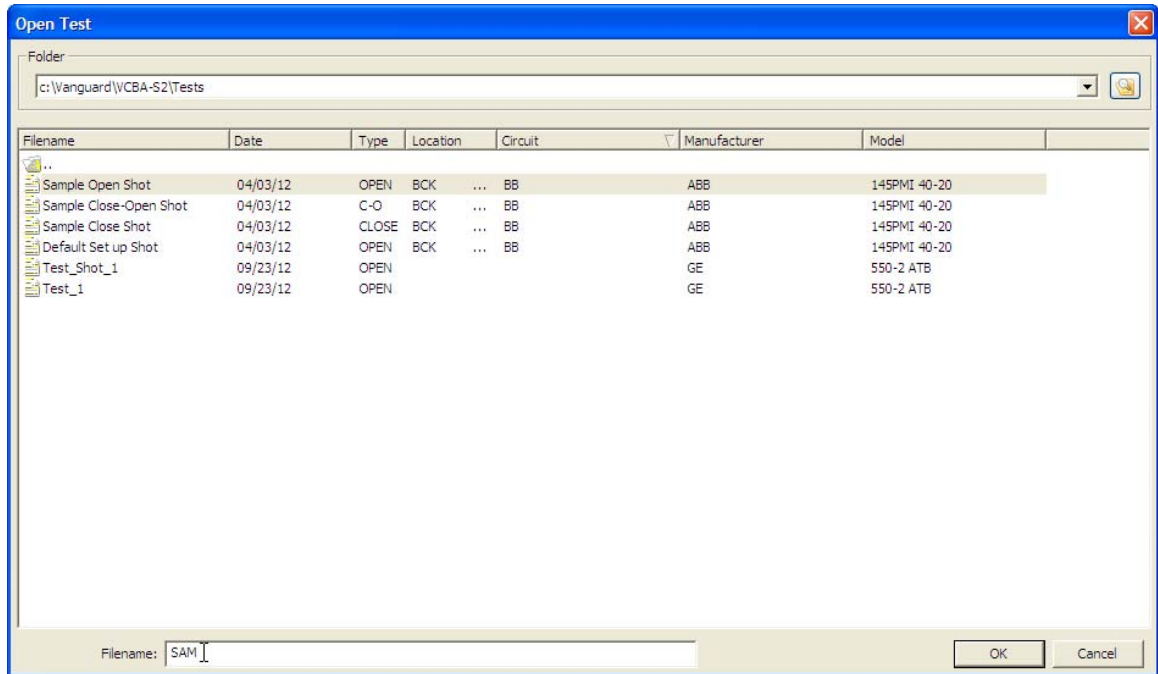
2. Click on the file name you would like to open and click the "OK" button. The test record will be loaded and the tabulated test results will be displayed (please see section 4.3 for details).

4.3   Analyzing Test Records

Whenever a test record is loaded from the hard drive, the VCBA S2 software will automatically export the test record in the formats selected in the Application Settings preferences (please see section 3.2.3). For example, if you had configured the application to export reports in PDF format, the record will be exported as a PDF file when you load it from the hard drive. When loading a file from the hard drive, the following window will be displayed while the export function is being performed:
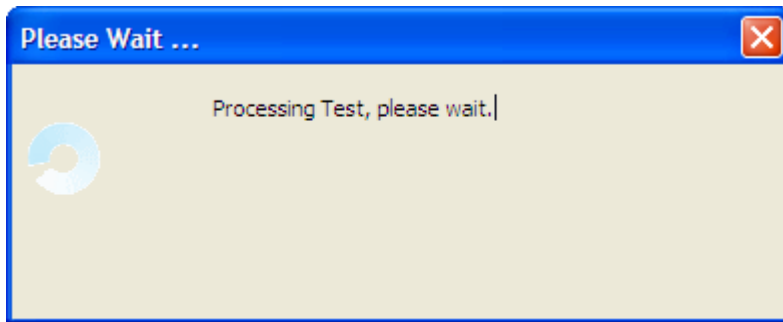
The exported PDF, Excel, and XML files are stored in subfolders named "Excel", "Pdf", and "Xml", respectively, within the folder where the original test record is stored. For example, if the original test record is stored in the folder "C:\Vanguard\VCBA-S2\Tests", the exported PDF file will be stored in the folder "C:\Vanguard\VCBA-S2\Tests\Pdf".

Once the test record is loaded and exported in the preferred formats, it will be displayed in graphical and tabulated format in the VCBA S2 application as shown in Figure 1 below. Please see Table 1 for a description of each numbered section.
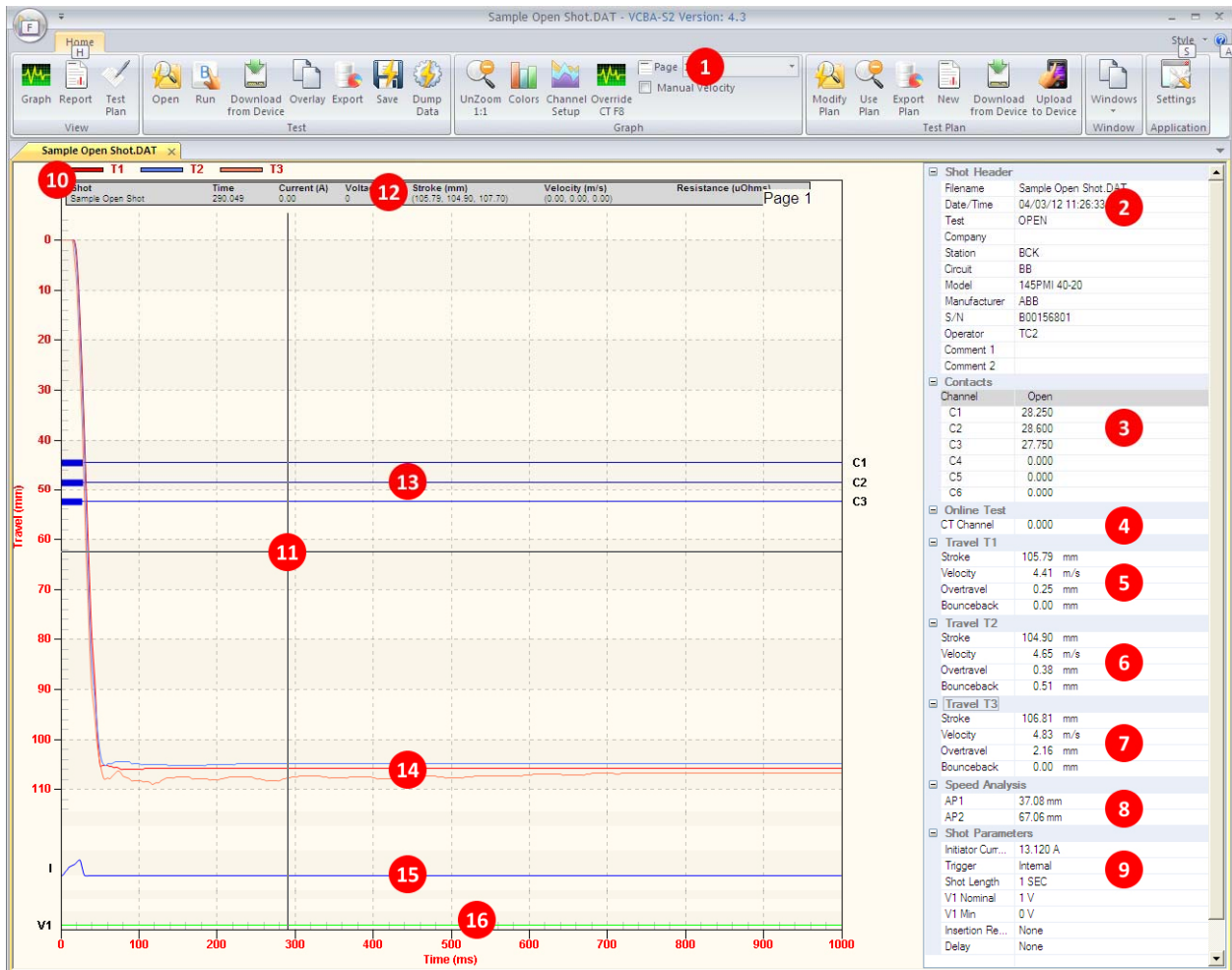

Figure 1. Sample Test Record

Table 1. Description of Test Record Sections

Item Number	Functional Description
1	Graph page number. Select which page to view from this drop-down menu.
2	Test record header information. Test record header information can include identifying information such as the date and time the test was performed, the company name, model number, etc.
3	Contact channel timing information.
4	This section displays on-line timing information (if performed)
5	Stroke, velocity, over-travel, and bounce-back values for contact channel 1
6	Stroke, velocity, over-travel, and bounce-back values for contact channel 2
7	Stroke, velocity, over-travel, and bounce-back values for contact channel 3
8	Speed analysis information
9	Additional test parameters such as initiator current, trigger type, shot length, etc.
10	Travel Transducer Curve Color Legend
11	Current cursor location
12	Time, Current, Voltage, Stroke, Velocity, and Resistance values from current cursor location
13	Graph for contact channels 1-3
14	Travel curves for contacts 1-3
15	Coil initiate current graph
16	Voltage graph

Each section of the tabulated data can be collapsed or expanded. If a section is expanded, a "-" sign will be displayed to the left of it. Clicking on the "-" sign will collapse the section and hide its data. If a section is collapsed, a "+" sign will be displayed to the left of it. Clicking on the "+" sign will expand the section and display its data.

4.4 Viewing a Test Record's Test Plan

You can view a test record's test plan by clicking on the ***Test Plan*** icon in the ***View*** command group in the Command Ribbon. The test plan parameters will be displayed as shown in Figure 2 below.

Figure 2. Test Plan Parameters

You can return to the graph view by clicking on the ***Graph*** icon in the ***View*** command group in the Command Ribbon.

You may edit any of the test plan parameters by typing a new value in the corresponding input field. Once you have made your changes, be sure to click on the "Apply Changes" button (you may need to scroll down to see the button) to save your changes.

NOTE

When a test record is saved, the test plan is saved along with it. You may also save the test plan as a separate test plan file. Please see section 5.1 for additional information.

4.5 Customizing the Items Displayed on the Graph

You can select which contact, travel, and voltage traces are displayed on each page of the graphic test results. To select the items to be displayed:

1. Click on the **Channel Setup** icon in the **Graph** command group in the Command Ribbon.

    The following window will be displayed:

2. First, select the page number that you would like to customize by clicking on the corresponding radio box at the top of the window.

3. From each section, select the channels that you would like to display on the graph by selecting the channel number from the corresponding drop down menu. In the example above, contact channels 1, 2, and 3 will be displayed on the graph, voltage channel 1 will be displayed, current channel 1 will be displayed, and travel channels 1, 2, and 3 will be displayed.

4. Repeat the above process for additional pages, and then click on the "OK" button. The graph view will be updated to reflect any changes made.

> **NOTE** The order of the contact and voltage channels can be arranged in any order by the user. This is determined by how they are selected from the dropdown menus. For example, if contact #3 is selected from the first dropdown menu, it will appear as the first item at the top of the graph.

4.6   Customizing the Graph View

4.6.1. Customizing Graph Colors

Follow the steps below to customize the colors for each graph element:

1. Click on the **Colors** icon in the **Graph** command group in the Command Ribbon. The following window will be displayed:
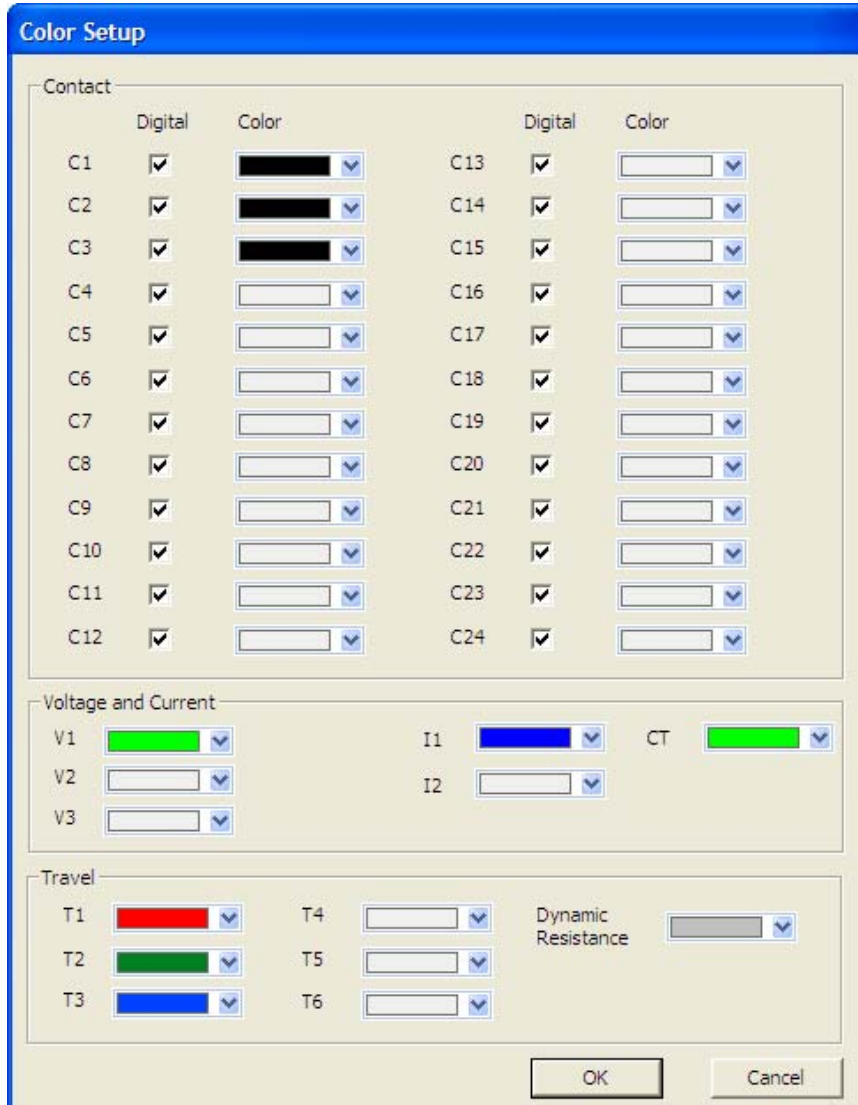
To change the color for a particular graph element, click on the drop down menu next to the label for that item and select the preferred color.

Contact channel graphs can be displayed either as an analog graph or a digital graph (on/off). If you would like to view a contact channel's graph as an analog graph, un-check the "Digital" checkbox for that item. In the example shown in Figure 3, the contact channel 1 graph is shown in analog format while the contact channel 2 and 3 graphs are shown in digital format.
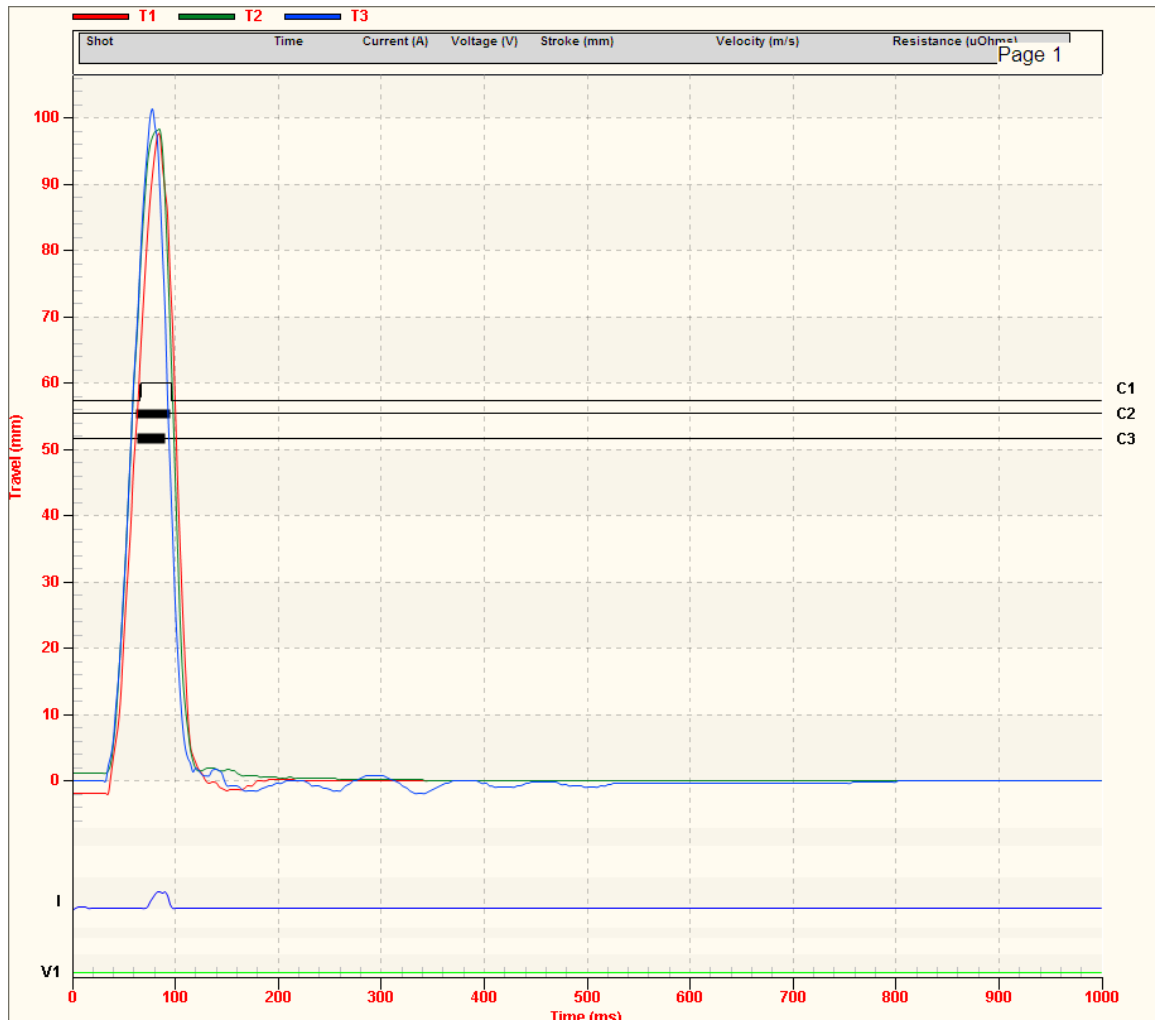
Figure 3. Graph Showing Contact Channels in Analog (C1) and Digital Format (C2 and C3)

2. Click on the "OK" button to save your settings. The graph will be refreshed reflecting any changes made.
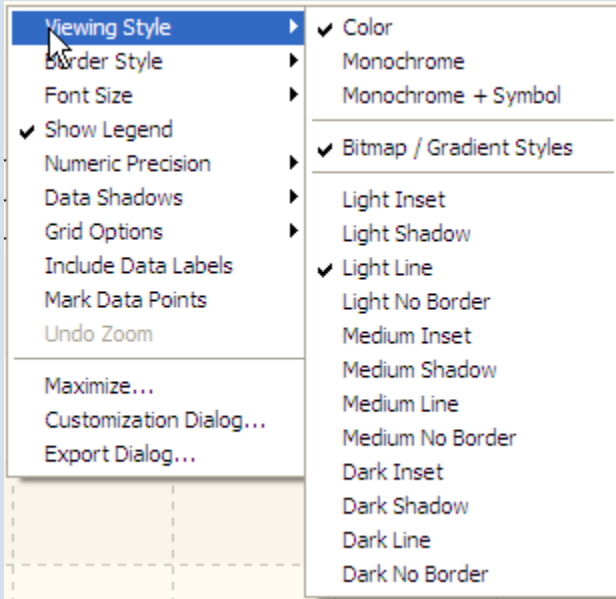
4.6.2. Customizing the Graph Style

You can fully customize all of the graph's elements including the background, line styles, etc. To customize specific graph elements, right-click anywhere on the graph. A pop-up menu will be displayed as shown below:
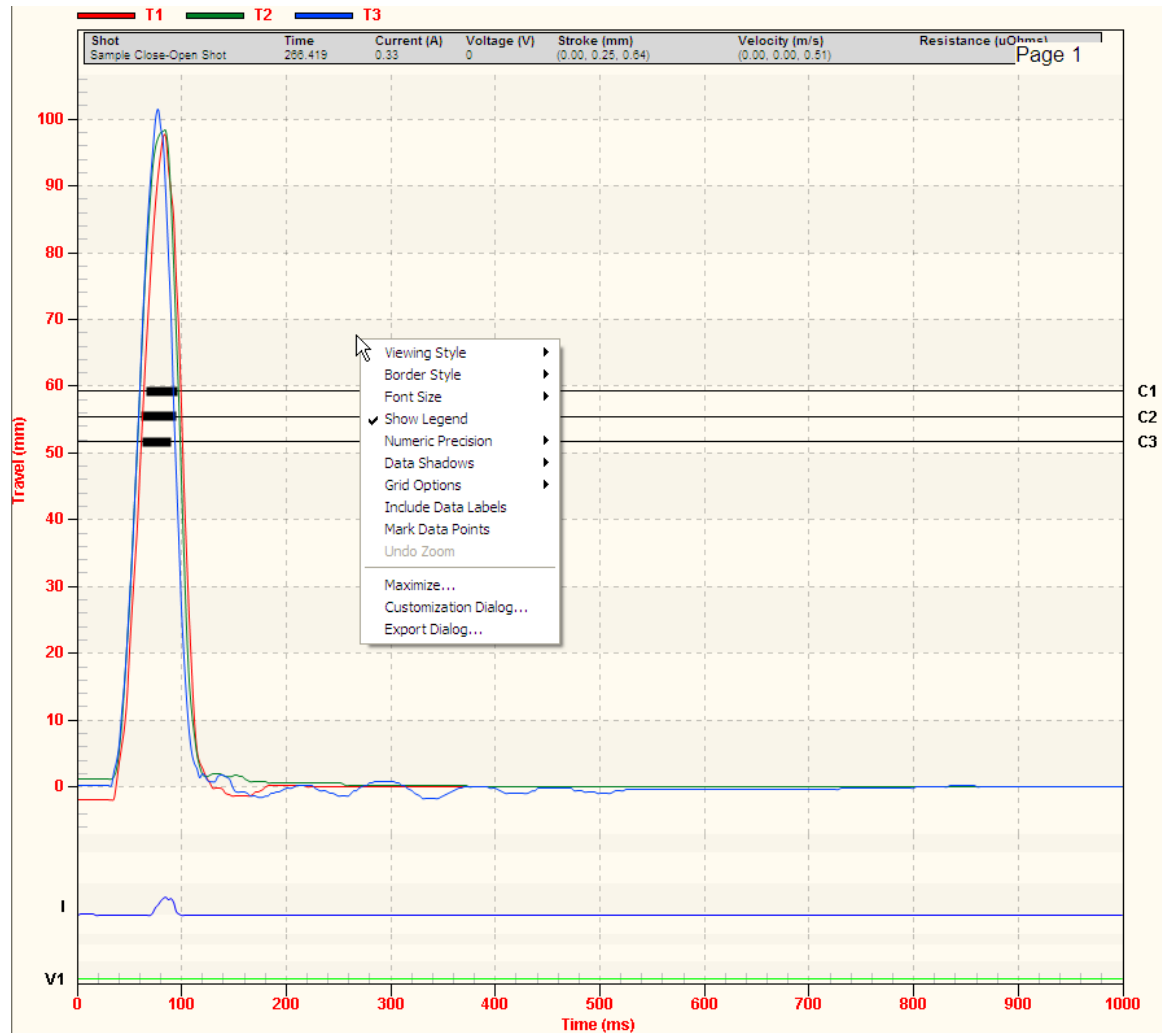
A brief description of each pop-up menu option is provided below.

Viewing Style Menu

The "Viewing Style" menu can be used to change the display style of the graph. For example, clicking on the "Monochrome" option will display the graph in monochrome (shades of gray). This menu also provides some pre-configured styles such as "Light Inset", "Light Shadow", etc. Each style features pre-configured colors, backgrounds, and line styles.
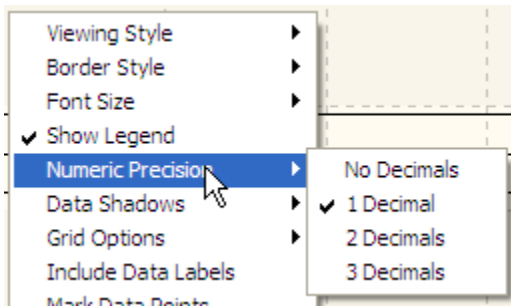
Border Style Menu
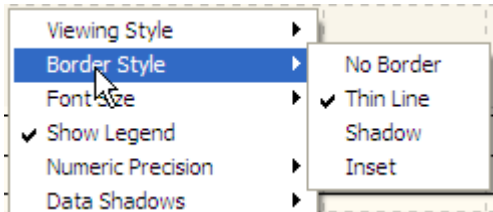
From the "Border Style" menu, you can select the type of border that is drawn around the entire graph. Options include "No Border", "Thin Line", "Shadow", and "Inset".
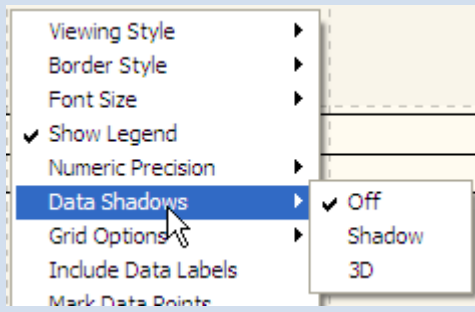
Font Size Menu
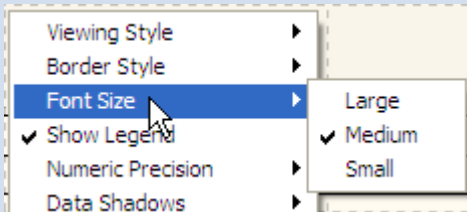
From the "Font Size" menu, you can select the font size used for displaying textual elements on the graph (such as axis labels, etc.)

Numeric Precision Menu

From the "Numeric Precision" menu, you can select the internal numeric precision used for generating the graph. In most cases, this has no significant effect.

Data Shadows Menu

From the "Data Shadows" menu you can select whether you would like a drop shadow to be displayed for each graph element. This is not recommended as it only adds additional un-necessary elements to the graph making it more difficult to analyze.

Grid Options Menu
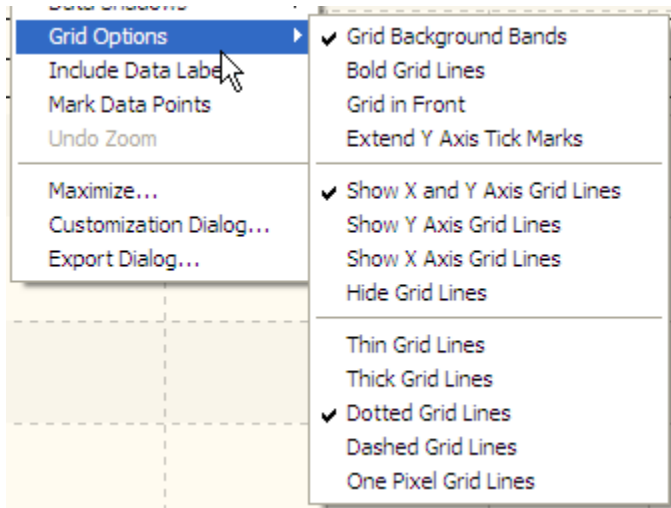
The "Grid Options" menu can be used to customize the display of grids and data axis on the graph.

The top 4 options in this menu control the style of the grid displayed on the graph.

The middle 4 options in this menu control which grid axis should be displayed.

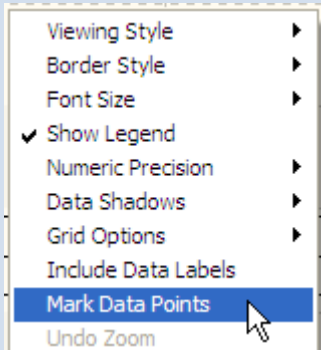The bottom 5 options in this menu can be used to customize the line style for the grid.

Include Data Labels Option
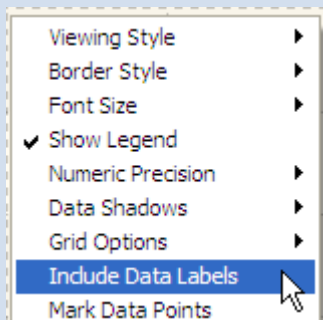
Selecting the "Include Data Labels" option will display the value of each data point on the graph, which can immensely clutter the graph. However, it may be a useful option if viewing a zoomed section of the graph as shown below:
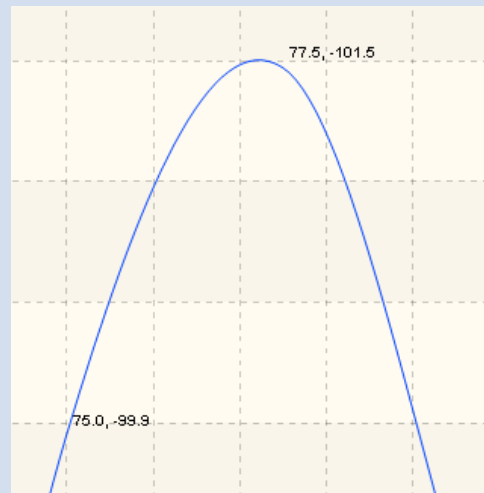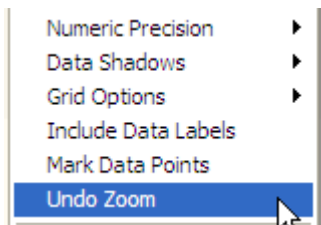
Mark Data Points Option

Selecting the "Mark Data Points" option will mark each data point on the graph with a small circle. As with the "Include Data Labels" option, this can clutter the graph, but can be useful if viewing a graph expansion as shown below:
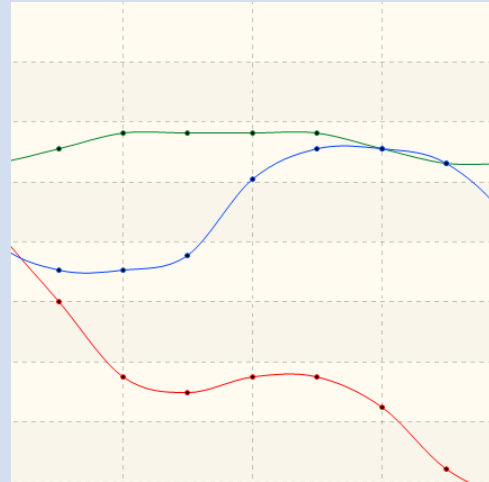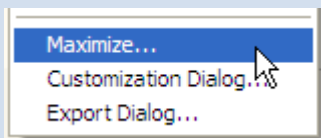
Undo Zoom Option

The "Undo Zoom" option will be available if you are viewing a graph expansion. Click on this option to un-zoom and view the entire graph.

You can also click on the **UnZoom 1:1** icon in the **Graph** command group in the Command Ribbon to un-zoom the graph.

Maximize… Option

Click on the "Maximize…" option to maximize the graph to full-screen view. The maximum size of your screen will be used to display the graph. All other window elements will be hidden, including the Command Ribbon and the tabulated test record data.

Press the "Esc" key to return to the normal view.

Customization Dialog… Option
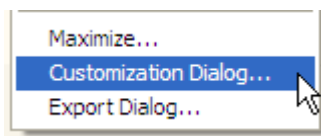
Clicking on the "Customization Dialog…" option will display a window with additional customization options. From this window, you can select the type of graph (such as bar, line, spline, etc.), set the font style for the graph's title and subtitle, and configure additional parameters such as the data point type (circle, diamond, etc.).

Export Dialog… Option

Maximize…
Customization Dialog…
Export Dialog…
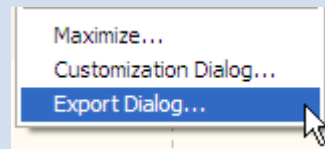
Click on the "Export Dialog…" option to quickly export the graph in various formats. The following window will be displayed:

Exporting

Export
○ EMF   ○ WMF   ○ BMP   ● JPG   ○ PNG   ○ Text / Data

Export Destination
● ClipBoard
○ File   [Browse]   [   ]
○ Printer

Export Size
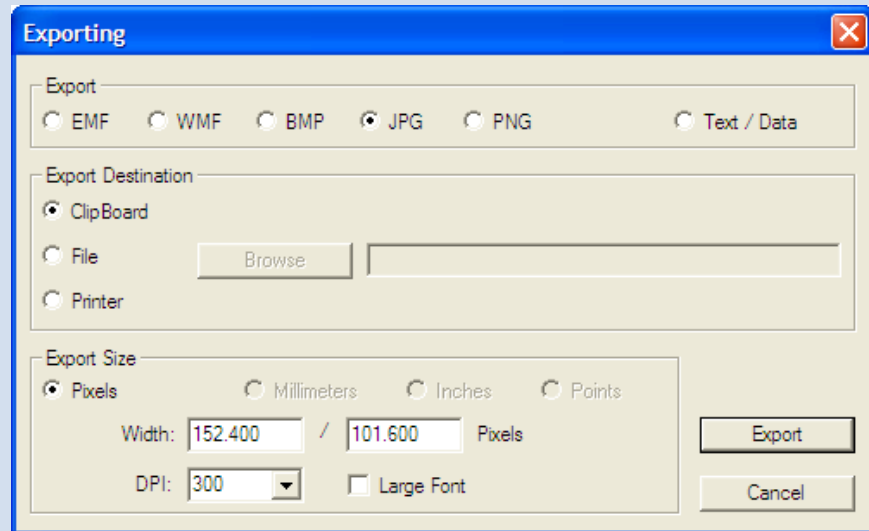● Pixels   ○ Millimeters   ○ Inches   ○ Points
       Width: [152.400]   /   [101.600]   Pixels   [Export]
       DPI: [300 ▼]   □ Large Font   [Cancel]

From the "Export" section at the top, select the export format for the graph. For example, if you would like to export the graph as a JPG file, click on the "JPG" radio box.

From the "Export Destination" section, select where you would like the graph to be exported to. For example, you can chose to export the graph to the Windows clipboard, to a file, or send it to the printer.

The options in the "Export Size" section will change based on the export format selected. For example, if JPG is selected as the export format, the "Export Size" section will allow you to enter the dimensions, in pixels, for the exported image size. These options are also affected by the export destination.

Click on the "Export" button (if exporting to the clipboard or a file) or the "Print…" button (if exporting to the printer) to complete the export process.
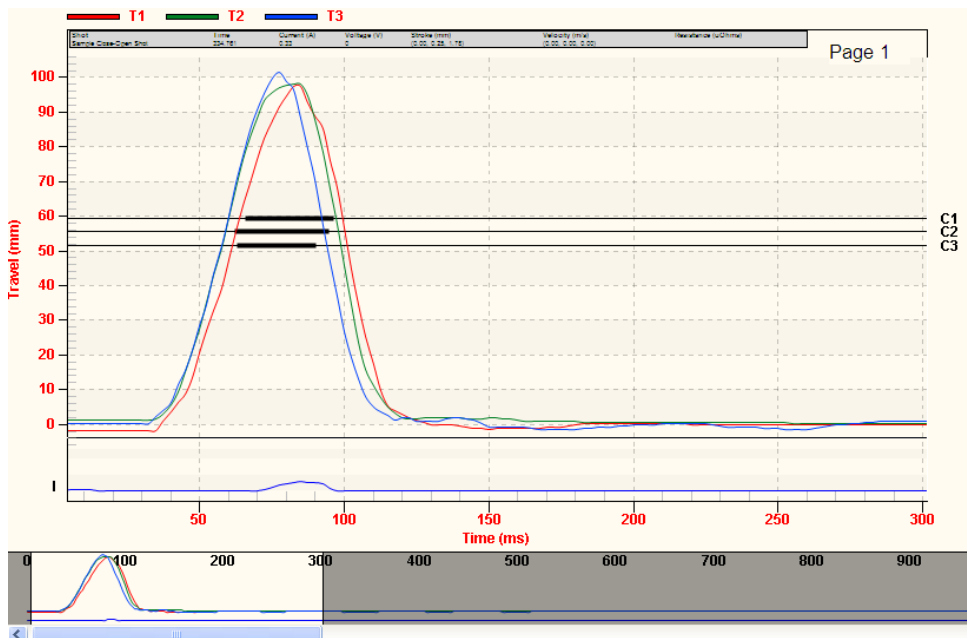
4.7   Viewing a Graph Expansion

You can expand a portion of the graphic test results for more accurate analysis. For example, if you want to view the graph expanded from 0ms to 300ms:

1.   Retrieve the test record that you would like to view.

2.   Move the cursor over the starting point on the graph (0ms). Click and hold down the left mouse button and drag the cursor to the right to the ending point (300ms). The selected section will be highlighted as shown below:

3.   Release the mouse button. An expanded graph of the selected region will be displayed as shown below:

When viewing a graph expansion, a smaller overall graph overview will be displayed at the bottom of the graph expansion. The area that is expanded will be highlighted in the overall graph. You can use the scroll bar at the bottom of the graph to navigate to other parts of the graph.

4. Click on the *UnZoom 1:1* icon in the *Graph* command group in the Command Ribbon to un-zoom and return to the full graph view.

4.8   Manually Calculating the Average Velocity

The VCBA S2 software offers a Manual Velocity feature that can be used to manually calculate the average velocity between two points. Follow the steps below to manually calculate velocity:
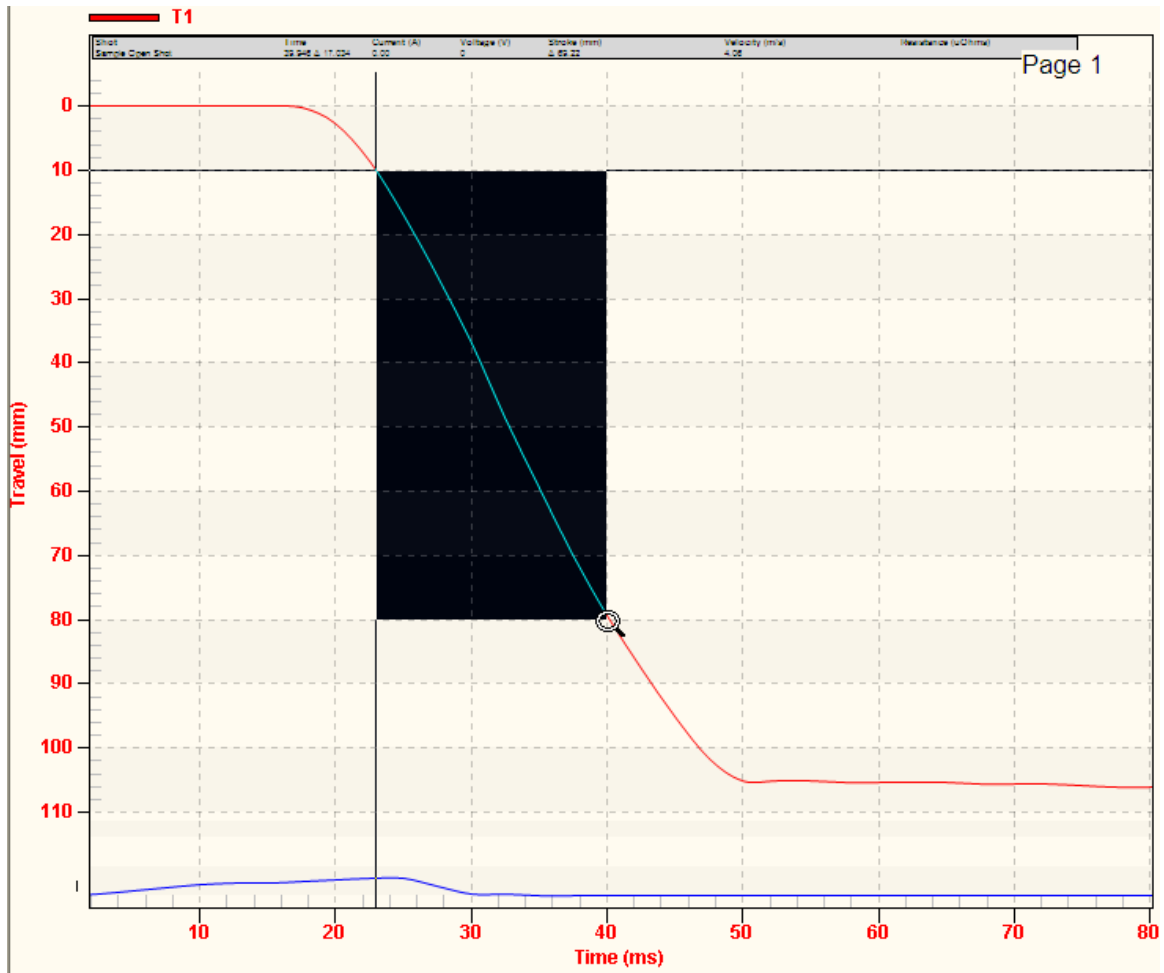
1. Check the "Manual Velocity" checkbox in the *Graph* command group in the Command Ribbon:
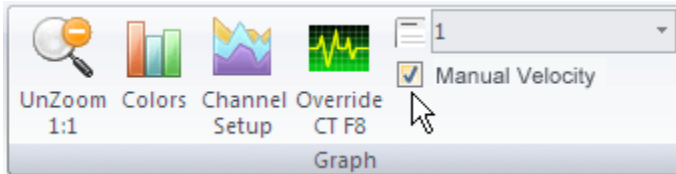
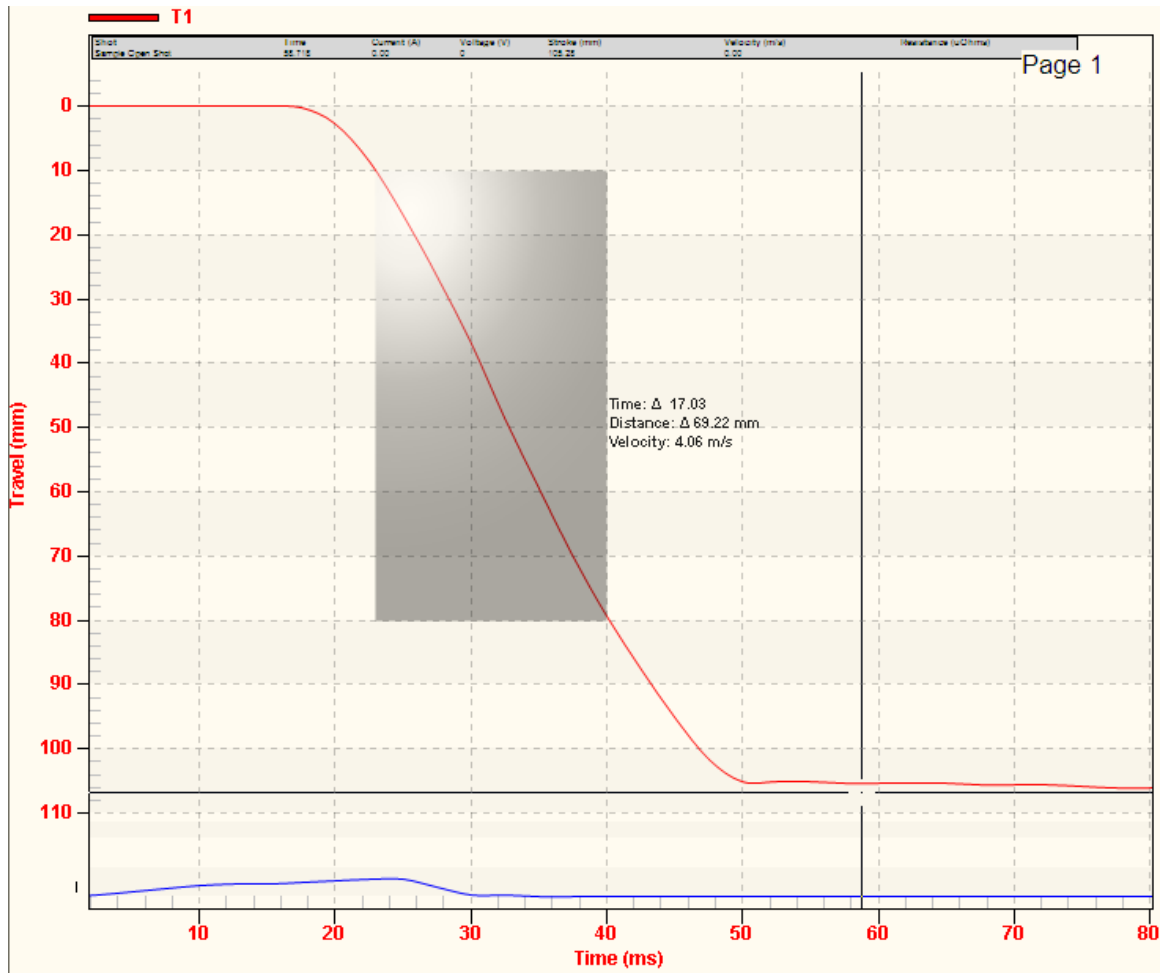2. Move the cursor to the first point on the graph as shown below:
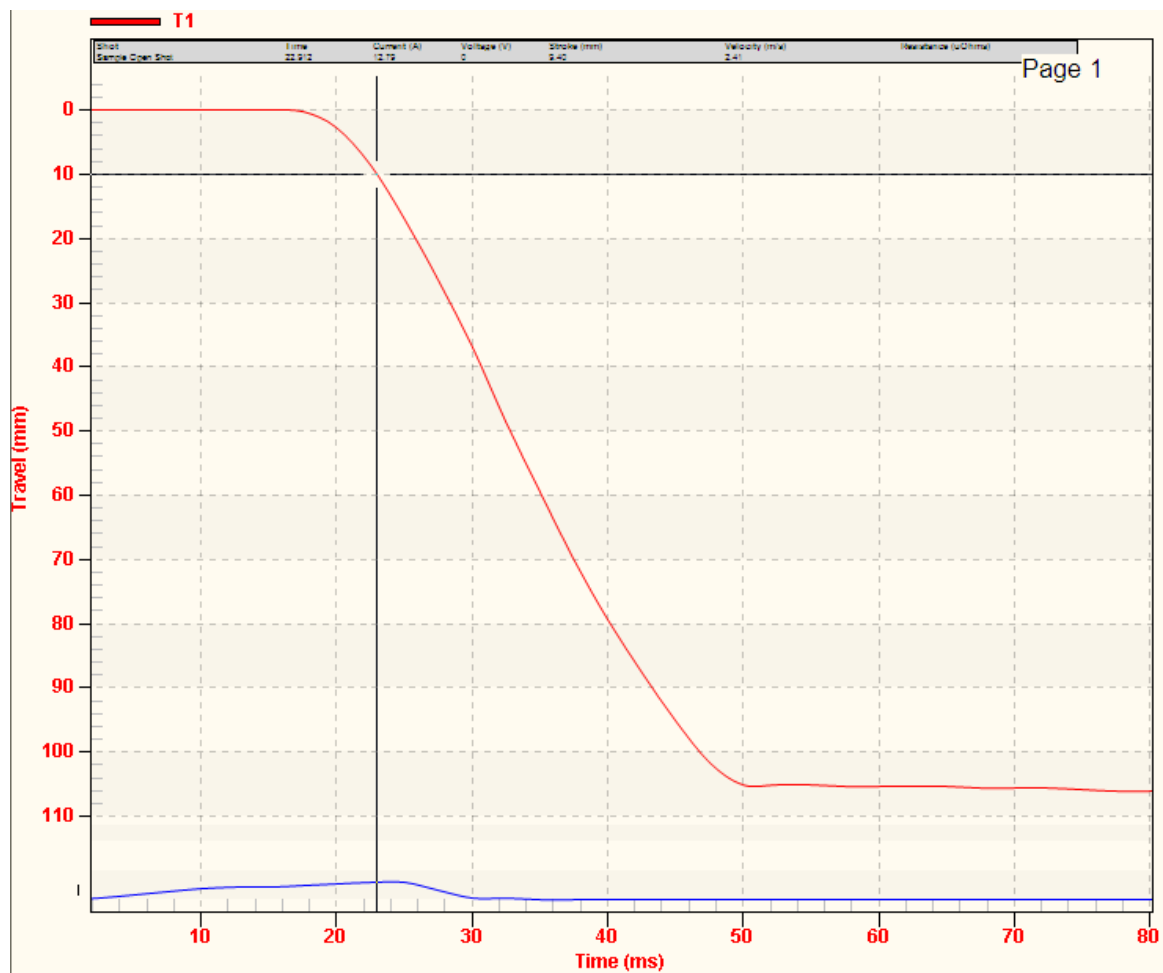
3. Left click and hold down the left mouse button. Drag to the second point on the graph. The selected area will be highlighted:

4. Release the mouse button. The value difference between the two points will be displayed on the graph:

5. Un-check the "Manual Velocity" checkbox in the *Graph* command group in the Command Ribbon.

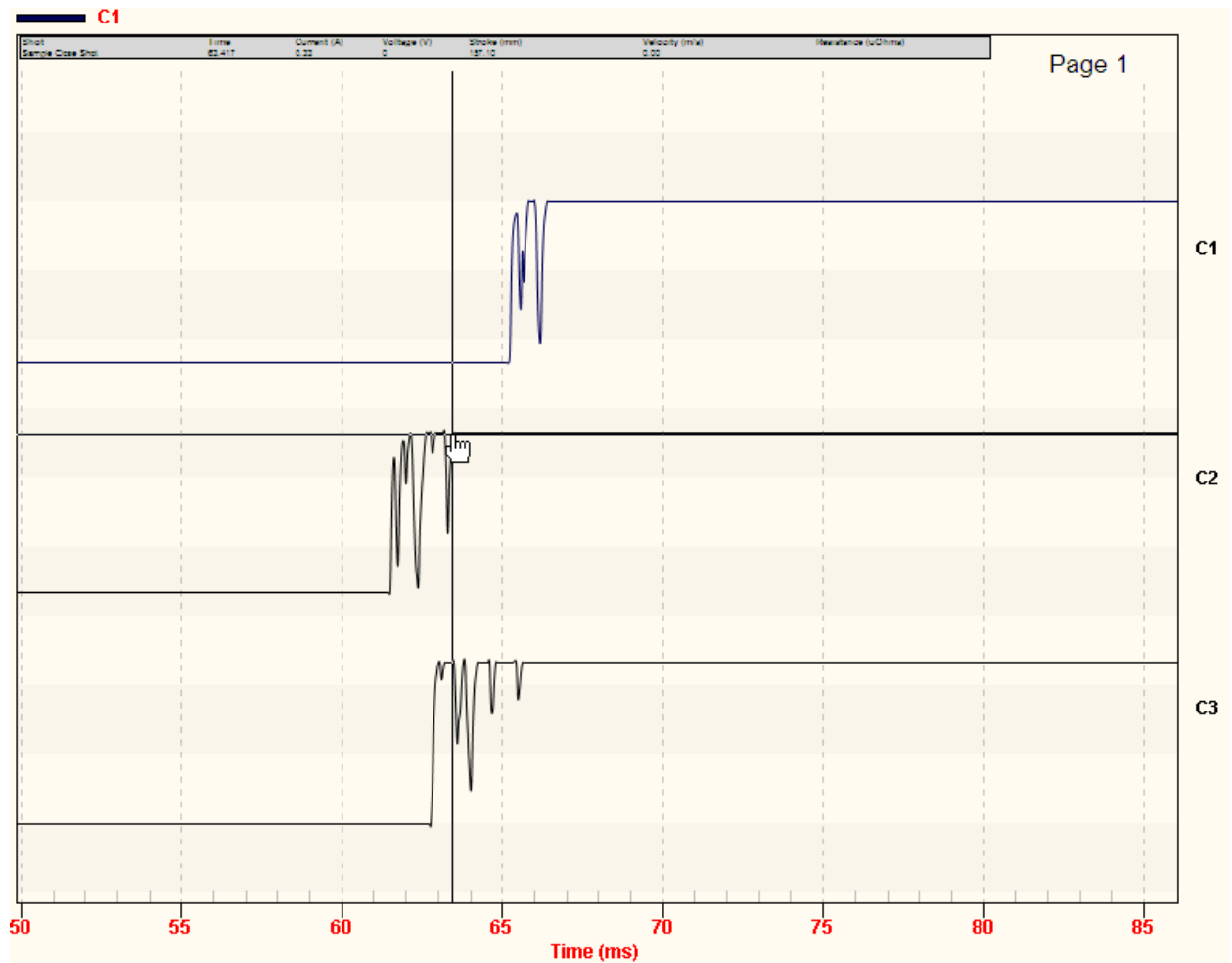### 4.9   Manually Overriding Contact Time/Resistor Contact Time or Contact Wipe

You can override the calculated Contact Time, Resistor Time, or Contact Wipe readings in the tabulated test results. This is a useful feature for situations where a manual calculation is preferred. For example, in the figure below, the calculated CLOSE time (61.600 ms) for channel 2 can be overridden with the preferred time (63.118 ms):
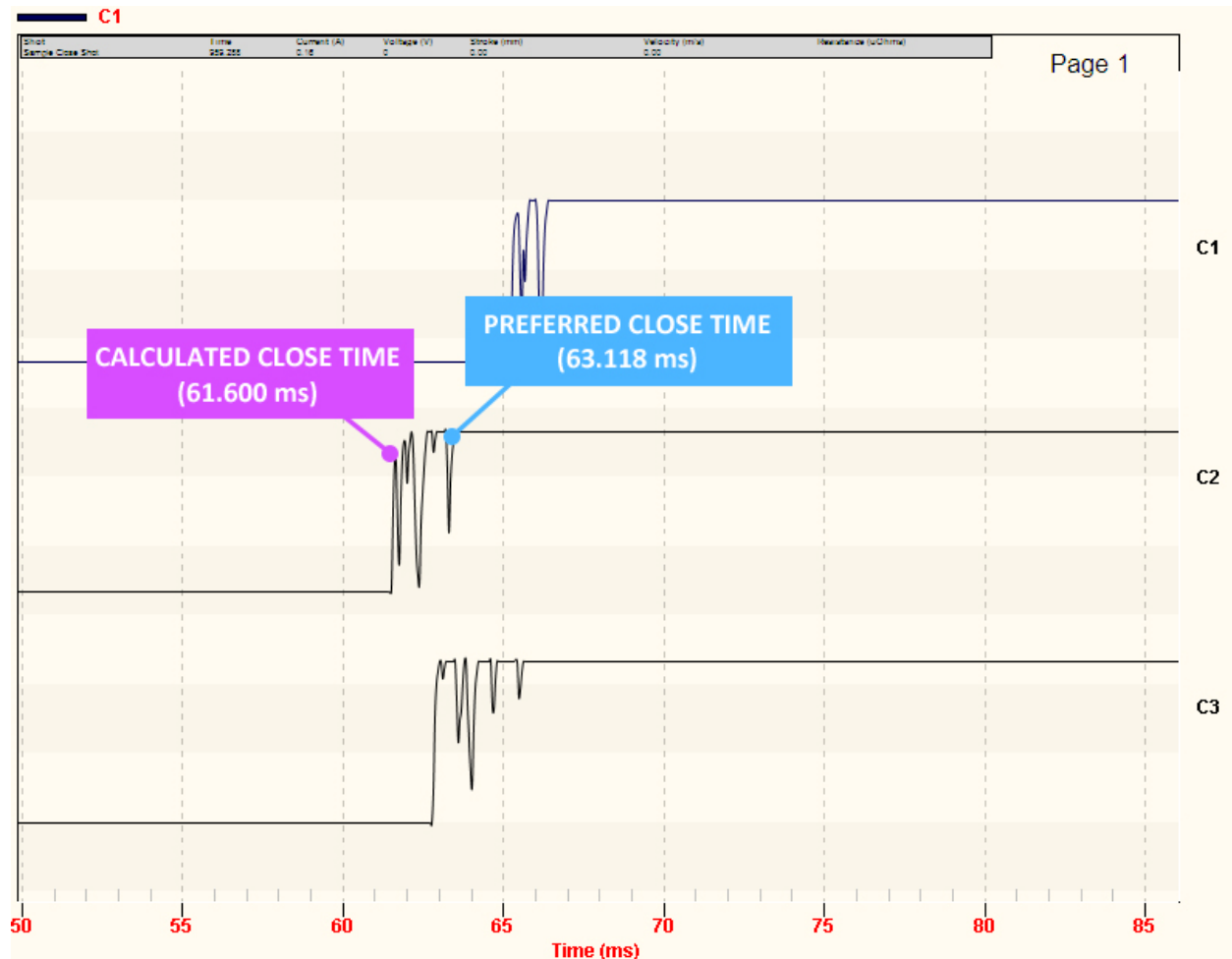
To override the calculated CLOSE time with the preferred time for the above example:

1. Move the cursor to the preferred time that you would like to use as the override value. For this example, the cursor is positioned at 63.118ms as shown below:

2. Press the **[F8]** key. The following window will be displayed:

3. Click on the "Contact:" dropdown list to select the contact you would like to override the values for. For the example above, we would like to override the CLOSE value for contact 2, so we will select 2 from the dropdown list. The values for contact 2 will be displayed as shown:

4. Click on the "Enable" checkbox next to each field that you would like to override with the value from the cursor position. The value from the cursor position will appear in the input area to the right of the calculated value. In this case, we would like to override the CLOSE value, so we will click on the "Enable" checkbox to the right of the "Close:" input

area. Once enabled, the value from the cursor position (63.118 ms) will be inserted in the input area as shown below:

5. Click on the "OK" button. The override value will be inserted in the tabulated test results. The value will be marked with an asterisk (*) to indicate that the calculated value was overridden:

The above method works well for simple tests such as an OPEN or CLOSE test. For more complex situations such as a CLOSE-OPEN test with an insertion resistor, you can manually input the override values. To manually input the override values:

1. Retrieve the test record that you would like to view.

2. Press the **[F8]** key.

3. The "Contact Override" windows will be displayed as in the previous example above. Select the contact number from the "Contact:" dropdown list.

4. Click on the "Enable" checkbox next to each value you would like to override for the selected contact, and then enter the override value in the input area to the left of the checkbox.

5. Click on the "OK" button and all enabled override values will be inserted in the tabulated test results.

4.10   Overlaying Two Timing Shots

You can graphically compare two timing shots on the screen by overlaying their graphs. This is a very useful feature for viewing a circuit breaker's operating condition. For example, test results from before and after breaker maintenance can be overlaid and compared. Follow the steps below to graphically overlay two timing shots.

1.   Click on the ***Overlay*** icon in the ***Test*** command group in the Command Ribbon.

2.   The following window will be displayed:
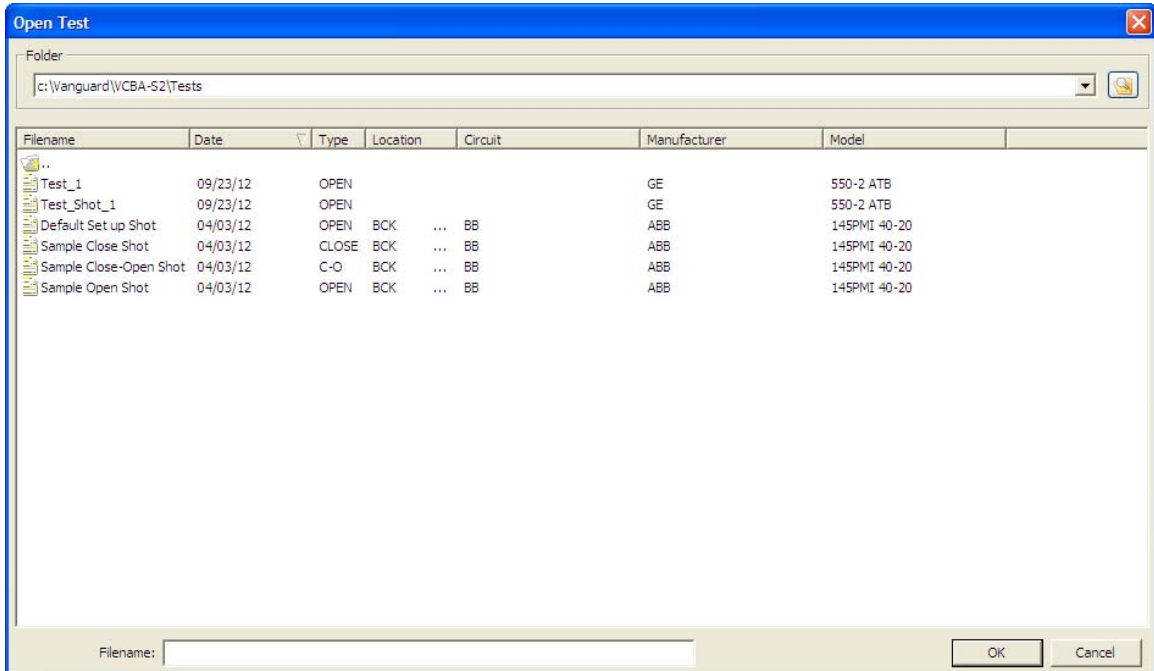
If the test records you would like to overlay are not located in the current folder, click on the folder icon at the top right of the window and locate the folder containing the test records.

3.   Select the first test record by clicking on the file name. Select the second test record by holding down the **[CTRL]** key and then clicking on the file name. Both file names will be highlighted.

4. Click on the "OK" button and the graphic test results will be displayed as shown below:


> You can customize the graph colors for each test shot by clicking on the **Settings** icon in the **Application** command group in the Command Ribbon. The Application Settings window will be displayed and you can select the color for each test shot from the "Graph and Overlay Settings" section.
>
> **NOTE**

4.11   Viewing the Test Report

Whenever a test record is loaded, the VCBA S2 generates a printable test report. To view the report, click on the *Report* icon in the *View* command group in the Command Ribbon. The test report will be displayed as shown below:
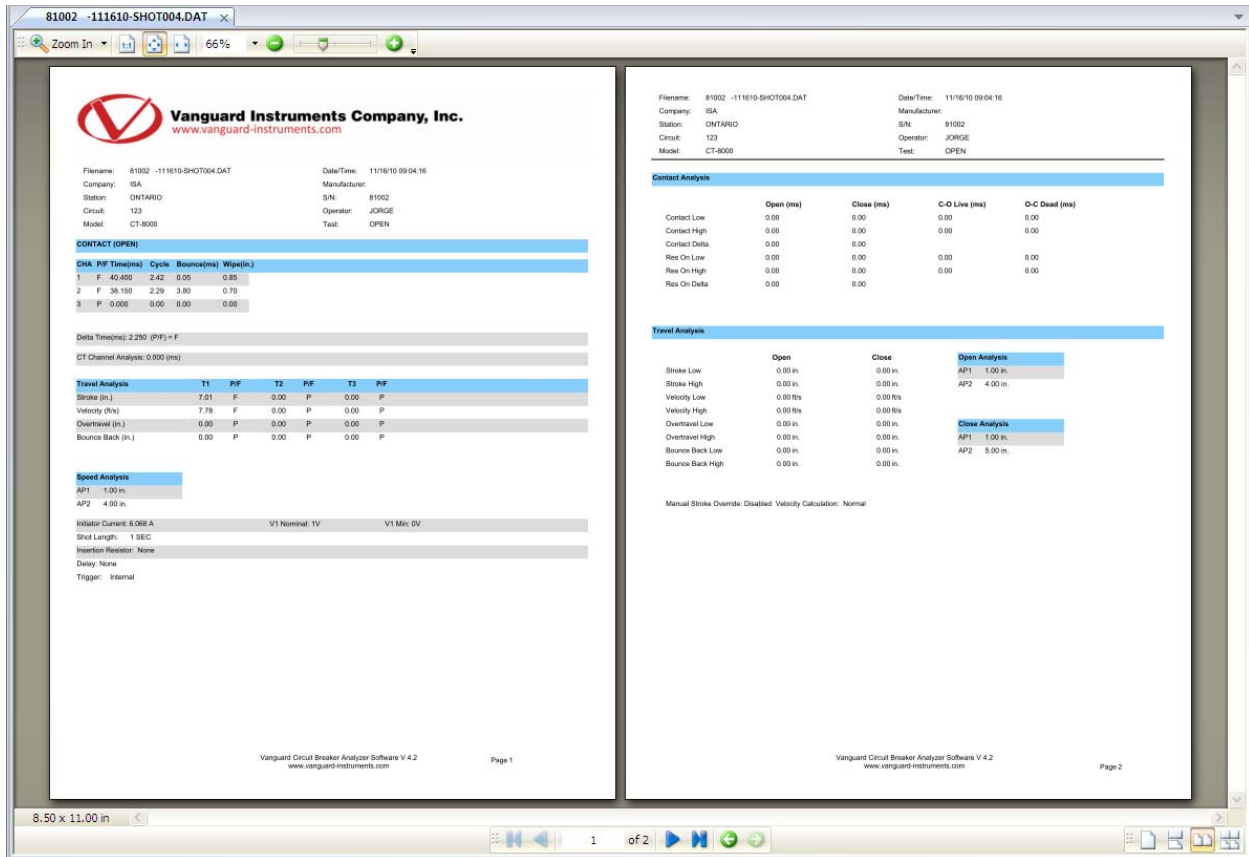
- To navigate to another page of the report, click on the page navigation icons at the bottom of the window:
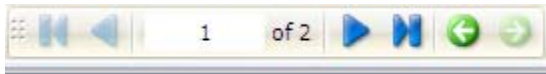
- You can zoom in and out of the report by using the pan and zoom controls at the top of the window:

- Click on the *Graph* icon in the *View* command group in the Command Ribbon to return to the graphic/tabulated view of the test record.

4.12   Printing Test Reports and Graphs

Test reports and graphs can be easily printed on a desktop printer. To print a test report or graph:

1. Click on the *VCBA S2 Menu Button*. Hover over the *Print* option. The following menu will be displayed:
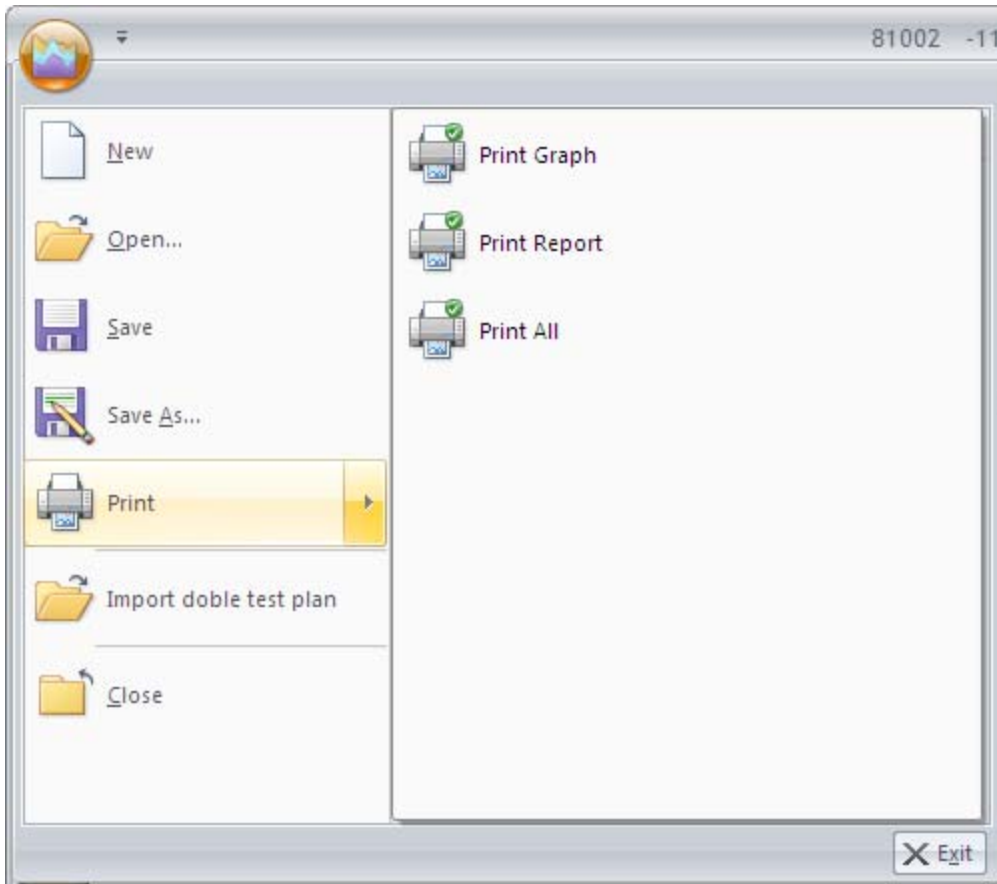
2. If you would like to print only the graph, click on *Print Graph*. To print just the test report, click on **Print Report**. To print both the graph and the report, click on **Print All**.

3. The "Print" window will be displayed as shown below: (the window will provide less options if printing just the graph).
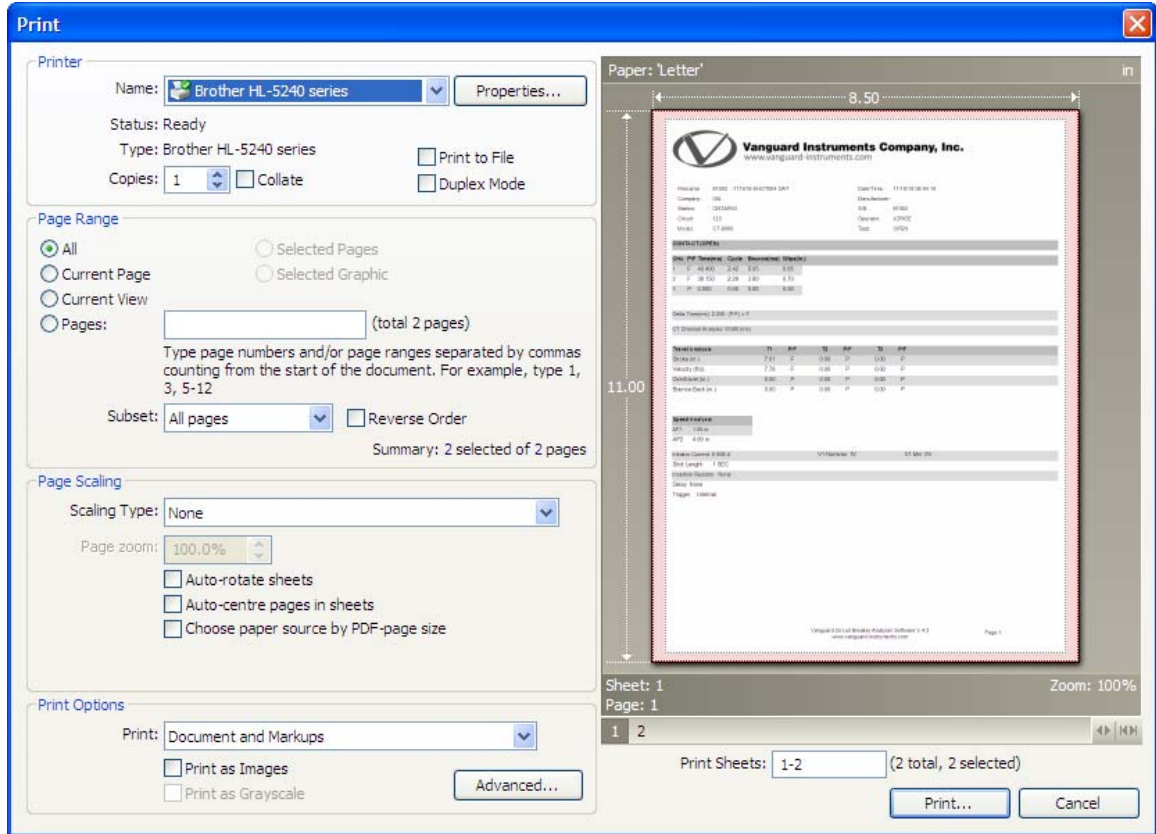
Select the printer you would like to print to and any relevant options and then click on the "Print..." button. The test report will be printed on the selected printer. A sample test report printout is shown in Figure 4 and Figure 5. A sample graph printout is shown in Figure 6.

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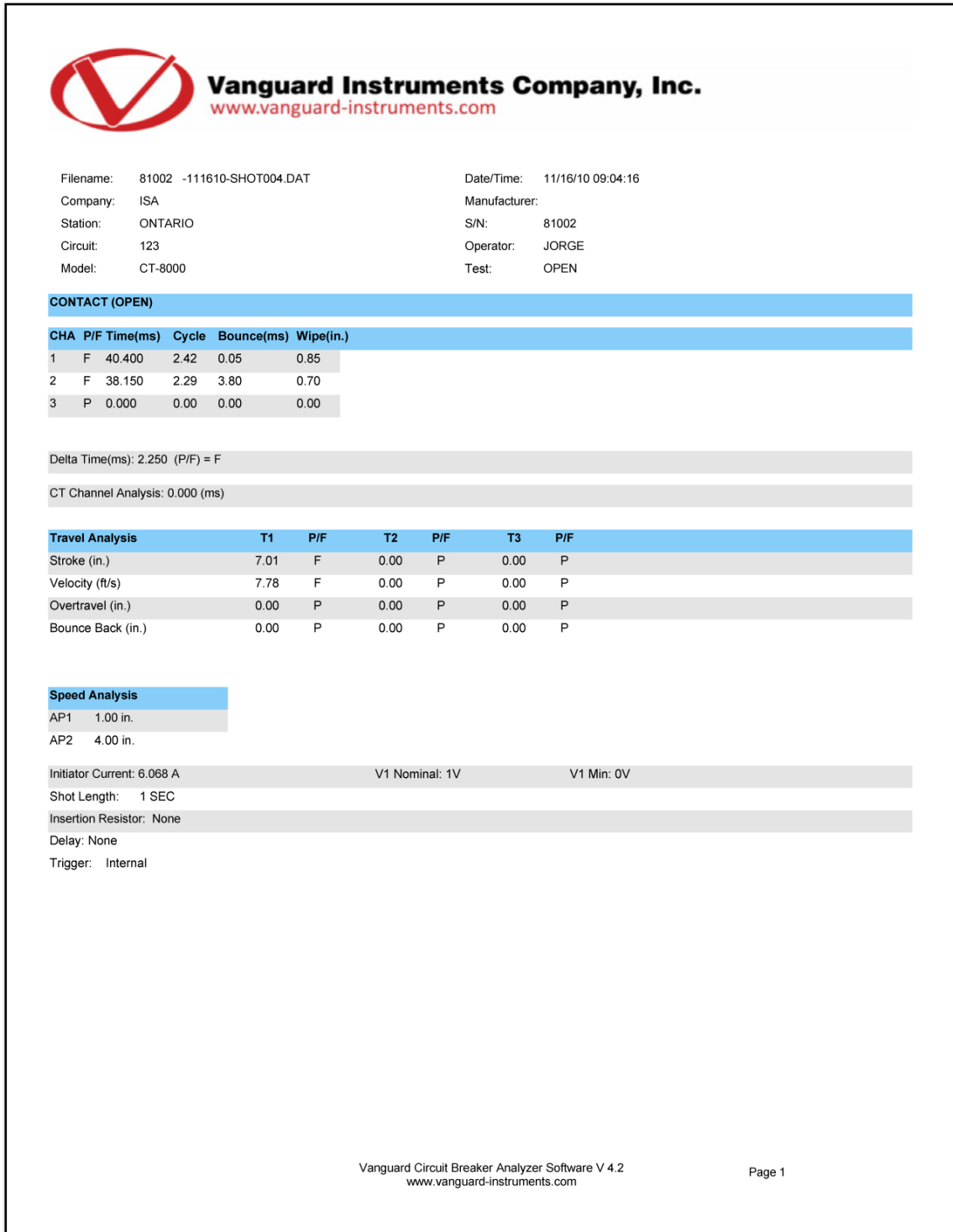| Filename:	81002 -111610-SHOT004.DAT		Date/Time:	11/16/10 09:04:16
Company:	ISA		Manufacturer:	
Station:	ONTARIO		S/N:	81002
Circuit:	123		Operator:	JORGE
Model:	CT-8000		Test:	OPEN

CONTACT (OPEN)

CHA	P/F	Time(ms)	Cycle	Bounce(ms)	Wipe(in.)
1	F	40.400	2.42	0.05	0.85
2	F	38.150	2.29	3.80	0.70
3	P	0.000	0.00	0.00	0.00

Delta Time(ms): 2.250 (P/F) = F

CT Channel Analysis: 0.000 (ms)

Travel Analysis	T1	P/F	T2	P/F	T3	P/F
Stroke (in.)	7.01	F	0.00	P	0.00	P
Velocity (ft/s)	7.78	F	0.00	P	0.00	P
Overtravel (in.)	0.00	P	0.00	P	0.00	P
Bounce Back (in.)	0.00	P	0.00	P	0.00	P

Speed Analysis	
AP1	1.00 in.
AP2	4.00 in.

Initiator Current: 6.068 A	V1 Nominal: 1V	V1 Min: 0V

Shot Length: 1 SEC

Insertion Resistor: None

Delay: None

Trigger: Internal

Vanguard Circuit Breaker Analyzer Software V 4.2
www.vanguard-instruments.com

Page 1

Figure 4. Sample Test Report Printout (Page 1)

Filename: 81002   -111610-SHOT004.DAT   Date/Time: 11/16/10 09:04:16

Company: ISA   Manufacturer:

Station: ONTARIO   S/N: 81002

Circuit: 123   Operator: JORGE

Model: CT-8000   Test: OPEN

Contact Analysis

	Open (ms)	Close (ms)	C-O Live (ms)	O-C Dead (ms)
Contact Low	0.00	0.00	0.00	0.00
Contact High	0.00	0.00	0.00	0.00
Contact Delta	0.00	0.00		
Res On Low	0.00	0.00	0.00	0.00
Res On High	0.00	0.00	0.00	0.00
Res On Delta	0.00	0.00		

Travel Analysis

	Open	Close
Stroke Low	0.00 in.	0.00 in.
Stroke High	0.00 in.	0.00 in.
Velocity Low	0.00 ft/s	0.00 ft/s
Velocity High	0.00 ft/s	0.00 ft/s
Overtravel Low	0.00 in.	0.00 in.
Overtravel High	0.00 in.	0.00 in.
Bounce Back Low	0.00 in.	0.00 in.
Bounce Back High	0.00 in.	0.00 in.

Open Analysis

AP1	1.00 in.
AP2	4.00 in.

Close Analysis

AP1	1.00 in.
AP2	5.00 in.

Manual Stroke Override: Disabled Velocity Calculation: Normal

Vanguard Circuit Breaker Analyzer Software V 4.2
www.vanguard-instruments.com

Page 2

**Figure 5. Sample Test Report Printout (Test Plan)**

Figure 6. Sample Test Graph Printout

4.13   Saving Test Records

**To save a test record with its current name in its current location:**

1. Click on the **VCBA S2 Menu Button**. (Alternatively you can click on the **Save** icon in the **Test** command group in the Command Ribbon).

2. Click on **Save** if you would like to save the test record with its current name in its current location. The following warning dialog box will be displayed:
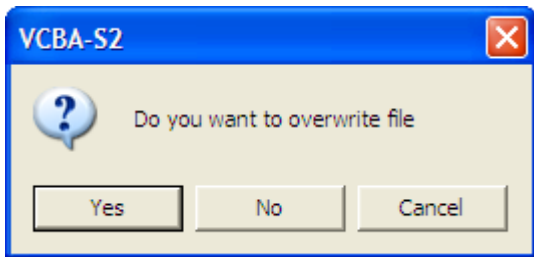
   Click on the "Yes" button to save the file.

To save a test record with a different name or to a different location:

1. Click on the **VCBA S2 Menu Button**.

2. Click on **Save As…** The following window will be displayed:
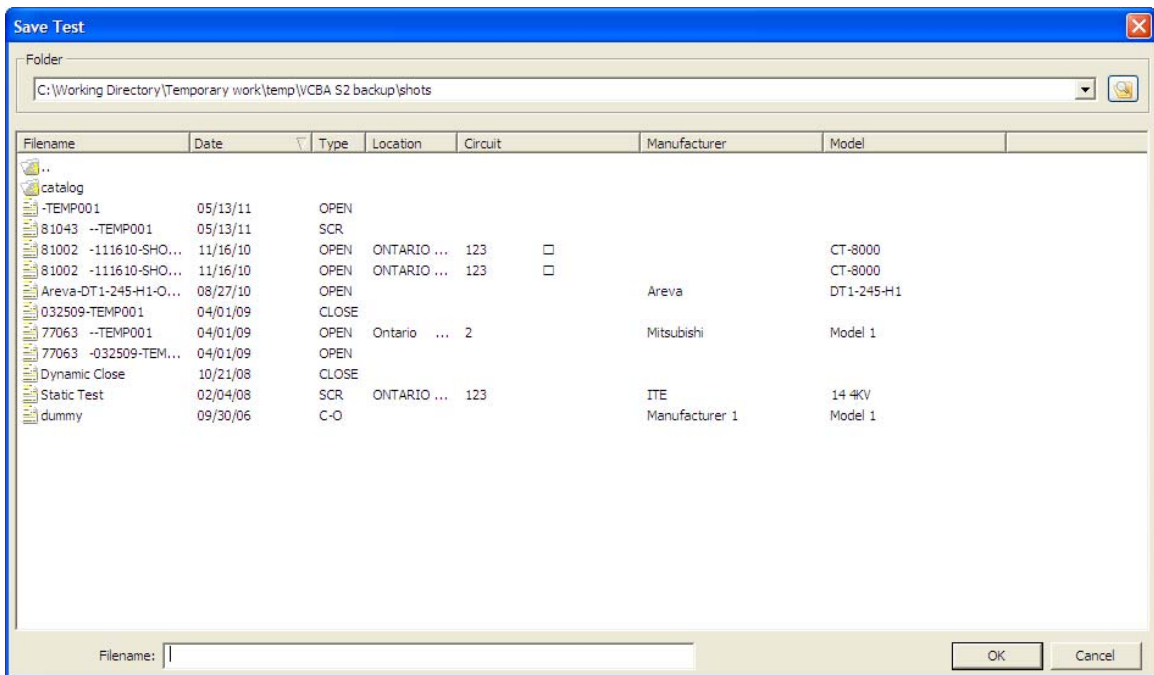
   If you want to save the test record to a different folder, click on the folder icon on the top right of the window and locate the desired folder.

   In the filename field, enter the filename that you would like for the test record. Click on the "OK" button. The test record will be saved with the new filename.

4.14 Merging Test Records

You can merge two test records to create a single test record. For example, you can combine two 6-channel timing shots to create a 12-channel timing shot. To merge two test records:

1. Click on the *VCBA S2 Menu Button*.
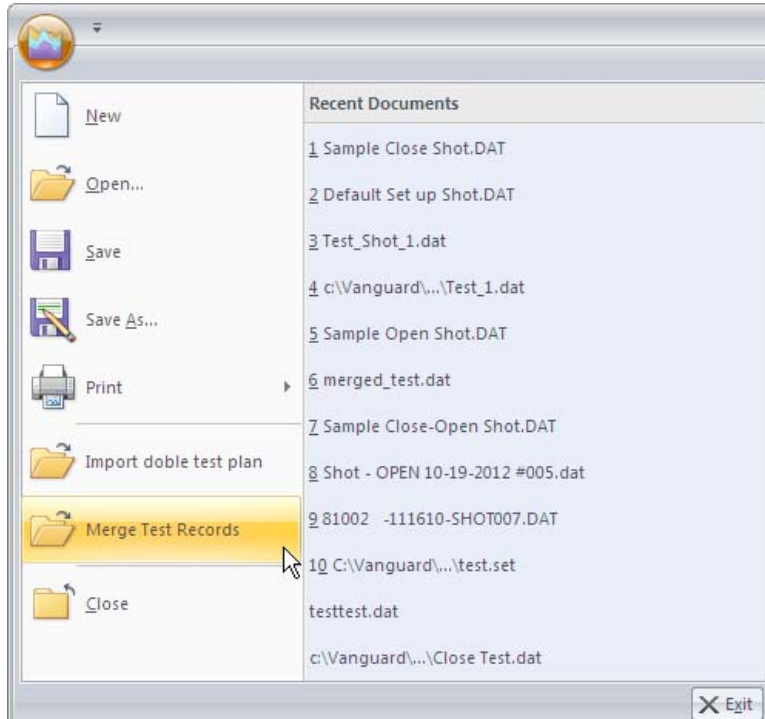
2. Click on *Merge Test Records*. The following window will be displayed:
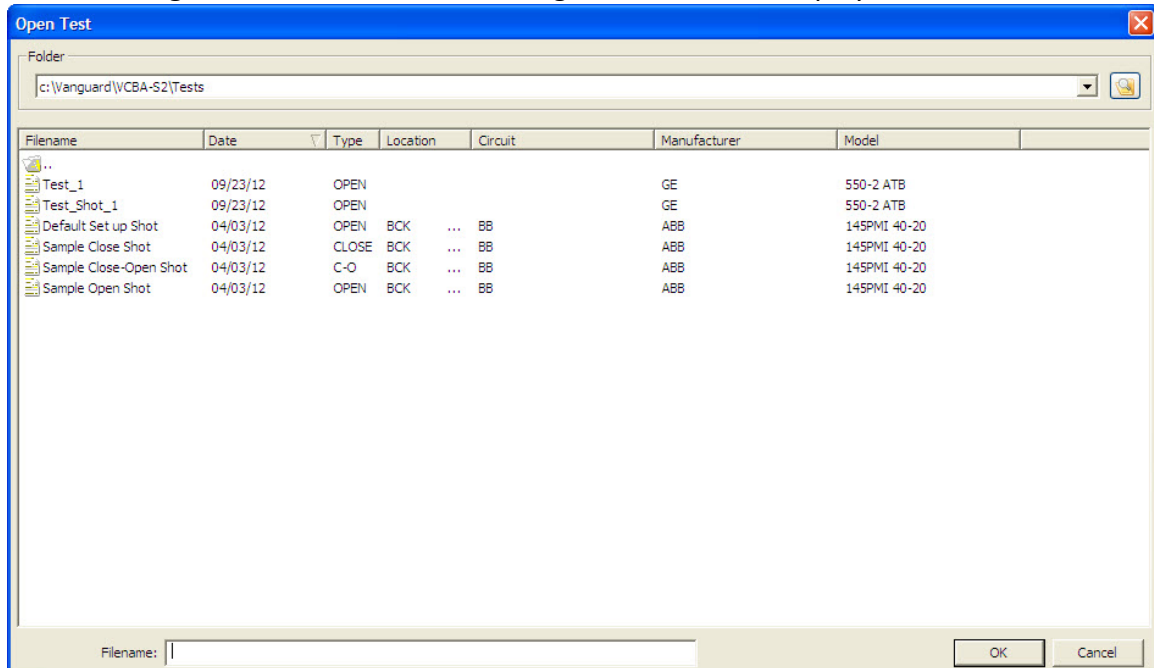
You can click on the file folder icon at the top right of the window to browse to the directory containing the test records to be merged. Once you have located the test records, click on the first file name to be merged and then hold down the **[CTRL]** key and click on the second file name. Click on the "OK" button.

> **NOTE** Both test records must be of the same type. For example, you cannot merge a CLOSE type test record with an OPEN type test record.

3. The following window will be displayed:
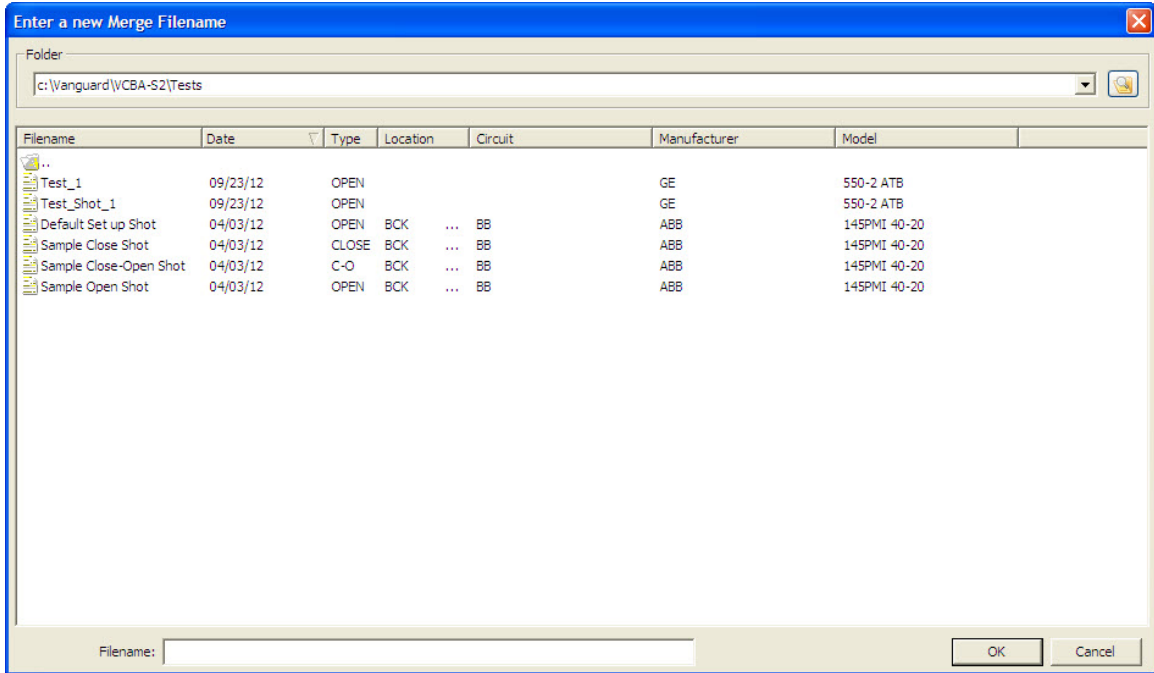
If you do not want to save the merged test shot in the directory shown, click on the folder icon at the top right of the window and locate the folder on your computer where you would like to save the merged test shot.

In the "Filename:" input field, type a name for the merged test shot file and click on the "OK" button.

4. The data from the two source test records will be merged and saved as the new file name. The merged test shot will be opened and displayed. The two source test records will not be modified in anyway.

4.15 Exporting Test Records

The VCBA S2 software can export test records in Excel, XML, and PDF formats. It can be configured to export to one or all of these formats automatically each time a test record is loaded and saved. You can also export a test record manually.

4.15.1. Setting Export Preferences

Before exporting test records, it's important to first select the preferred file format(s) for the export. To configure your export preferences:

1. Click on the **Settings** icon in the **Application** command group in the Command Ribbon. The following window will be displayed:

2. From the "Report and Export" section, check the boxes next to the formats that you would like the data to be exported to. In the example above, the PDF box is checked so whenever a test record is loaded or saved, it is also exported in PDF format. Also, if the test record is manually exported, it will be exported in PDF format.

> **NOTE**
> The exported PDF, Excel, and XML files are stored in subfolders named "Excel", "Pdf", and "Xml", respectively, within the folder where the original test record is stored. For example, if the original test record is stored in the folder "C:\Vanguard\VCBA-S2\Tests", the exported PDF file will be stored in the folder "C:\Vanguard\VCBA-S2\Tests\Pdf".

3. Click on the "OK" button to save your preferences.

4.15.2. Manually Exporting a Test Record

Although the VCBA S2 software can automatically export test records when they are loaded and saved, you can also export them manually. To export a test record manually:

1. Open the test record.

2. Click on the *Export* icon in the Test command group in the Command Ribbon. The following will be displayed while the file is being exported:
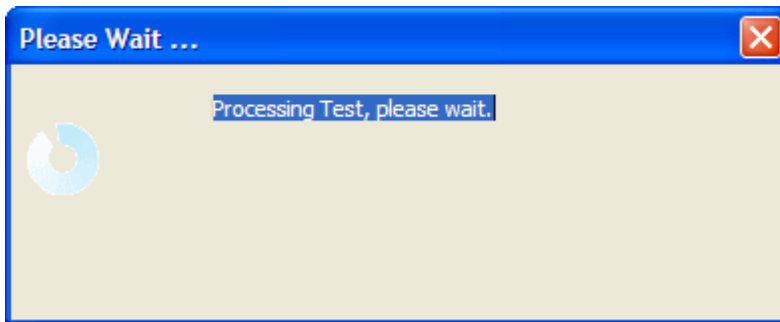
3. The exported file will be stored in a sub-folder where the original test record is stored. Please see section 4.15.1 for additional information.

4.16 Toggling the Resistor Flag

When performing a timing test on a circuit breaker with an insertion resistor, it's important to select the correct resistance value at the time the test is performed. If this value is not entered for some reason, the resistor contact time is not shown or is incorrectly obtained. However, this can be corrected using the VCBA S2 software. To set the resistor value for a test record:

1. Open the test record that you would like to view.

2. Click on the **Test Plan** icon in the *View* command group in the Command Ribbon.

3. The test plan for the test record will be displayed. From the "Contact Analysis" section of the test plan, select the correct resistor value from the "Resistor" drop down menu:

The VCBA S2 software will calculate the main contact time and the resistor contact time based on the resistance value selected.

4. Click on the "Apply Changes" button at the bottom of the test plan screen (you may need to scroll down the screen to see it).

5. Save the test record to store the resistor value permanently.

6. Click on the **Report** icon in the *View* command group in the Command Ribbon. The test report will be displayed. A new section will be added to the report displaying the resistor analysis values:

4.17 Viewing Raw Shot Data

The VCBA S2 software can be used to view the raw test record data. To view a dump of this data:

1. Open the test record that you would like to view.

2. Click on the **Dump Data** icon in the **Test** command group in the Command Ribbon.

    The following window will be displayed:
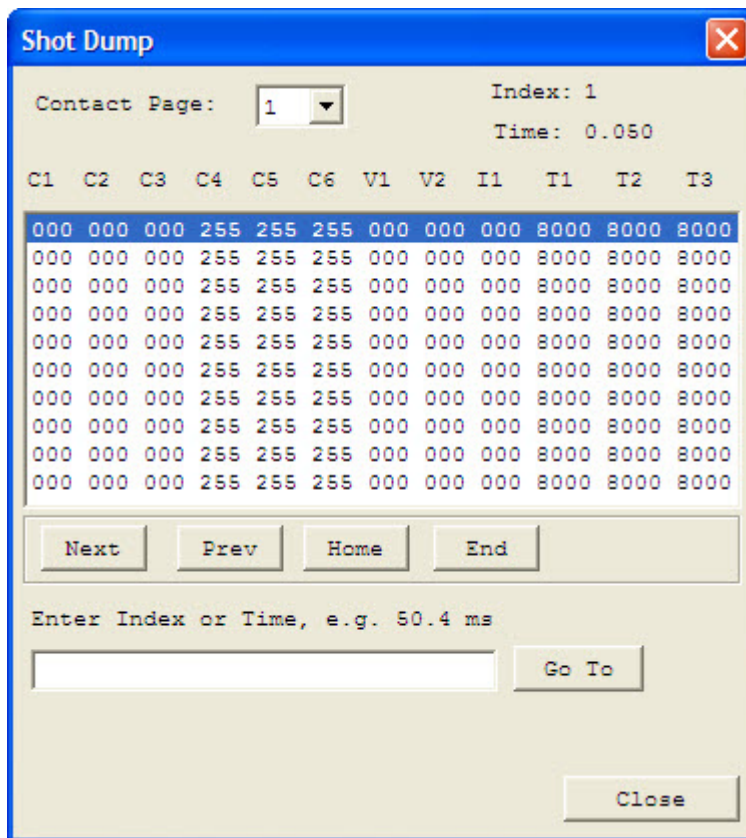
3. You can now browse the raw shot data by clicking on the navigation buttons at the bottom of the window. Click on the "Close" button to close the window.

5.0   WORKING WITH TEST PLANS

A circuit breaker test plan is comprised of all circuit-breaker performance specifications (stroke, velocity, and contact time). A test plan can be used to test a circuit breaker. When used with a test record, a Pass/Fail report is generated by comparing the actual performance of the breaker with the specifications in the stored test plan. Test plans can be easily created with the VCBA S2 software and can be stored on the hard drive or transferred to a CB analyzer.

5.1   Saving the Test Plan from a Test Record

The VCBA S2 software can be used to create a new test plan, but sometimes it is faster to extract the test plan from an existing test record. Follow the steps below to save the test plan from an existing test record to a separate test plan file for future use:

1. Open the test record that contains the test plan that you would like to extract.

2. Click on the *Export Plan* icon in the *Test Plan* command group in the Command Ribbon. The following window will be displayed:
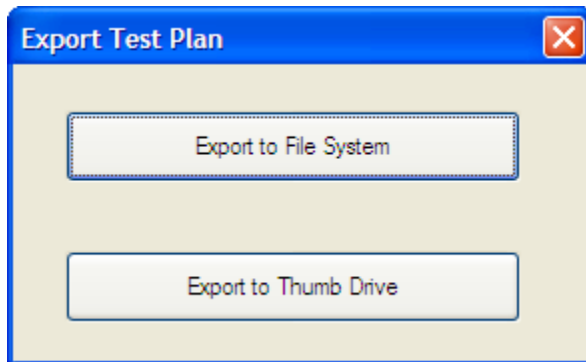
> If you would like to use the test plan to run tests from the PC using the VCBA S software, continue to step 3.

> If you would like to copy the test plan to a thumb drive so that it can be used to run tests directly on a supported Vanguard Circuit Breaker Analyzer, continue to step 4.

3. Click on the "Export to File System" button. The following window will be displayed:
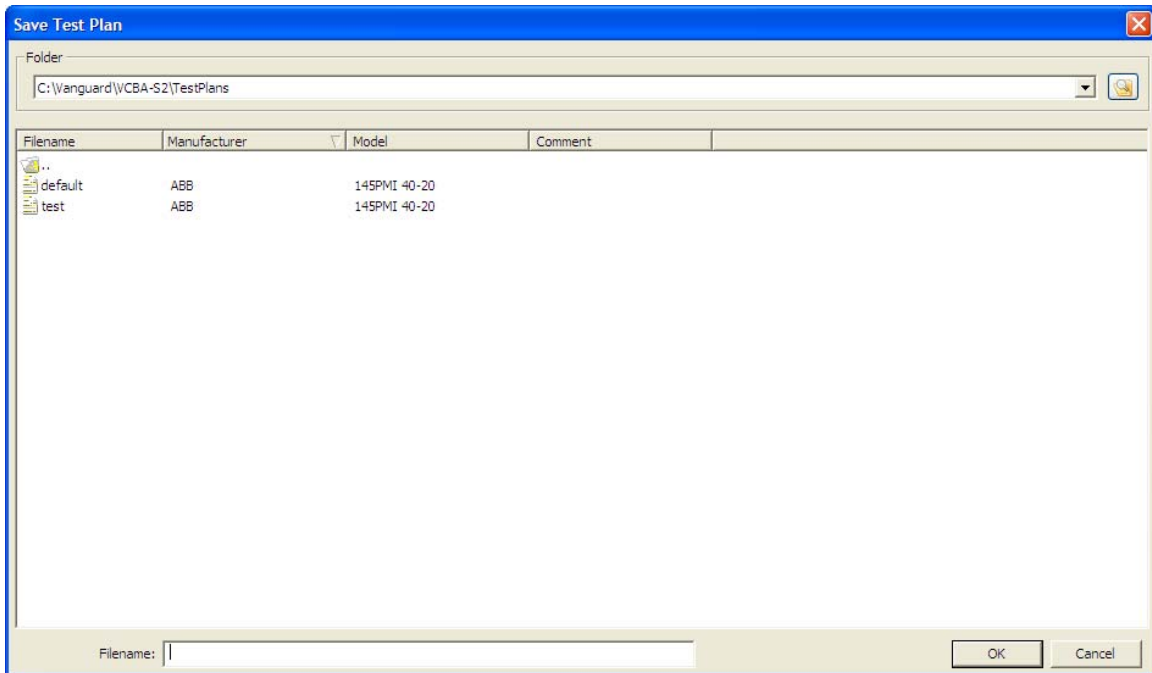
The "Folder" section at the top of the window displays the current folder where the test plan will be saved to. If you would like to save the test plan in a different folder, click on the folder icon at the top right of the window and then navigate to the desired folder.

Enter a filename for the test plan in the "Filename:" input field and then click on the "OK" button. The test plan will be saved and can be used later to perform tests.

> **NOTE**
>
> Test plans exported to the file system will have the ".set" file extension. For example, if you had named the file "test plan 1", the complete file name will be "test plan 1.set".

4. Click on the "Export to Thumb Drive" button. The following window will be displayed:
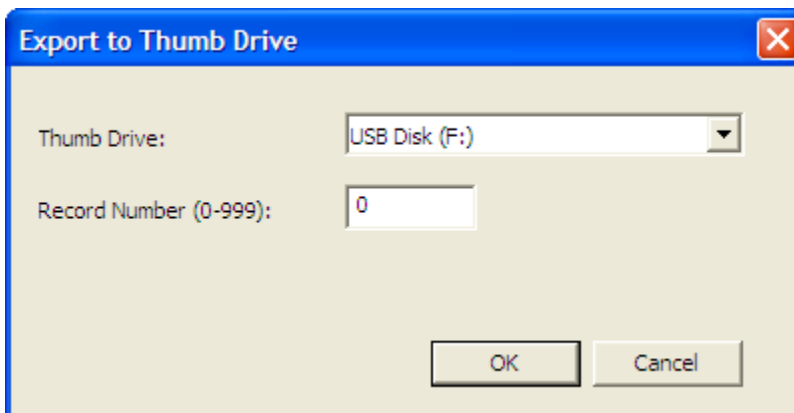
Click on the "Thumb Drive" dropdown list and select the thumb drive connected to your PC. In the "Record Number" field, enter the number that you would like to assign the

test plan. Click on the "OK" button. The test plan will be saved to the thumb drive. You can now connect the thumb drive to a supported Vanguard Circuit Breaker Analyzer and load the test plan in the unit to perform tests (please see the Circuit Breaker Analyzer's User's Manual for details).

Test plans saved to a flash drive will have a filename in the format "PLAN_xxx" where xxx is the record number.

NOTE

5.2   Creating a New Circuit Breaker Test Plan

To create a new circuit breaker test plan, click on the **New** icon in the **Test Plan** command group in the Command Ribbon. The following window will be displayed:

> You may need to scroll down to see all of the options.
>
> **NOTE**

5.2.1. Shot Information Section

Enter common header information in the "Shot Information" section of the test plan. This information includes identifying information such as the company name, station ID, circuit, etc. You can also enter comments about the test plan in this section.

5.2.2. Contact Analysis Section

In this section, you can define the Open, Close, Close-Open, and Open-Close contact analysis parameters.

NOTES

- Contact Low is the fastest time of the circuit breaker main contacts.
- Contact High is the slowest time of the circuit breaker main contacts.
- Contact Delta, also known as Contact Spread, is the maximum time between the fastest and slowest contact time.
- Resistor On Low is the fastest time of the circuit breaker insertion-resistor contacts.
- Resistor On High is the slowest Time of the circuit-breaker insertion-resistor contacts.
- Resistor On Delta is the maximum time between the fastest and slowest resistor contact time.

5.2.3. Travel Analysis Section

The "Travel Analysis Section" can be used to define the breaker's Open and Close stroke, velocity, over-travel, and bounce-back limits.

NOTES	• Stroke Low is the minimum distance of contact travel.
	• Stroke High is the maximum distance of contact travel.
	• Velocity Low is the minimum contact opening velocity.
	• Velocity High is the maximum contact opening velocity.
	• Overtravel Low is the contact travel distance above the Open or Close position and is usually zero.
	• Overtravel High is the maximum contact distance travel above the Open or Close position.
	• Bounce Back Low is the minimum contact distance travel under the Open or Close position and is usually set to zero.
	• Bounce Back High is the maximum contact distance travel under the Open or Close position.

Open Analysis Point

| Point #1 | % of Stroke | 25 | % |
| Point #2 | % of Stroke | 50 | % |

Close Analysis Point

| Point #1 | % of Stroke | 25 | % |
| Point #2 | % of Stroke | 50 | % |

Open and Close analysis points can also be defined in this section.

NOTES

- Contact Point #1 is the distance from the fully closed position to the position when contact #1 opens.

- Percentage of Stroke is the distance from the fully closed position to the second analysis point represented as percentage of the total stroke distance.

- Distance from Close is the user-defined distance from the fully closed position to the first analysis point.

- Contact #1 + Time is the time to add to Contact #1's Open position time. This new position defines an analysis point to calculate velocity.

- Contact #1 – Time is the time to subtract from Contact #1's Open position time. This new position defines an analysis point to calculate velocity.

Measure Unit: English   Manual Override Disabled

The VCBA S2 software supports both Metric and English units. The units of measure can be set from the "Measure Unit" dropdown list in this section.

The "Manual Override" option can be used to select a velocity calculation formula.

NOTES

- Manual Stroke allows the user to define a scaling factor for the velocity calculation. If the stroke is measured as 5 inches by the travel transducer, using a manual stroke of 10 inches will scale the velocity calculations as a 2-to-1 ratio.

- V = C / Time(AP1 to AP2): Velocity is calculated by a user-defined constant divided by the time (in milliseconds) between analysis point #1 and analysis point #2.

- V = C * Dist(AP1 to AP2) / Stroke: Velocity is calculated by a user-defined constant multiplied by the distance between analysis point #1 to analysis point #2, then divided by the breaker's stroke. This formula is often used to calculate velocity in the new Siemens SPS or TPC breakers.

- V = C / Delta T: Velocity calculation is defined by constant C divided by a constant Delta T.

- Disabled: No formula is used.

5.2.4. Display Setup Section
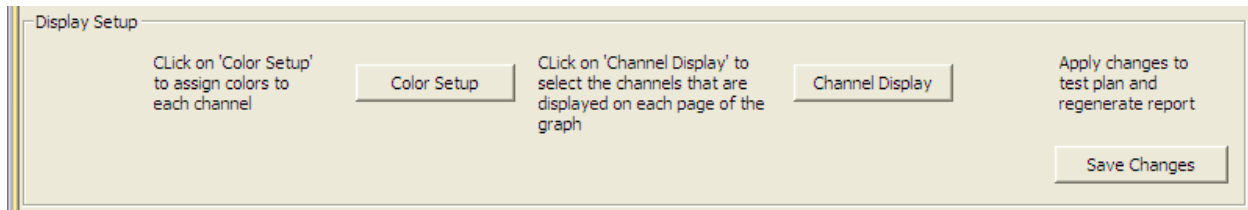
Click on the "Color Setup" button to select the colors used for displaying each channel on the graph. Please see section 4.6.1 for additional information.

Click on the "Channel Display" button to select what channels should be displayed on each graph page. Please see section 4.5 for additional information.

Click on the "Save Changes" button to save your changes. The following window will be displayed:
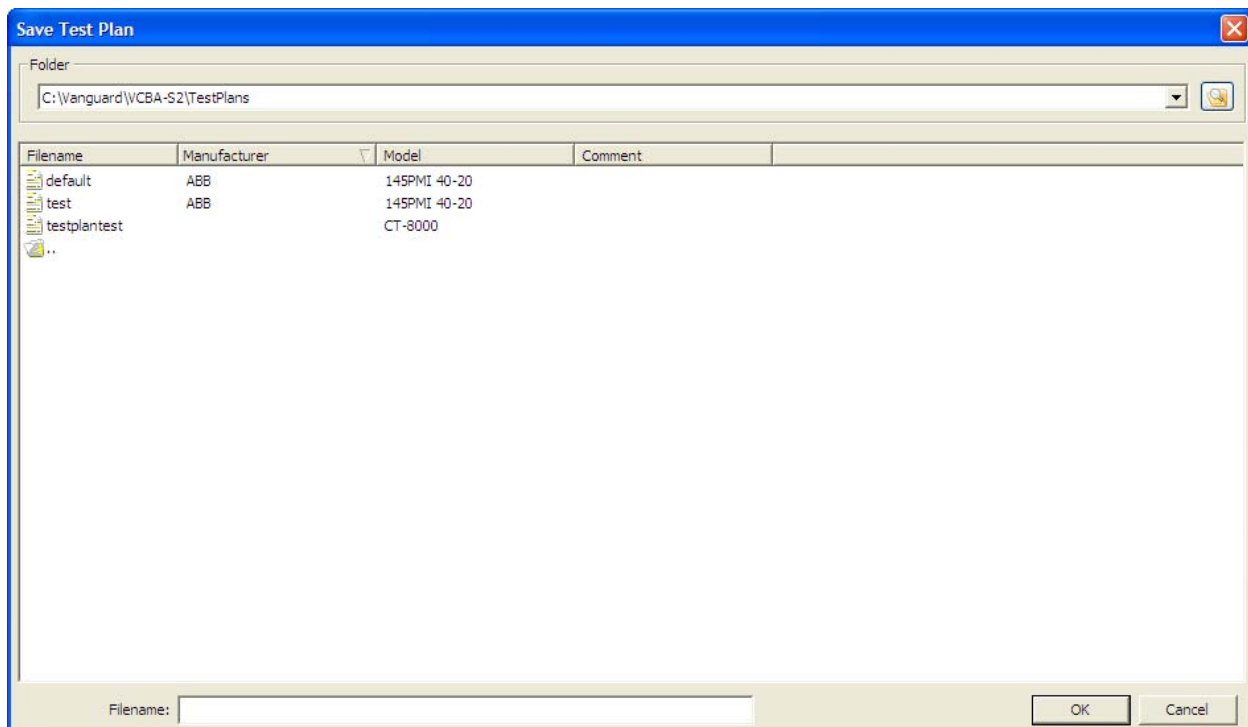
The "Folder" section at the top of the window displays the current folder where the test plan will be saved to. If you would like to save the test plan in a different folder, click on the folder icon at the top right of the window and then navigate to the desired folder.

Enter a filename for the test plan in the "Filename:" input field and then click on the "OK" button to save the test plan.

5.3   Modifying an Existing Circuit Breaker Test Plan

To modify an existing test plan, click on the ***Modify Plan*** icon in the ***Test Plan*** command group in the Command Ribbon. The following window will be displayed:
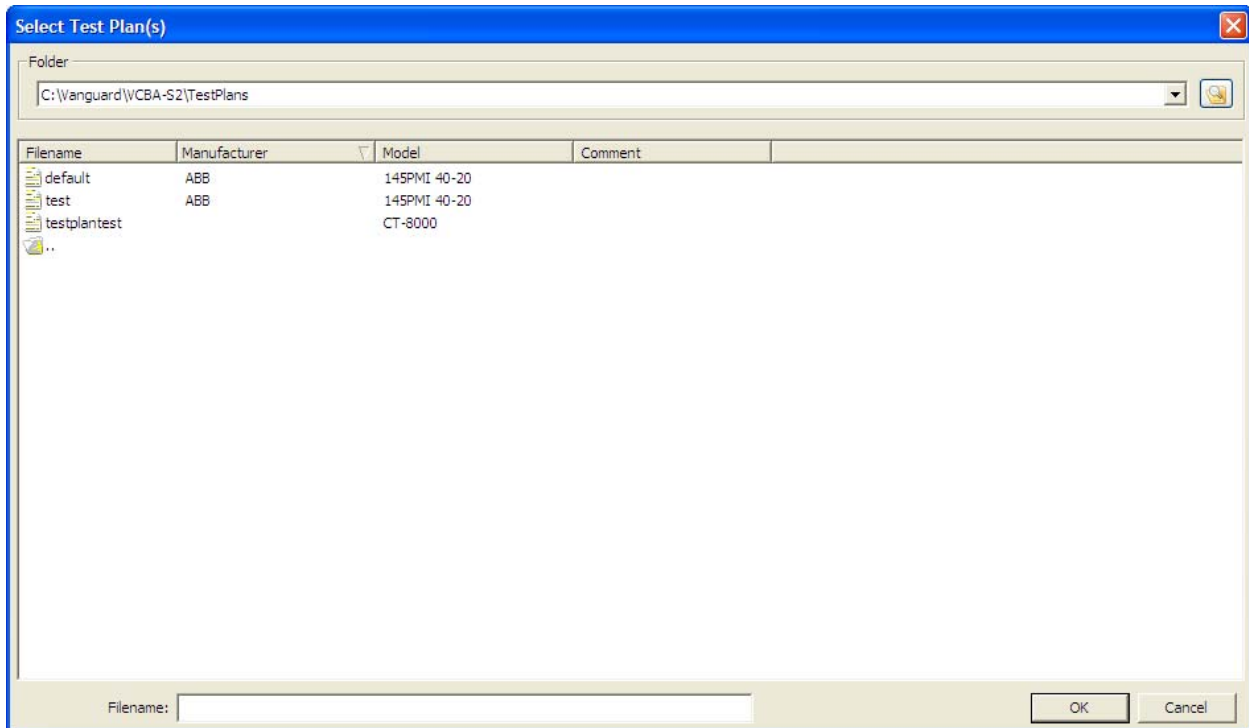
You can retrieve an existing test plan from the hard drive by clicking on the folder icon at the top right of the window and navigating to the folder that contains the test plan. Once you have selected the folder, any test plans in that folder will be listed below the "Folder" section. Click on the test plan filename to select it, and then click on the "OK" button.

The test plan will be loaded and the parameters will be displayed as shown below:

Make any necessary changes to the test plan (see section 5.2), and then click on the "Save Changes" button to save your changes. If you do not want to overwrite the existing test plan file and would prefer to save the test plan to a new file, click on the *Export Plan* icon in the *Test Plan* command group in the Command Ribbon (see section 5.1).

5.4   Retrieving a Test Plan from a Circuit Breaker Analyzer

To retrieve a test plan from a CB analyzer:

1. Make sure the VCBA S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port.

2. The CB analyzer should enter Computer Interface Mode.

3. Click on the **Download from Device** icon in the **Test Plan** command group in the Command Ribbon.

4. The following window will be displayed:
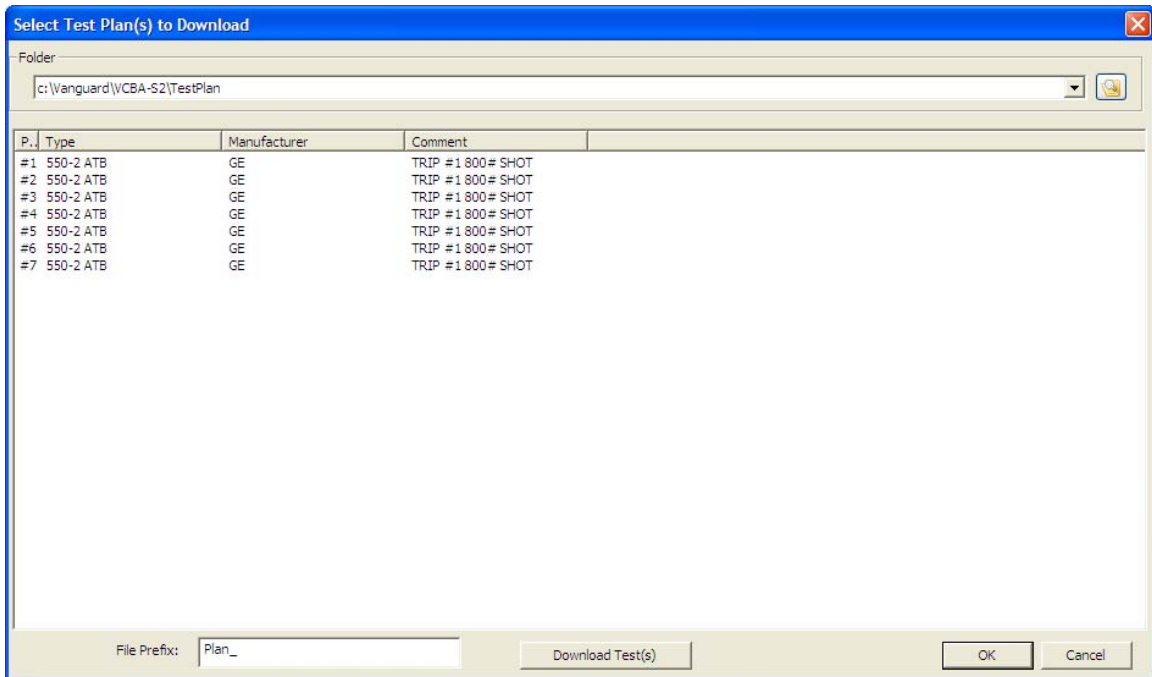
The "Folder" area displays the location where the retrieved test plans will be stored. If you would like to store the test plans in a different folder, click on the folder icon at the top right of the window and locate the folder on your computer.

From the list of test plans, click on the test plan that you would like to retrieve. You can select multiple test plans by holding down the **[CTRL]** key and clicking on each file name.

In the "File Prefix" input field, you can enter a prefix for the filenames. By default, the prefix will be "Plan_", so a test plan retrieved will be saved as "Plan_n.set" on your computer (where n is the plan number).

Click on the "Download Test(s)" button to retrieve the selected test plans from the connected Vanguard Circuit Breaker Analyzer and save them to the selected folder on your computer.

5.5   Transferring a Test Plan to a Circuit Breaker Analyzer

To transfer a test plan from the PC to a connected circuit breaker analyzer:

1. Make sure the VCBA-S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port.

2. The CB analyzer should enter Computer Interface Mode.

3. Click on the *Upload to Device* icon in the *Test Plan* command group in the Command Ribbon.

4. The following window will be displayed:
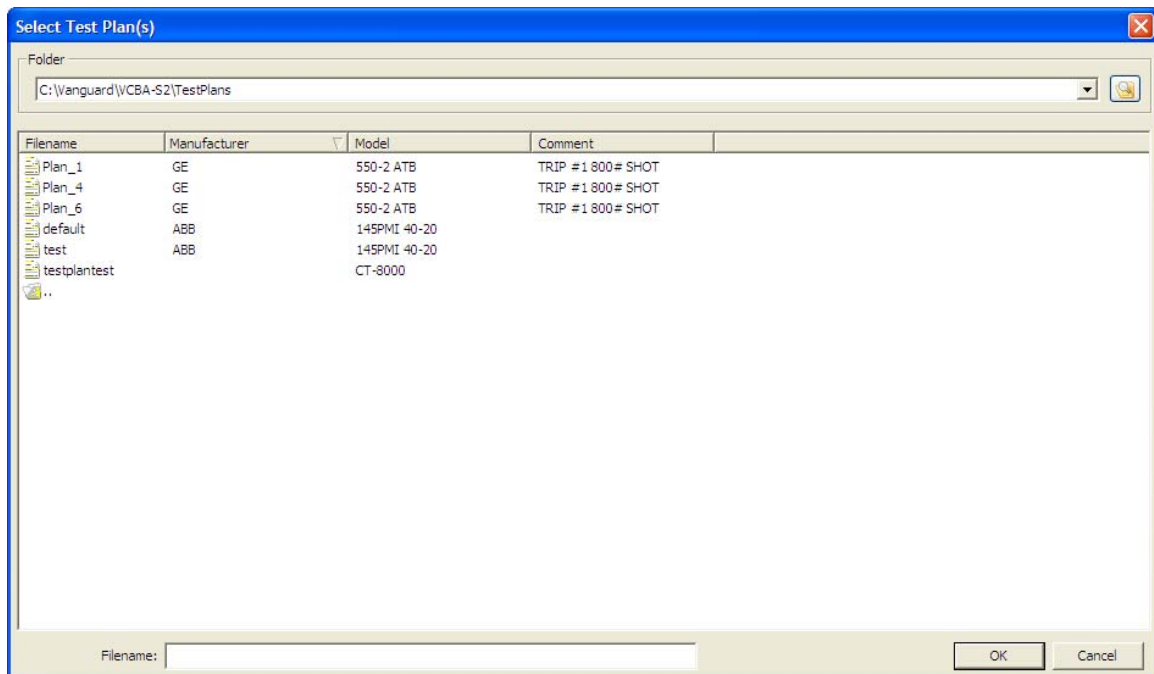
The "Folder" section displays the location of the default test plan folder. If your test plans are located in a different folder, click on the folder icon at the top right of the window and navigate to the folder containing your test plans.

From the list of test plan files, click on the filename that you would like to transfer to the connected CB analyzer. You can select multiple files by holding down the **[CTRL]** key and clicking on each filename.

Click on the "OK" button.

5. The following window will be displayed:
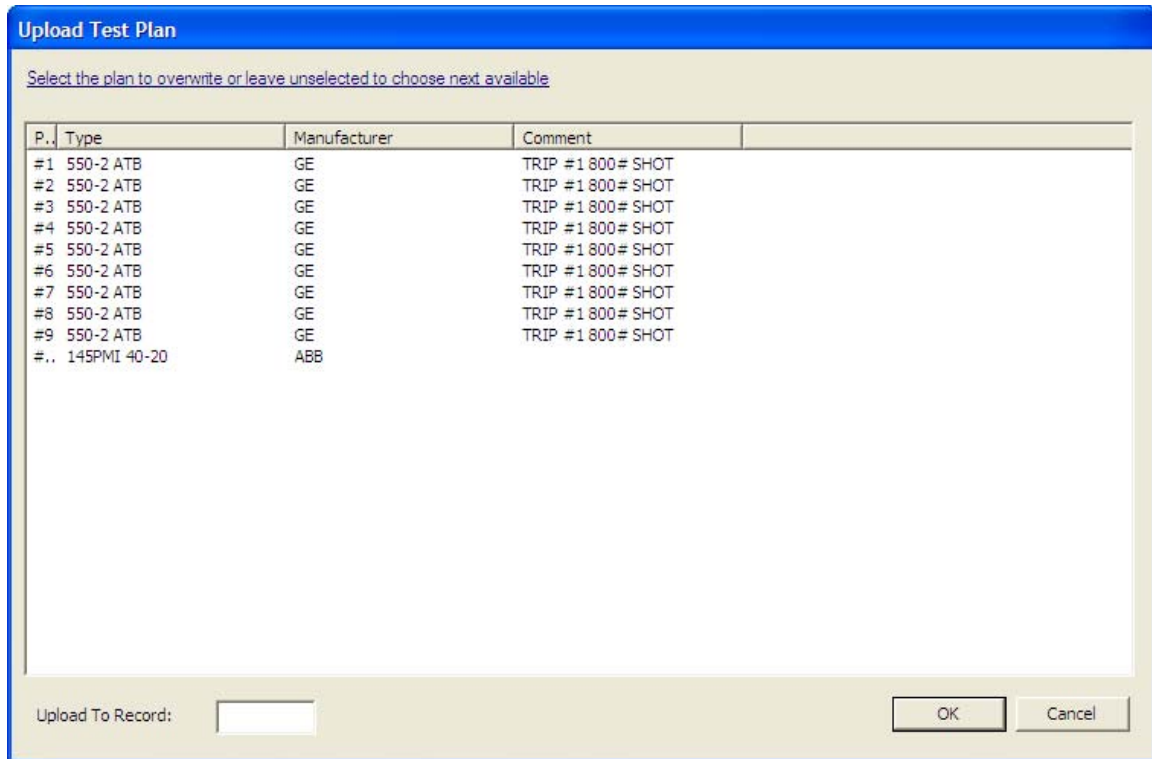
From this window, you may choose to overwrite existing test plans stored in the CB analyzer. This can be useful if all of the CB analyzer's internal memory has been used and there is no room for storing additional test plans.

However, if the unit's memory is not used up, we highly recommend not selecting any test plans from this list and just clicking on the "OK" button. The selected test plans from your computer will be transferred to the CB analyzer and stored in the unit's next available memory location.

> **⚠ WARNING** If you select multiple test plans to upload to the CB analyzer and choose to overwrite existing test plans stored in the CB analyzer, they will overwrite the same number of test plans starting with the first one you select. For example, if you upload 3 test plans to the CB analyzer and then click on test plan #3 in the window above, the uploaded test plans will replace test plans #3, #4, and #5 in the CB analyzer's internal memory.

5.6 Using a Test Plan for a Timing Test

A test plan for a specific breaker can be used when performing a timing test (please see section 5.7 for instructions on how to perform timing tests). If a test plan is used, the Pass/Fail indicator will be displayed based on the settings in the test plan. To use a test plan with a timing test:

1. Close any open test records or test plans.

2. Click on the **Use Plan** icon in the **Test Plan** command group in the Command Ribbon. The following window will be displayed:
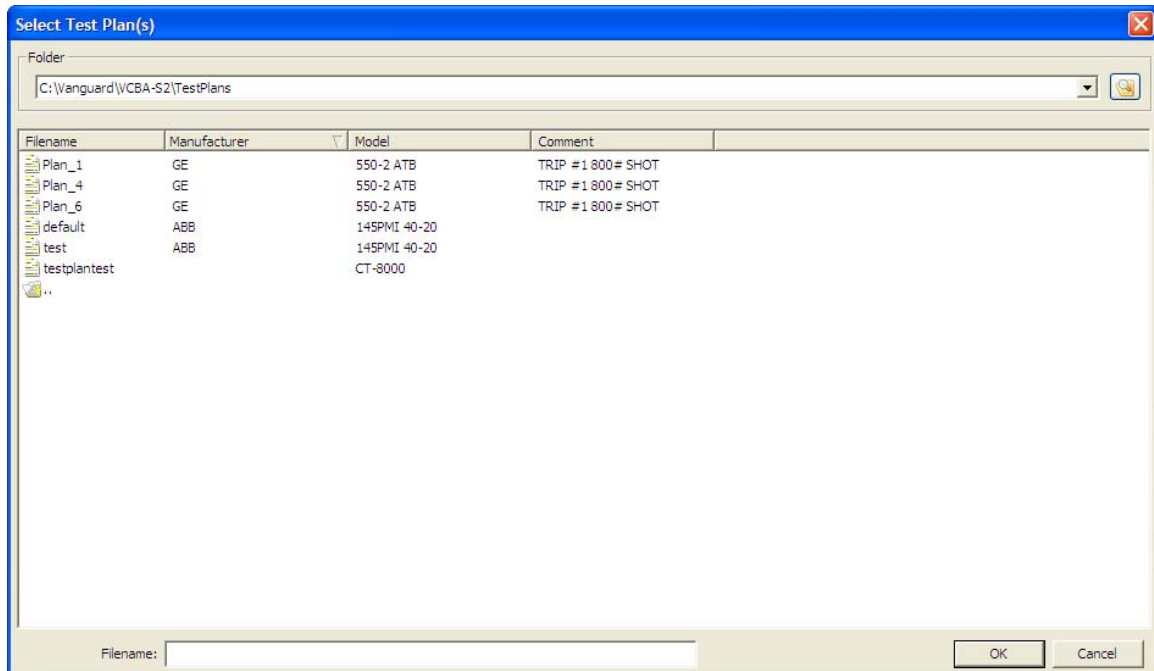
3. If the test plan you would like to use is not listed in the current directory, click on the folder icon at the top right of the window and browse to the directory containing the file. Once you have located the test plan file to use, click on the file name to select it and then click on the "OK" button. The test plan will be loaded and displayed on the screen.

4. Start a circuit breaker timing test per the instructions in section 5.7. When the test is completed, the test results will be compared with the settings in the test plan. The Pass/Fail indicator will be displayed based on the results of the comparison.

> **NOTE** Once a test plan is used, it will stay active for the rest of the session, even if the actual test plan file is closed. If you no longer want to use the test plan with a test, close and restart the VCBA S2 software.
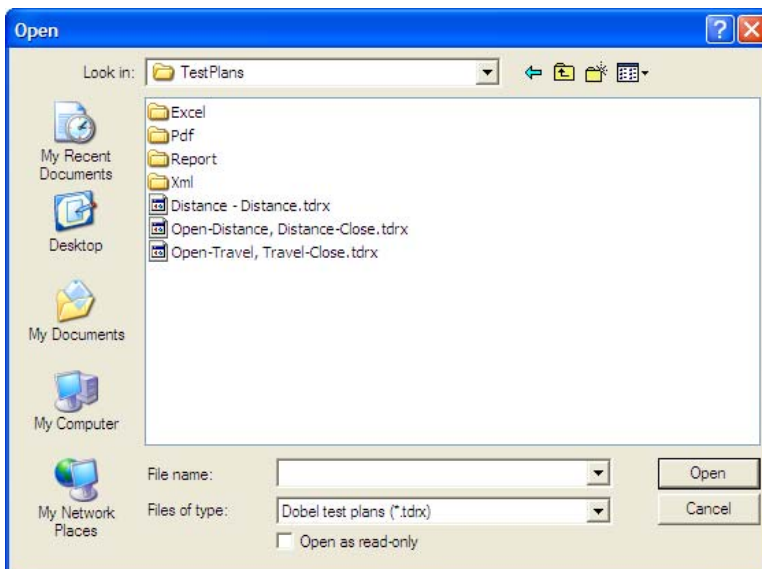
5.7 Converting Doble Test Plans

The VCBA S2 software can convert test plans created with Doble software (test plan files with the file extension of ".tdrx" and ".pln" are supported). Follow the steps below to convert a Doble test plan file to a VCBA S2 test plan file:

1. Click on the **VCBA S2 Menu Button** and select the **Convert Doble Test Plans** option:
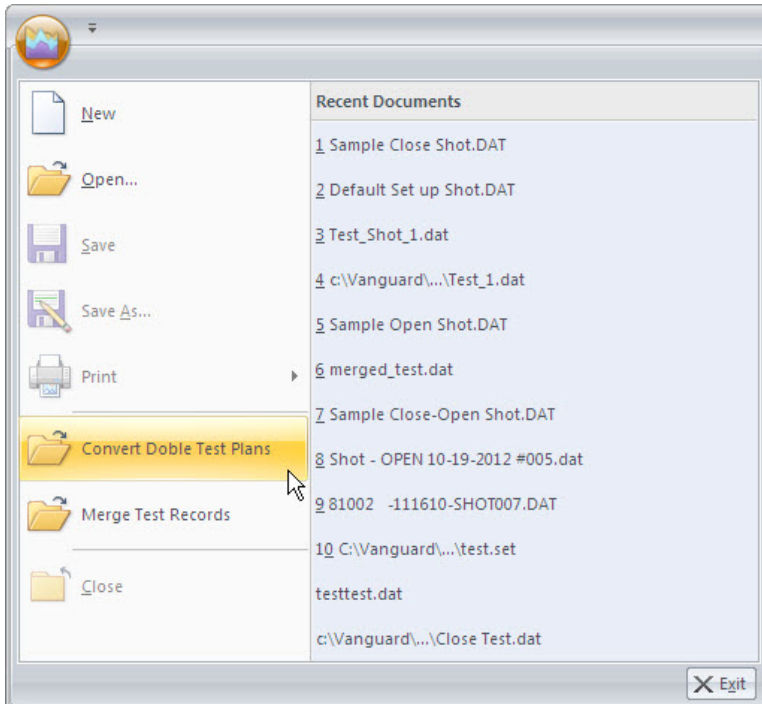

2. The following window will be displayed:

Browse to the folder containing the Doble test plans and select the file or files you would like to convert (you can select multiple files by holding down the **[CTRL]** key and clicking on file names). Click on the "Open" button.

3. The VCBA S2 software will convert the Doble test plans and place the converted test plan files in the default test plan folder. The following message will be displayed:
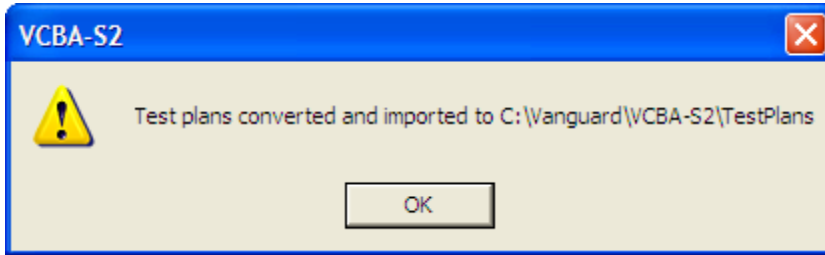
Click on the "OK" button.

	The converted test plans are placed in the default test plan folder. The location of this folder can be configured under Application Settings (please see section 3.2).
NOTE	

4. You can now use the converted test plans with the VCBA S2 software.

6.0 TIMING A CIRCUIT BREAKER USING THE VCBA S2 SOFTWARE

The VCBA S2 software can be used to control a CB analyzer and run circuit breaker timing tests. The following tests are supported: OPEN, CLOSE, OPEN-CLOSE, CLOSE-OPEN, OPEN-CLOSE-OPEN, and STATIC RESISTANCE. Also, a test plan for a specific breaker can be used with the test (please see section 5.6 for details). If a test plan is used, the Pass/Fail indicator will be displayed based on the settings in the test plan.

6.1 Performing an OPEN, CLOSE, OPEN-CLOSE, CLOSE-OPEN, or OPEN-CLOSE-OPEN test

1. Make sure the VCBA-S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port.

2. The CB analyzer should enter Computer Interface Mode.

3. Click on the *Run* icon in the *Test* command group in the Command Ribbon. The following window will be displayed:

4. From the "File Information" section, click on the folder icon and select the folder on your computer where you would like to save the test record.

You can type a filename prefix in the "Filename" input field. This can be any text that will be helpful to you in identifying your test records. If you would like the date to be added to the filename, check the "Add Date" checkbox. Also, to ensure that filenames are unique, check the "Add '001' to ensure uniqueness" checkbox.

5. From the "Shot Type" section, click on either the "Open", "Close", "Open-Close", "Close-Open", or "Open-Close-Open" radio button.

    If performing an "Open-Close" test, enter the delay, in milliseconds, between the OPEN and CLOSE operation in the "Delay between Open-Close" input field.

    If performing a "Close-Open" test, from the drop-down menu to the right of the radio button, select the trip command, the following options are available:

    "Contact #1 Closed": Trip breaker after detecting contact timing channel #1 is closed.

    "No Delay": Trip breaker with no delay. Both Close and Trip coils are energized at the same time.

    "Delay Between Close to Open": Trip the breaker with a preset delay between the Close and Trip commands. This delay can be programmed from 10 ms to 500 ms in 1 ms increments by typing the desired delay time in the "Delay between Close-Open" input field.
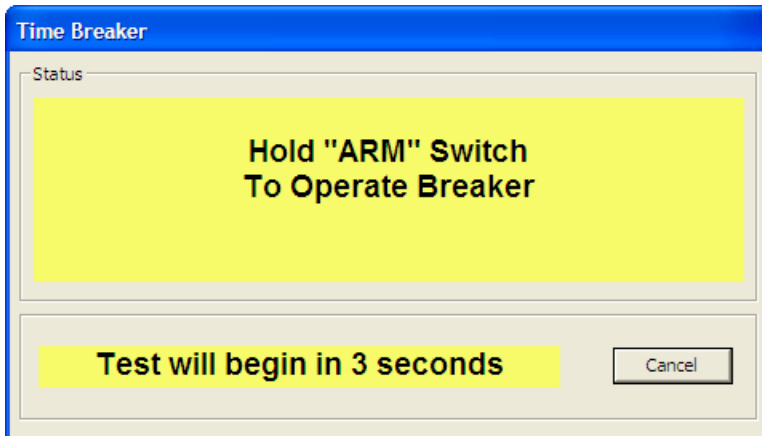
6. Select the desired timing window from the "Timing Window" options.
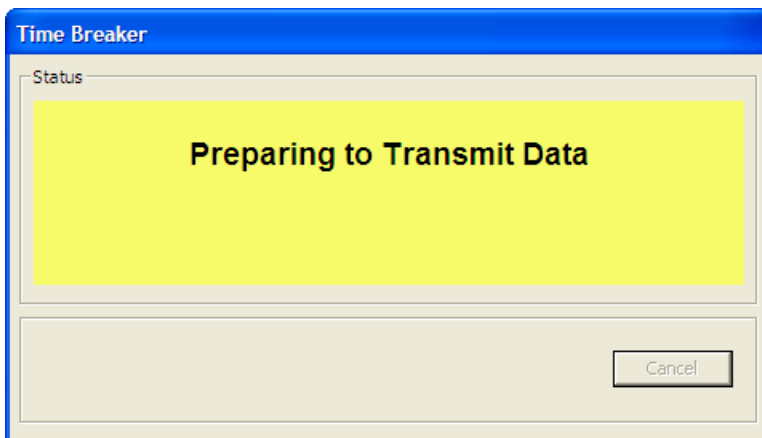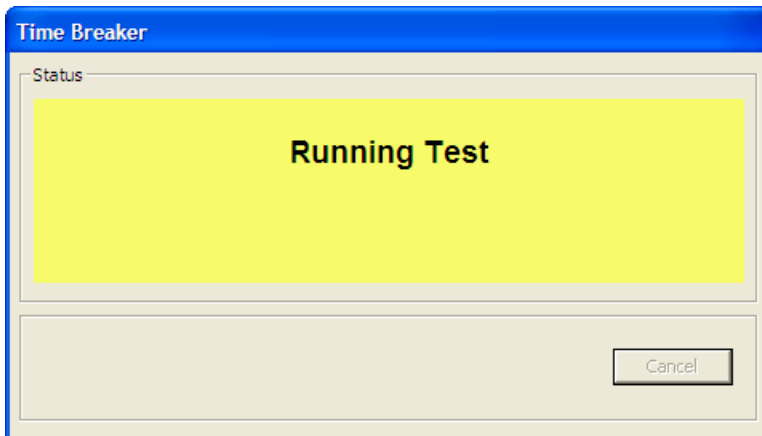
    > **NOTE**
    > - For the 1-second timing window, the timing resolution is ±50 micro-seconds
    > - For the 10-second timing window, the timing resolution is ±500 micro-seconds
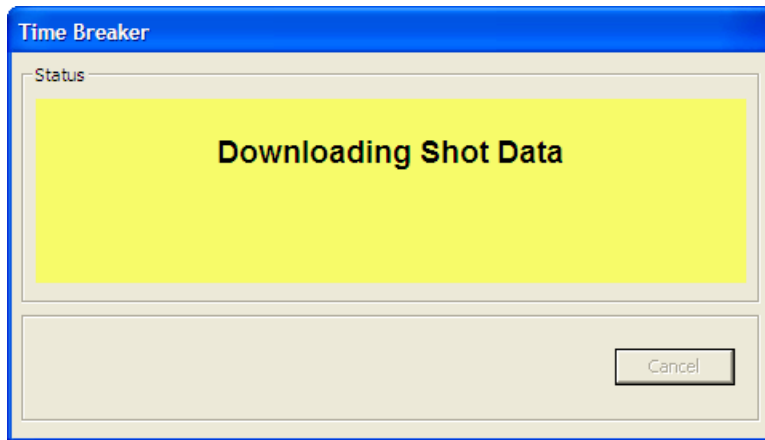   > - For the 20-second timing window, the timing resolution is ±1.0 milliseconds

7. Select the trigger type from the "Trigger Type" options (Internal or External).

8. From the "Insertion Resistor" radio group, select the desired insertion resistance value. If you would like to perform a dynamic resistance test (CT-8000 only), check the "Dynamic Resistance" checkbox.

9. Click on the "OK" button. The following window will be displayed:

Time Breaker

Status

Hold "ARM" Switch
To Operate Breaker

Test will begin in 3 seconds   Cancel

10. A 5-second timer will count down, and then the test will be initiated. The following
sequence of screens will be displayed:

Time Breaker

Status

Running Test

Cancel

Time Breaker

Status

Preparing to Transmit Data

Cancel

11. When the test is complete, the results will be displayed. The test record will also be saved in the location selected in step 4.

6.2 **Performing a Static Resistance Test**

1. Make sure the VCBA S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port.

2. The CB analyzer should enter Computer Interface Mode.

3. Click on the *Run* icon in the *Test* command group in the Command Ribbon. The following window will be displayed:

4. From the "File Information" section, click on the folder icon and select the folder on your computer where you would like to save the test record.

   You can type a filename prefix in the "Filename" input field. This can be any text that will be helpful to you in identifying your test records. If you would like the date to be added to the filename, check the "Add Date" checkbox. Also, to ensure that filenames are unique, check the "Add '001' to ensure uniqueness" checkbox.

5. From the "Shot Type" section, click on the "Static Resistance" radio button.

6. Select the desired timing window from the "Timing Window" options.

- For the 1-second timing window, the timing resolution is ±50 micro-seconds
- For the 10-second timing window, the timing resolution is ±500 micro-seconds
- For the 20-second timing window, the timing resolution is ±1.0 milliseconds

7. Select the trigger type from the "Trigger Type" options (Internal or External).

8. From the "Insertion Resistor" radio group, select the desired insertion resistance value. Make sure the "Dynamic Resistance" option is NOT checked.

9. Click on the "OK" button. The following window will be displayed:
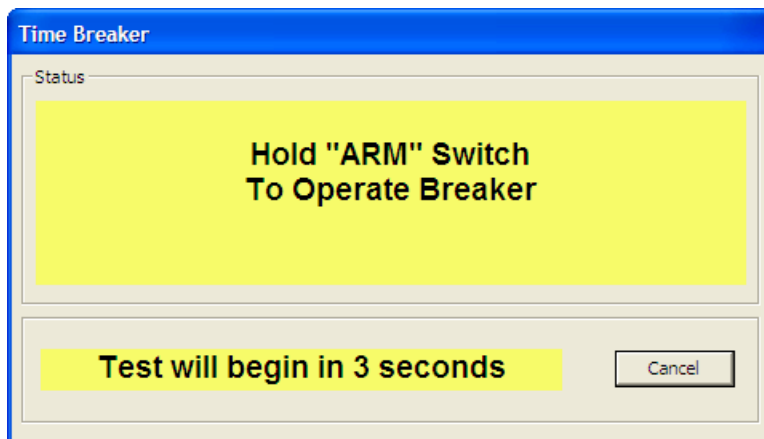
10. A 5-second timer will count down, and then the test will be initiated. A sequence of status messages will be displayed, and when the test is complete, the results will be displayed in the VCBA S2 software. The test record will also be saved in the location selected in step 4.

6.3   Performing a Dynamic Resistance Test (CT-8000 Only)

The CT-8000 is capable of performing dynamic resistance tests. To perform a dynamic resistance test:

1. Make sure the VCBA-S2 software is running. Connect the CB analyzer to the PC via either the RS-232C or USB port.

2. The CB analyzer should enter Computer Interface Mode.

3. Click on the **Run** icon in the **Test** command group in the Command Ribbon. The following window will be displayed:

4. From the "File Information" section, click on the folder icon and select the folder on your computer where you would like to save the test record.

   You can type a filename prefix in the "Filename" input field. This can be any text that will be helpful to you in identifying your test records. If you would like the date to be added to the filename, check the "Add Date" checkbox. Also, to ensure that filenames are unique, check the "Add '001' to ensure uniqueness" checkbox.

5. From the "Type" radio box group, select the breaker operation.

6. From the "Timing Window" radio box group, select "1 second". The 1 second timing window should always be used since it provides the required adequate resolution (±50 micro-seconds) for dynamic tests.

7. From the "Insertion Resistor" radio box group, select the desired insertion resistance value.

8. Check the "Dynamic Resistance" checkbox.

9. From the "Trigger Type" radio box group, select the trigger type.

10. Click on the "OK" button. The following window will be displayed:
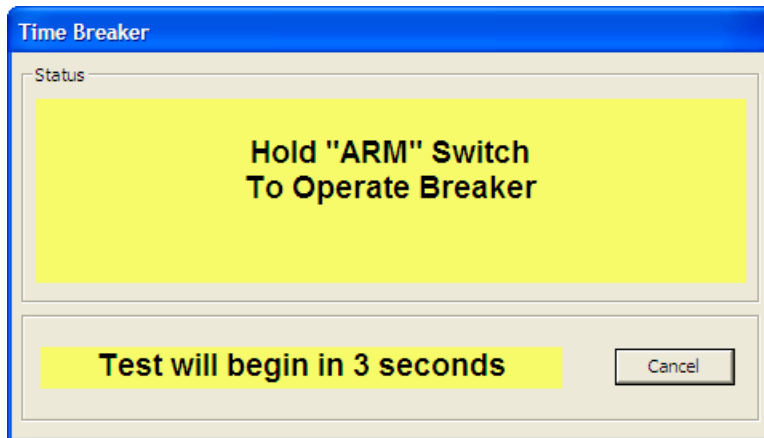
11. A 5-second timer will count down, and then the test will be initiated. A sequence of status messages will be displayed. When the test is complete, the data will be transferred from the CB analyzer to the PC. When the data has been transferred to the PC, the results will be displayed in the VCBA S2 software. The test record will also be saved in the location selected in step 4.

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