

TABLE OF CONTENTS

CONVENTIONS USED IN THIS DOCUMENT	1
1.0 INTRODUCTION.....	2
1.1 System Requirements	2
2.0 SOFTWARE INSTALLATION.....	3
3.0 STARTING THE VCBA SOFTWARE	6
3.1 Main Menu Item Descriptions	6
3.2 Enabling the Computer Interface.....	8
3.3 Application Setup	10
4.0 WORKING WITH TEST RECORDS	12
4.1 Exploring the Test Records Directory.....	12
4.2 Retrieving Test Records From a CB Analyzer	12
4.2.1. Retrieve Test Records From Timer	12
4.2.2. Retrieve Test Records to Directory.....	14
4.3 Recalling Test Records From the PC Hard Drive	15
4.4 Saving a Test Record	17
4.4.1. Saving a Test Record with its Original File Name.....	17
4.4.2. Saving a Test Record with a Different File Name	17
4.5 Copying a Test Record.....	18
4.6 Renaming a Test Record.....	19
4.7 Deleting a Test Record	20
4.8 Merging Test Records.....	21
4.9 Exporting a Test Record in Microsoft® Excel® Format	22
4.10 Viewing and Working with Tabulated Test Results.....	24
4.10.1. Viewing the Test Plan for a Test Record	25
4.10.2. Printing Tabulated Test Results.....	27
4.11 Viewing and Working with Graphic Test Results.....	30
4.11.1. Toggling the Display of the Velocity Curve	31
4.11.2. Customizing the Items Displayed on the Graphic Results Screen.....	33
4.11.3. Customizing the Graph Colors.....	34
4.11.4. Overlaying Two Timing Shots.....	35
4.11.5. Viewing a Graph Expansion.....	37
4.11.6. Calculating the Average Velocity From the Graphic Test Results.....	40
4.11.7. Manually Overriding Contact Time/Resistor Contact Time or Contact Wipe.....	42
4.11.8. Printing the Graphic Test Results.....	46
4.12 Test Record Diagnostic Tools.....	47
4.12.1. Viewing Raw Shot Data	47
4.12.2. Toggling the Resistor Flag	48
5.0 WORKING WITH TEST PLANS	49
5.1 Exploring the Test Plans Directory	49
5.2 Creating a Circuit Breaker Test Plan.....	49
5.3 Modifying an Existing Circuit Breaker Test Plan	60

5.4	Retrieving a Test Plan from a CB Analyzer	63
5.5	Saving a Test Plan	65
5.6	Saving a Test Plan from a Test Record	65
5.7	Transferring a Test Plan to a CB Analyzer	66
5.8	Copying a Test Plan to a Different Location	68
5.9	Deleting a Test Plan	69
5.10	Using a Test Plan for a Timing Test	70
5.11	Printing a Test Plan	71
6.0	TIMING A CIRCUIT BREAKER USING THE VCBA SOFTWARE	72
6.1	Performing an OPEN or CLOSE test	72
6.2	Performing an OPEN-CLOSE test	74
6.3	Performing a CLOSE-OPEN test	76
6.4	Performing an OPEN-CLOSE-OPEN test	78

LIST OF FIGURES

Figure 1	Test Record in VCBA Software and Microsoft Excel	23
Figure 2	Typical CB Tabulated Test Report	28
Figure 3	Typical CB Test Parameters	29
Figure 4	Graphic Test Results	30
Figure 5	Typical Graphic Results Printout	46

CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- Microsoft® Windows XP and Vista 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 compatible Vanguard circuit breaker analyzer models (CT-6500, CT-7000, CT-7500, DigiTMR)
- Menu Names are referred to as ***Menu Name***
- Menu items are referred to as *Menu 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]**.
- A key or switch on the CB analyzer is indicated as **[KEY]**
- File locations, directories, and file names are shown as “C:\folder\filename”
- CB analyzer menu options are referenced as (*MENU OPTION*)
- A CB analyzer’s LCD screen output is shown as:

```
1. OPTION 1
2. OPTION 2
3. OPTION 3
4. OPTION 4
```

- Warning messages are indicated as:



Warning message

WARNING

- Important notes are indicated as:



Note details

NOTE

1.0 INTRODUCTION

The Vanguard Circuit Breaker Analyzer (VCBA) software is a Windows-based PC software application for use with Vanguard's CT-6500, CT-7000, CT-7500, and DigiTMR 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
- Control a CB analyzer from the PC to perform Timing Tests

1.1 System Requirements

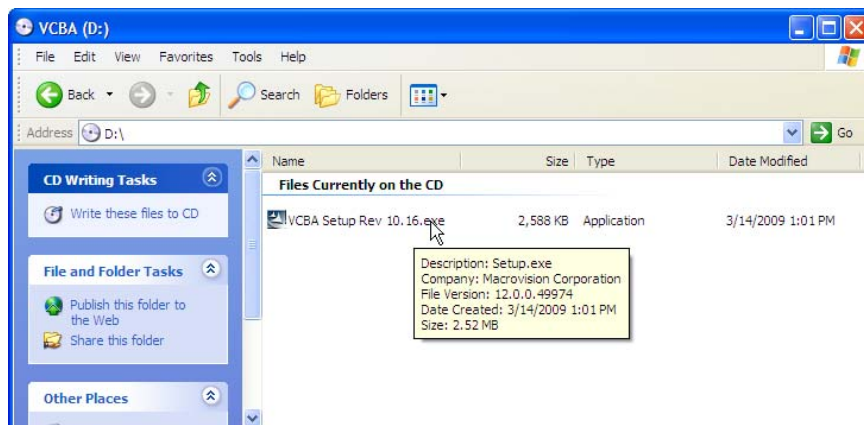
The VCBA software has the following minimum system requirements:

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

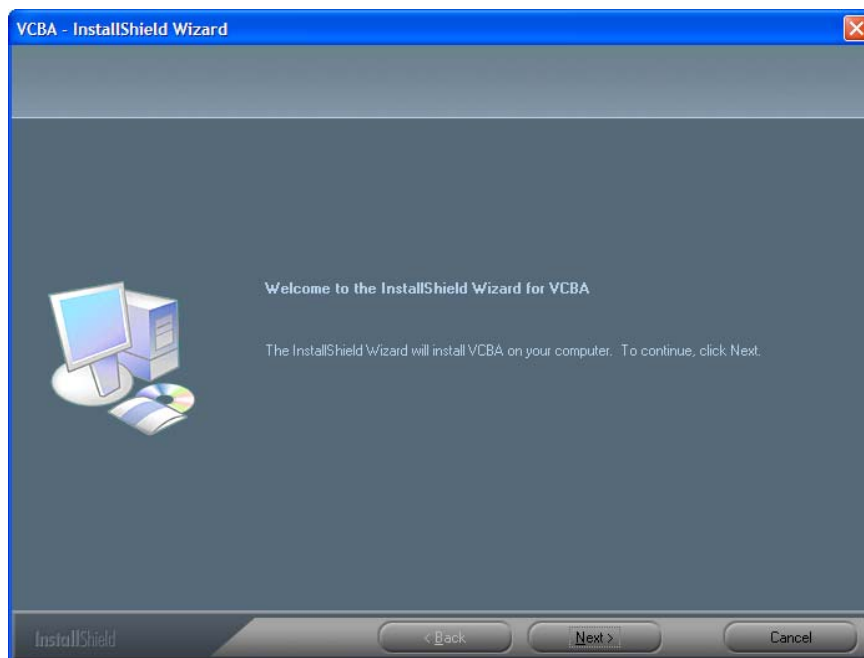
2.0 SOFTWARE INSTALLATION

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

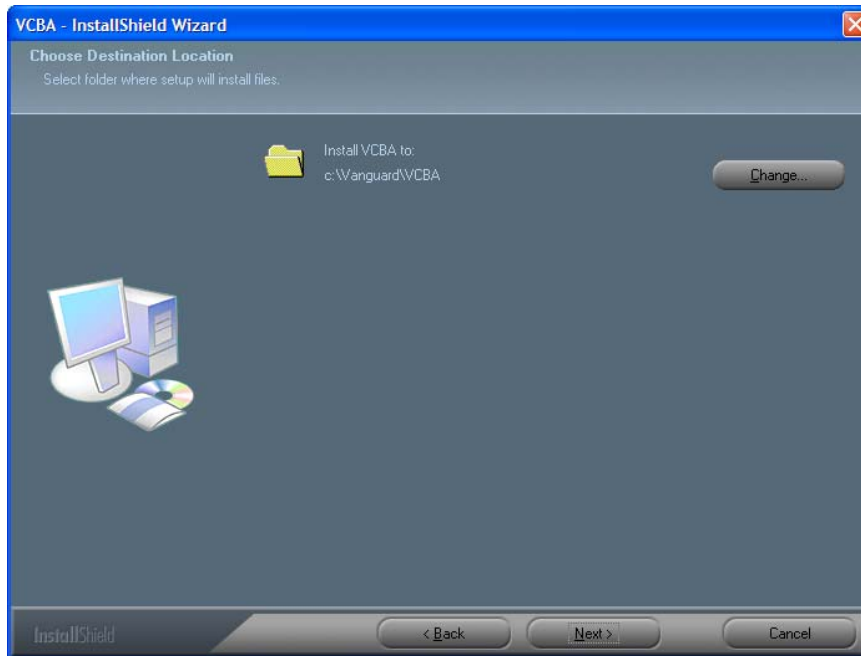
1. Insert the installation CD in the PC's CD or DVD drive.
2. From the Windows Desktop, click on the "Start" button to bring up the **Start Menu**.
3. From the **Start Menu**, click on *My Computer* to open the My Computer window.
4. Double click (or single click in some Windows configurations) on your CD/DVD Drive icon to navigate the installation CD. The contents of the CD will be listed as shown below:



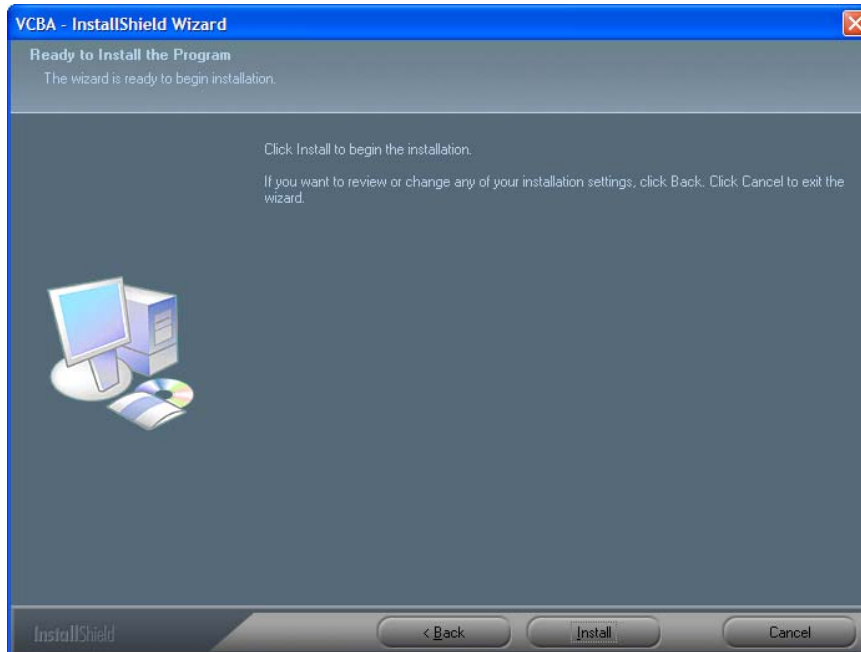
5. Double click (or single click in some Windows configurations) on the "VCBA Setup Rev 10.xx.exe" file to start the installation process. The VCBA InstallShield Wizard will appear as shown below:



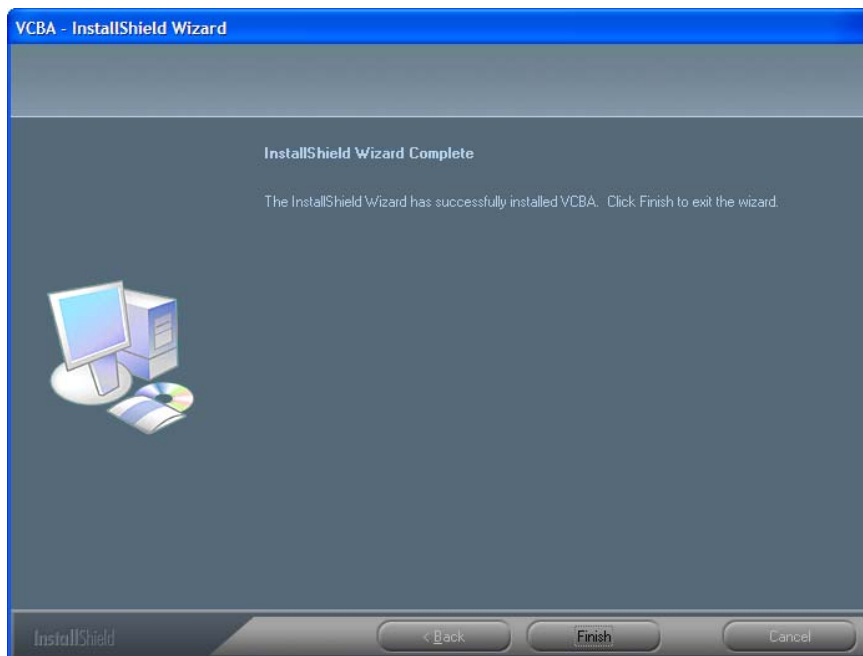
- Click on the “Next” button to continue. The following screen will be displayed showing the location on your hard drive where the software will be installed (C:\vanguard\VCBA):



- You may choose a different installation location by clicking on the “Change...” 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 “Next” button to continue. The following screen will be displayed:



8. Click on the “Install” button. The InstallShield Wizard will copy files to your hard drive. 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.

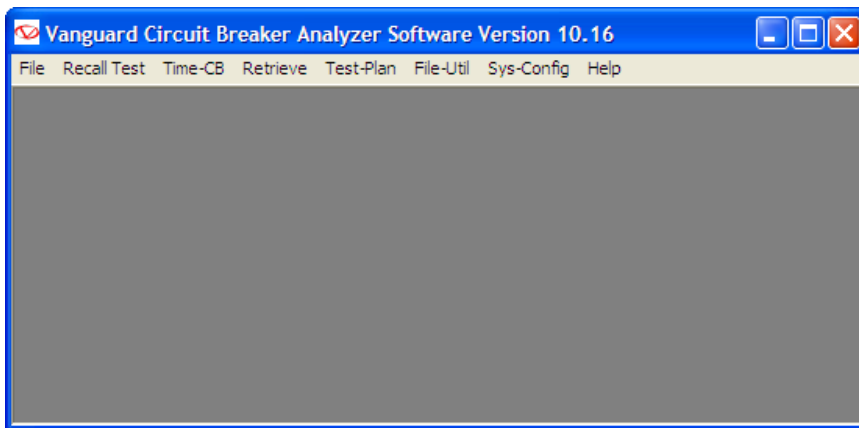
**NOTES**

- The installation program will create two sub-folders, “shots” and “setup”, in the main installation folder. By default all test records will be stored in the “shots” folder and all test plans will be stored in the “setup” folder.
- You can later change the default test record and test plan storage locations. Please see section 3.4 for details.

3.0 STARTING THE VCBA 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 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* menu item.
5. Click on the *Launch vcba.exe* menu item. The VCBA main application window will appear as shown below:

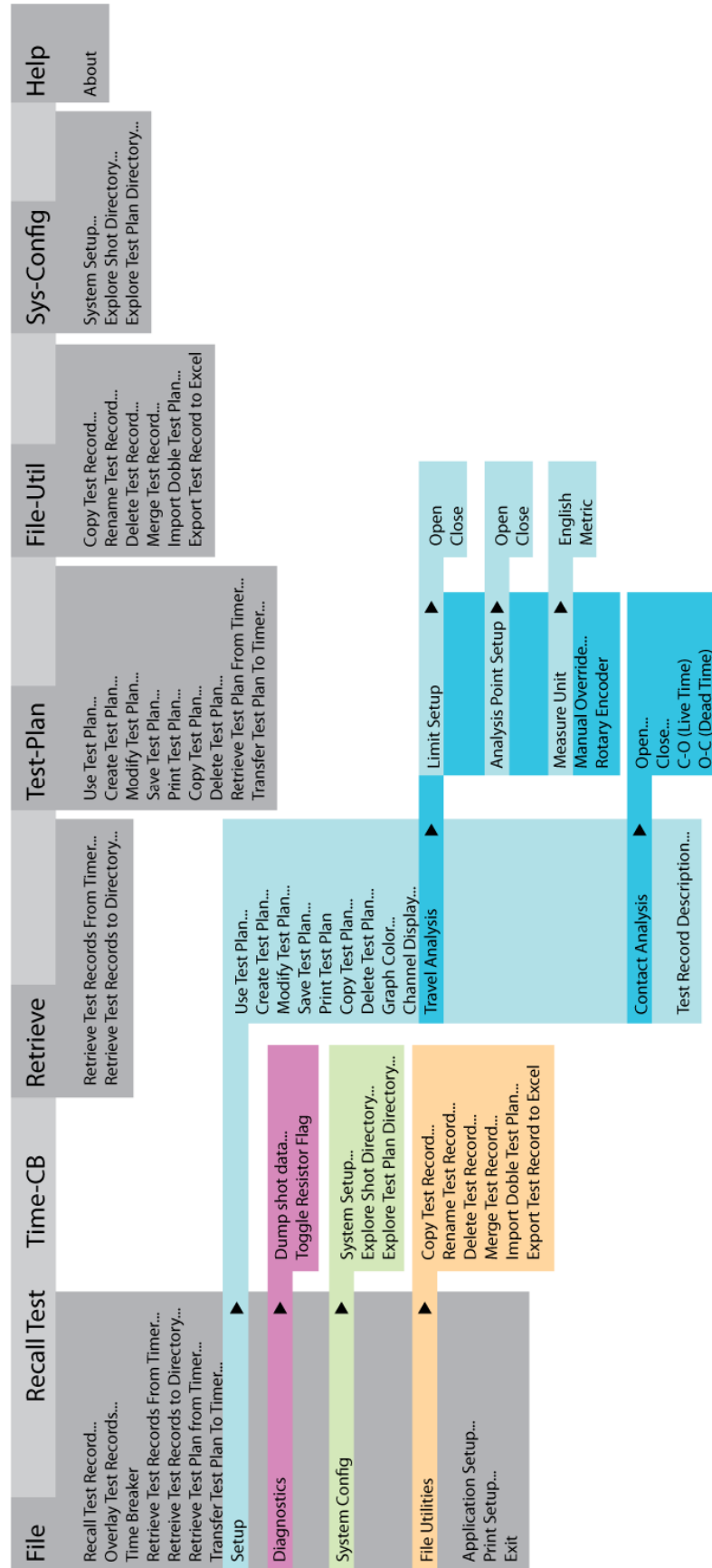


3.1 Main Menu Item Descriptions

The VCBA Main Menu bar features the following menus:

- **File menu:**
 - Recall and overlay test records
 - Transfer test records and test plans
 - Configure system parameters and options
 - Use various file utilities
- **Recall Test:** Recall test records from the PC hard drive for viewing
- **Time CB:** Perform a breaker timing test from the PC using a connected CB analyzer
- **Retrieve:** Retrieve test records from a CB analyzer
- **Test-Plan:** Create, use, modify, save, print, copy, delete, and transfer test plans
- **File-Util:** Copy, rename, delete, merge, and export test records
- **Sys-Config:** Configure system parameters
- **Help:** Display information about the VCBA software

VCBA Main Menu Structure

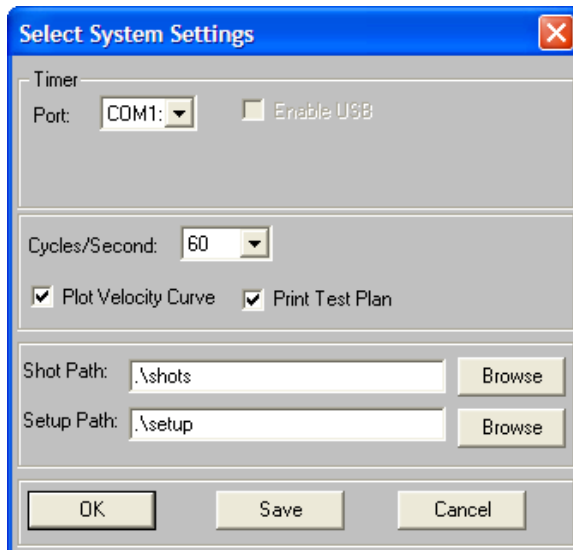


3.2 Enabling the Computer Interface

The Computer Interface Mode allows you to retrieve test records and test plans from a CB analyzer and to transfer test plans to a CB analyzer. In this mode, tests can also be run on a CB analyzer from the PC.

To enable the Computer Interface Mode:

1. Make sure the VCBA software is running on the PC.
2. Click on the **Sys-Config** menu and select *System Setup...* to configure the RS-232C communication port. The following window will be displayed:



Click on the “Port:” drop down list and select the PC COM: port that the CB analyzer will be connected to (COM1: to COM8: is supported). Click on the “Save” button, and then click on the “OK” button. If you do not click on the “Save” button, any settings you change will only stay active for the current session and will be reset the next time you run the software.

3. Connect the CB analyzer to the PC via the RS-232C port and turn on the power.
4. Once the CB analyzer has gone through its start-up cycle, the main menu will be displayed as shown:

```
1. TIME BRKR    03/24/09
2. GET RSLT
3. SET-UP
4. DIAGNOSTICS
```

Press the **[3]** key (*SET-UP*).

5. The following screen will be displayed:

```
1. ANALYSIS POINTS
2. MEASUREMENT UNITS
3. SAVE / RESTORE
4. NEXT PAGE
```

Press the **[4]** key (*NEXT PAGE*).

6. The following screen will be displayed:

```
1. SHOT DESCRIPTION
2. COMPUTER ITF
3. SET CLOCK
4. SET PRINT MODE
```

Press the **[2]** key (*COMPUTER ITF*).

7. The following screen will be displayed:

```
COMPUTER ITF MODE

"STOP" TO ABORT
```

The CB analyzer is now ready to communicate with the VCBA software.

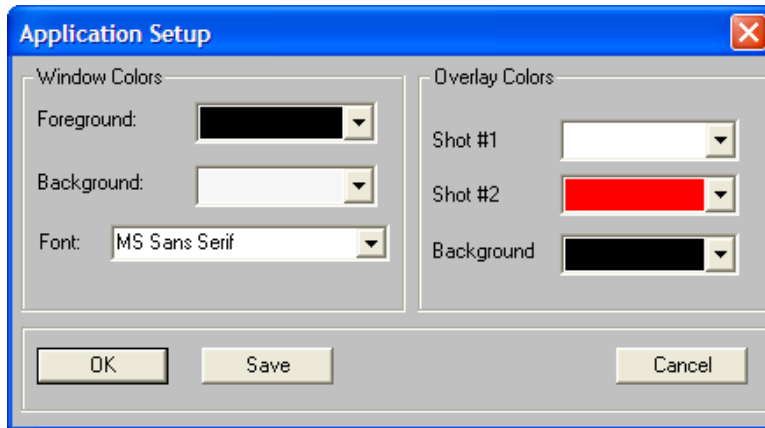
If you experience any problems enabling the Computer Interface Mode:

1. Turn off both the PC and the CB analyzer.
2. Connect the CB analyzer to the PC via the RS-232C port.
3. Turn on the computer and run the VCBA software.
4. Follow steps 4-7 in the above section to put the CB analyzer in computer interface mode.

3.3 Application Setup

You can customize the VCBA's window colors and the font used to display data. You can also customize the colors used for the test record overlay graph (see section 4.11.4 for further information about overlaying test records). To customize the interface and overlay graph colors:

1. Click on the **File** menu and select *Application Setup...* The following window will be displayed:

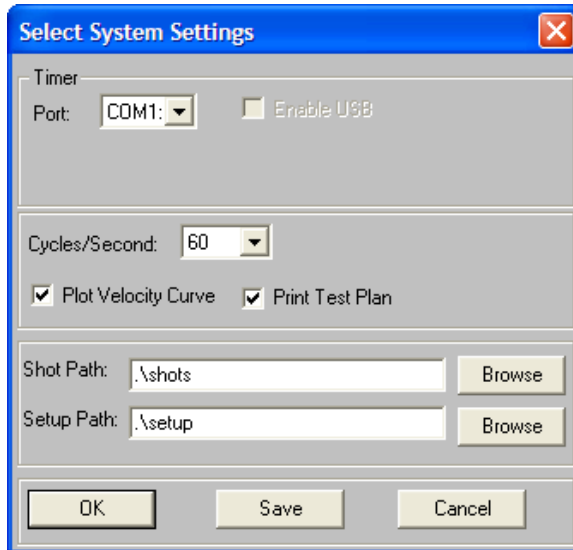


2. From the "Foreground:" drop down list in the "Window Colors" group, select the color you would like to use for the foreground elements displayed on the screen.
3. From the "Background:" drop down list in the "Window Colors" group, select the color you would like to use for the background elements displayed on the screen.
4. From the "Font:" drop down list in the "Window Colors" group, select the font you would like to use for displaying information on the screen.
5. From the "Shot #1" drop down list in the "Overlay Colors" group, select the color you would like to use for the Shot #1 trace when viewing test record overlay graphs.
6. From the "Shot #2" drop down list in the "Overlay Colors" group, select the color you would like to use for the Shot #2 trace when viewing test record overlay graphs.
7. From the "Background" drop down list in the "Overlay Colors" group, select the background color for the test record overlay graph.
8. Click on the "Save" button and then click on the "OK" button. If you do not click on the "Save" button, any settings you change will only stay active for the current session and will be reset the next time you run the software.

3.4 System Setup

To change the default system settings (such as the communication port, file location paths, etc):

1. From the **File** menu, click on *System Config* and then select *System Setup...*
(Alternatively, if no test records or test plans are open, you can click on the **Sys-Config** menu and select *System Setup...*). The following window will be displayed:



2. Click on the "Port:" drop down list and select the PC COM: port that the CB analyzer is connected to.
3. Select the appropriate frequency setting from the "Cycles/Second:" drop down list.
4. If you would like to have the velocity curve plotted on the graphic results screen and on the test record printout, check the "Plot Velocity Curve" checkbox by clicking on it. Please see section 4.11.1 for further information.
5. If you would like to print the test plan when a tabulated test record is printed, check the "Print Test Plan" checkbox by clicking on it. Please see section 4.10.2 for further information.
6. To change the default location where test records are stored, click on the "Browse" button to the right of the "Shot Path:" input field. Browse to the new location and click on the "OK" button.
7. To change the default location where test plans are stored, click on the "Browse" button to the right of the "Setup Path:" input field. Browse to the new location and click on the "OK" button.
8. Click on the "Save" button and then click on the "OK" button. If you do not click on the "Save" button, any settings you change will only stay active for the current session and will be reset the next time you run the software.

4.0 WORKING WITH TEST RECORDS

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

4.1 Exploring the Test Records Directory

You can access the default test records directory (please see section 3.4 for information on how to set the default test record directory) either via Windows Explorer or from within the VCBA software. To open the test records directory:

1. From the **File** menu, click on *System Config* and then select *Explore Shot Directory...* The default test record directory will be opened in Windows Explorer.
2. Use standard Windows Explorer commands to organize, rename, copy, or delete the test record files. You can also create folders in this directory to logically organize the test records.

4.2 Retrieving Test Records From a CB Analyzer

There are two ways to retrieve test records from a CB analyzer's Flash EEPROM. The first method is to click on the **Retrieve** menu and select *Retrieve Test Records From Timer...*



NOTE

Alternatively, you can click on the **File** menu and select *Retrieve Test Records From Timer...*

The second method is to click on the **Retrieve** menu and select *Retrieve Test Records to a Directory...*



NOTE

Alternatively, you can click on the **File** menu and select *Retrieve Test Records to a Directory...*

Both methods are described in detail below.

4.2.1. Retrieve Test Records From Timer

The *Retrieve Test Records From Timer...* option from the **Retrieve** or **File** menu can be used to retrieve one or more records from a CB analyzer. When a record is retrieved, it is automatically saved to the PC hard drive in the default "shots" folder.

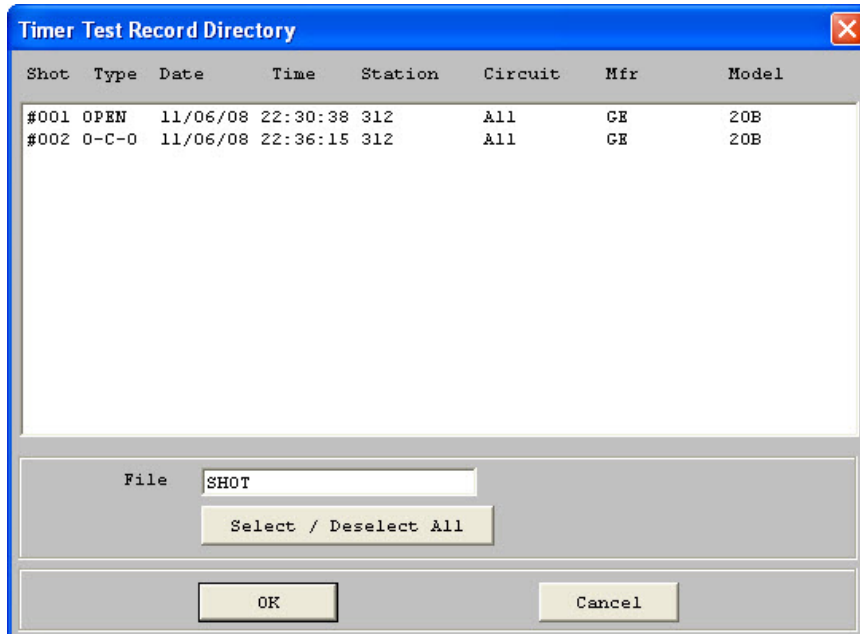


NOTE

You can change the location of the "shots" folder. Please see section 3.4 for further information.

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

- Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
- From the **Retrieve** or **File** menu select *Retrieve Test Records From Timer...*
- A window will appear listing a directory of all the test records stored in the CB analyzer's memory:



- 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. If you would like to select all test records, click on the "Select / Deselect All" button.
- The "File" input field allows you to enter a word that will be used as part of 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 following format:

76055 -032509-SHOT001.DAT

76055	-032509-	SHOT	001	.DAT
CB Analyzer Serial #	Test Record Date	Text from "File" Field	Test Record Number	File Extension

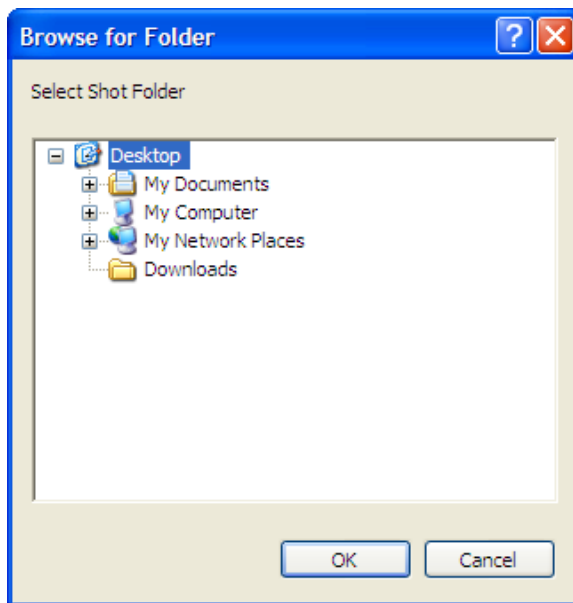
So if you would like the file name to be "76055 -032509-TEST001.DAT", enter the word TEST in the "File" input field.

- Click on the "OK" button to start retrieving the selected test records.

4.2.2. Retrieve Test Records to Directory

The *Retrieve Test Records to Directory...* option from the **Retrieve** or **File** menu can be used to retrieve one or more records from a CB analyzer to a specific directory on the PC hard drive.

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port and turn on the power.
2. Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
3. From the **Retrieve** or **File** menu select *Retrieve Test Records to Directory...*
4. The following window will appear allowing you to select the location where you would like to store the retrieved test records:



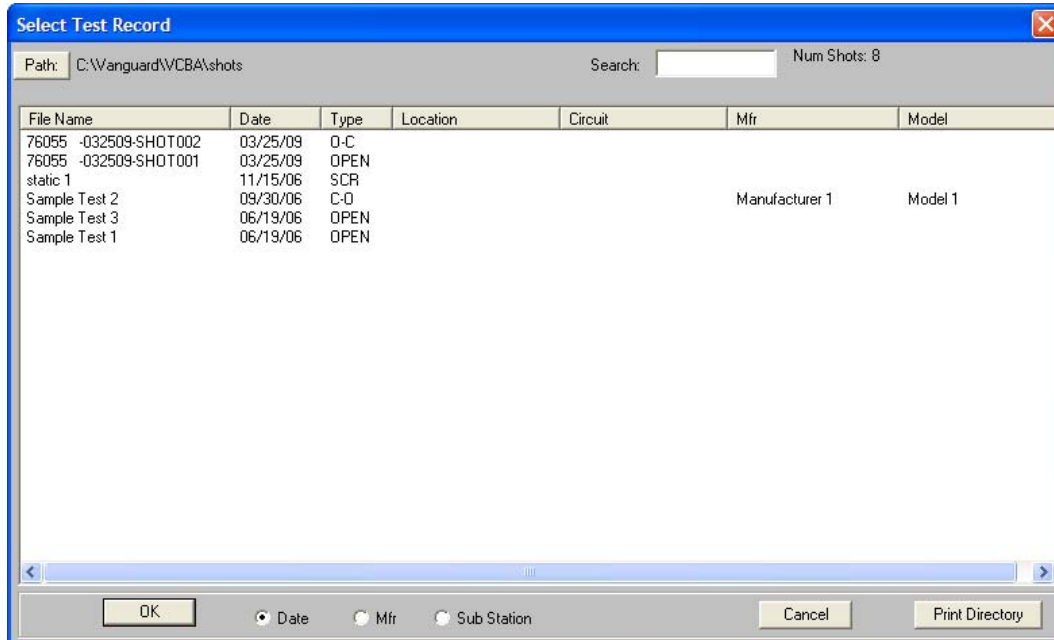
Browse to the folder where you would like the retrieved records to be stored. Click on the folder name and then click on the "OK" button.

5. Continue to step 4 from section 4.2.1.

4.3 Recalling Test Records From the PC Hard Drive

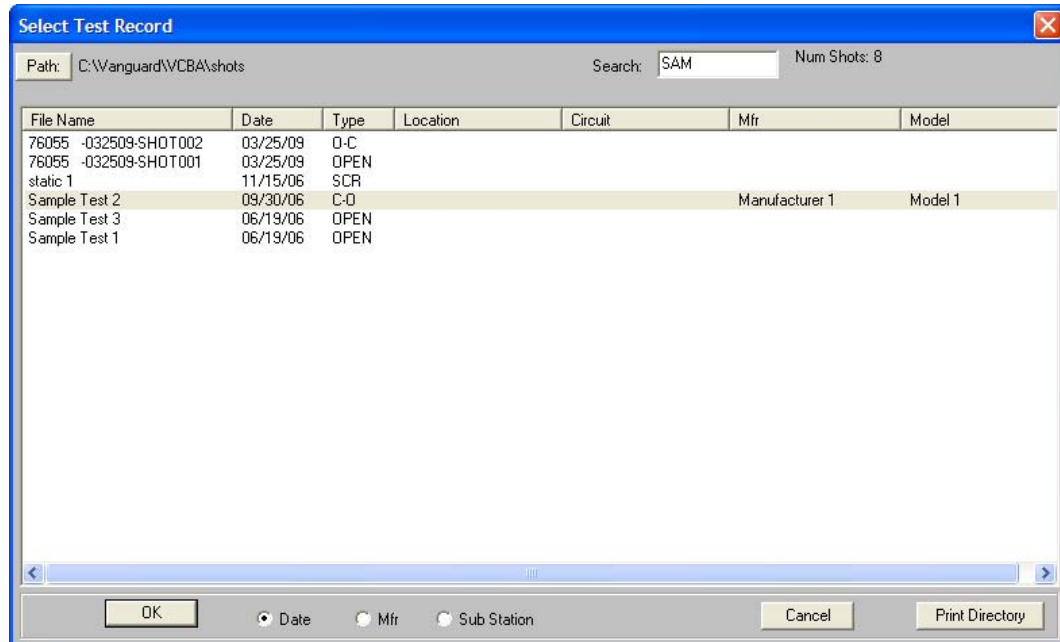
Test records stored on the PC hard drive can be recalled using the steps below:

1. Click on the **Recall Test** menu (or click on the **File** menu and select *Recall Test Record...*). The following window will be displayed:



- 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 “Path” button and browse to the folder containing the test records.
- The top right section of the window displays the total number of shots stored in the current directory.
- You can sort the records by Date, Manufacturer, or Sub Station name. To change the sort order, click on the corresponding radio box at the bottom of the window. For example, if you would like the records to be sorted by Substation, click on the “Sub Station” radio box at the bottom of the window.
- If you would like to print the current directory listing, click on the “Print Directory” button at the bottom of the window. Select the printer to print to and click on the “OK” button.

- You can also search for a particular record. You can start typing in the “Search” input field and it will actively highlight the first matching file name. For example, in the listing below, typing SAM in the “Search” field will highlight the “*Sample Test 2*” file name as shown below:



- Click on the file name you would like to retrieve and click the “OK” button. The test record will be loaded and the tabulated test results will be displayed (please see section 4.10 for details).

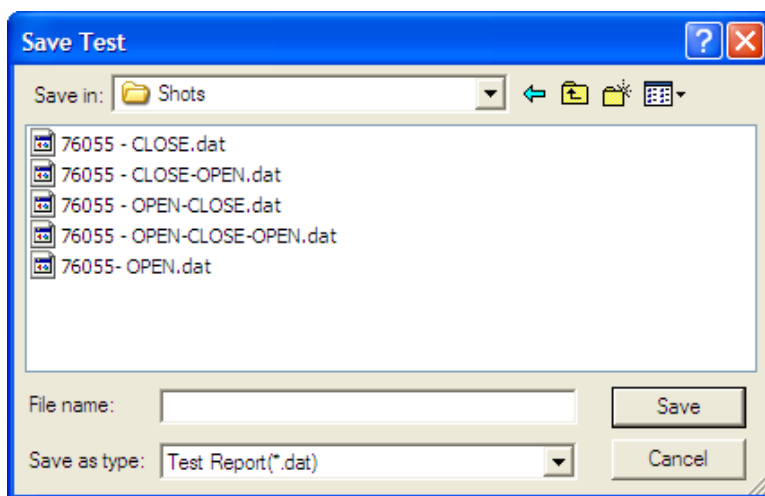
4.4 Saving a Test Record

4.4.1. Saving a Test Record with its Original File Name

1. To save a test record with its original file name, click on the **Save-Test** menu and select *Overwrite*.
2. The test record will be saved with its original file name.

4.4.2. Saving a Test Record with a Different File Name

1. To save a test record with a different file name, click on the **Save-Test** menu and select *Save As*. The following window will be displayed:

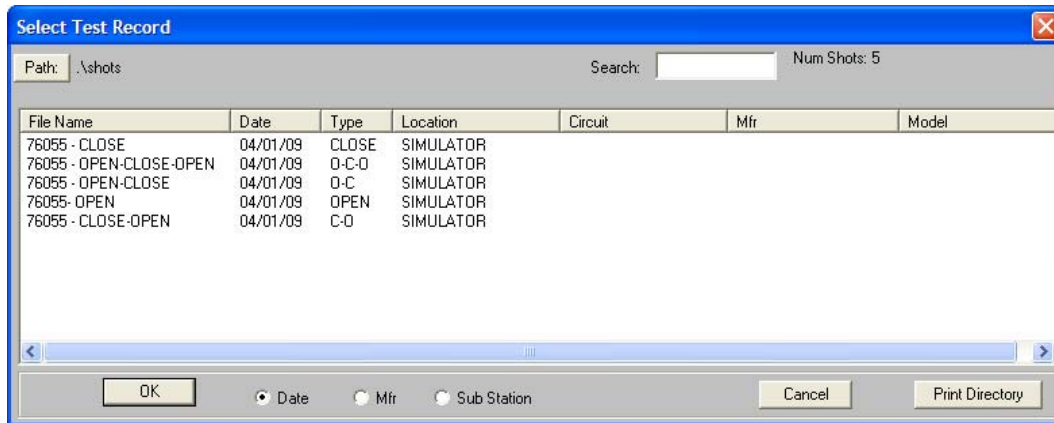


2. Browse to the folder where you would like to save the test record.
3. Enter the file name in the "File name:" input field.
4. Click on the "Save" button.
5. The test record will be saved with the new file name.

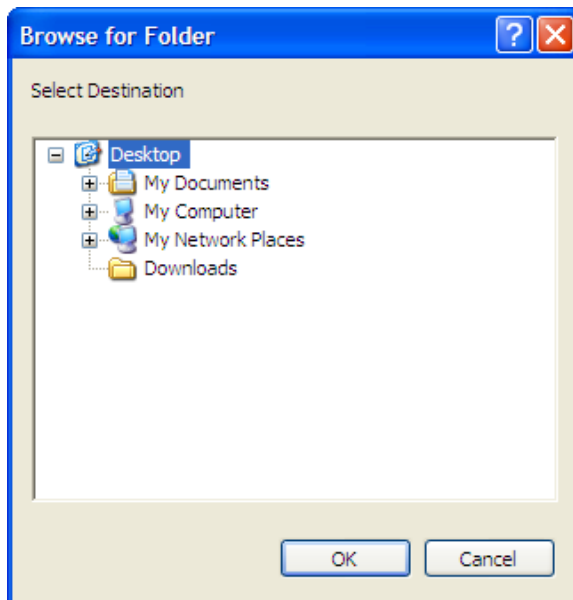
4.5 Copying a Test Record

To copy a test record from one location on the PC hard drive to another location:

1. From the **File** menu, click on *File Utilities* and then select *Copy Test Record...* The following window will be displayed:



2. If the test record you would like to copy is not in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test record to be copied, click on the file name. You may select additional test records by holding down the **[CTRL]** key and clicking on each subsequent file name. Once you have selected the test record(s) to be copied, click on the "OK" button. The following window will be displayed:

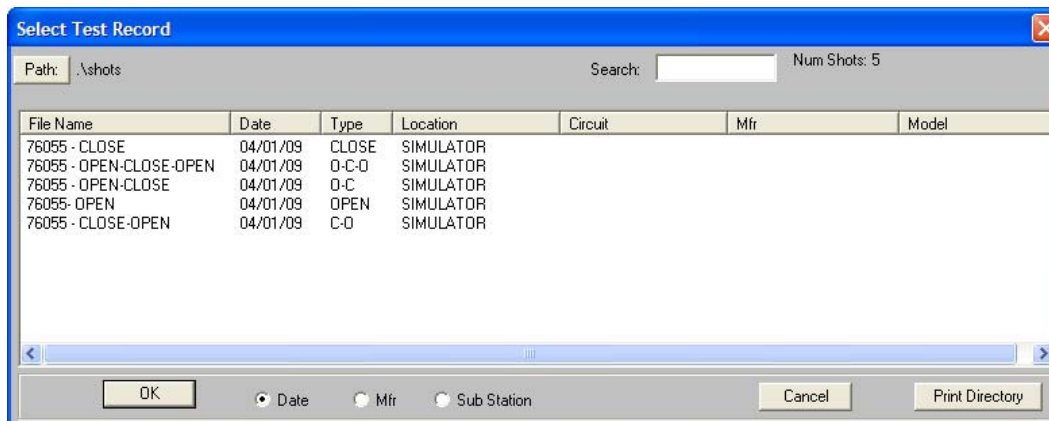


3. Browse to the folder where you would like the test record to be copied to, and then click on the "OK" button. The test record will be copied to this folder with the same file name as the original.

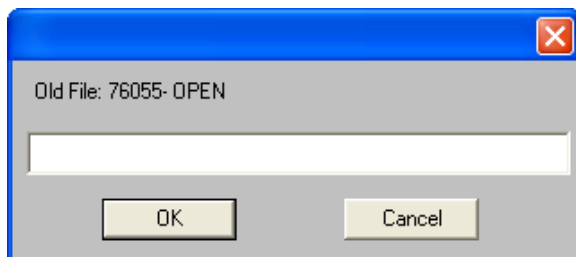
4.6 Renaming a Test Record

To rename a test record stored on the PC hard drive:

1. From the **File** menu, click on *File Utilities* and then select *Rename Test Record...* The following window will be displayed:



2. If the test record you would like to rename is not in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test record to be renamed, click on the file name and then click on the "OK" button. The following dialog box will be displayed:

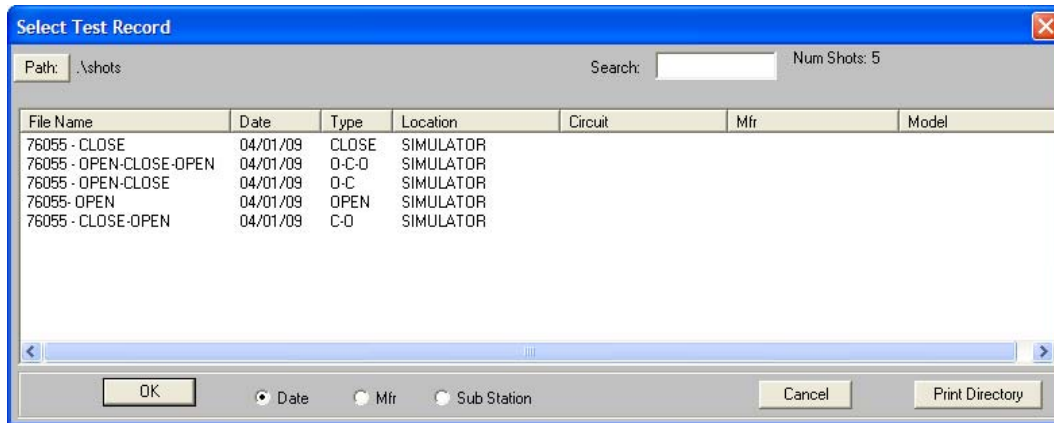


3. Enter the new file name for the test record and click on the "OK" button. The test record will be renamed with the new file name.

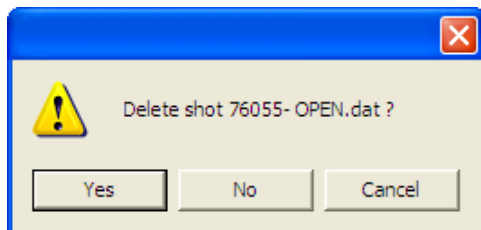
4.7 Deleting a Test Record

To delete a test record from the PC hard drive:

1. From the **File** menu, click on *File Utilities* and then select *Delete Test Record...* The following window will be displayed:



2. If the test record you would like to delete is not in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test record to be deleted, click on the file name. You may select additional test records by holding down the **[CTRL]** key and clicking on each subsequent file name. Once you have selected the test record(s) to be deleted, click on the "OK" button. The following window will be displayed:

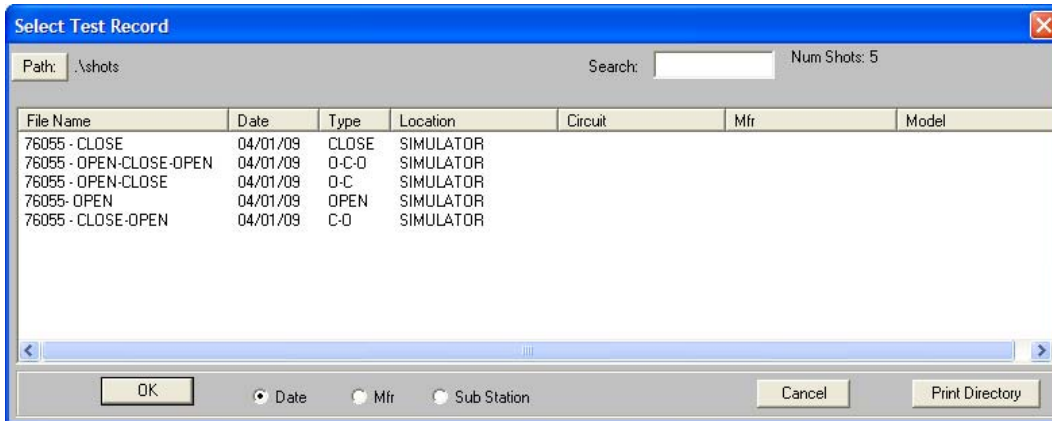


3. Click on the "Yes" button to confirm the deletion of the test record. If you do not want to delete the test record, click on the "No" or "Cancel" button.

4.8 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. From the **File** menu, click on *File Utilities* and then select *Merge Test Record...* The following window will be displayed:



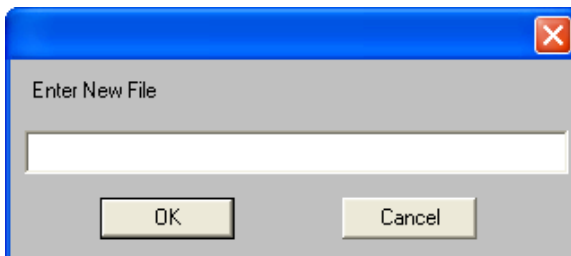
2. You can click on the “Path” button to browse to the directory containing the test records to be merged. Once you have located the test records, click on the first file name to be merged and then hold down the **[CTRL]** key and click on the second file name. Then click on the “OK” button.



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.

The following dialog box will be displayed:

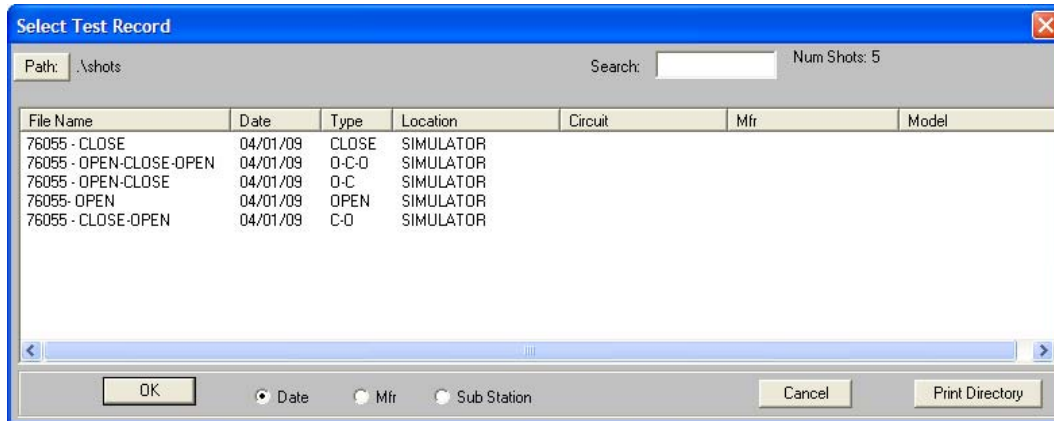


3. Enter the file name for the new merged test record and then click on the “OK” button. The data from the two source test records will be merged and saved as the new file name. The two source test records will not be modified in any way.

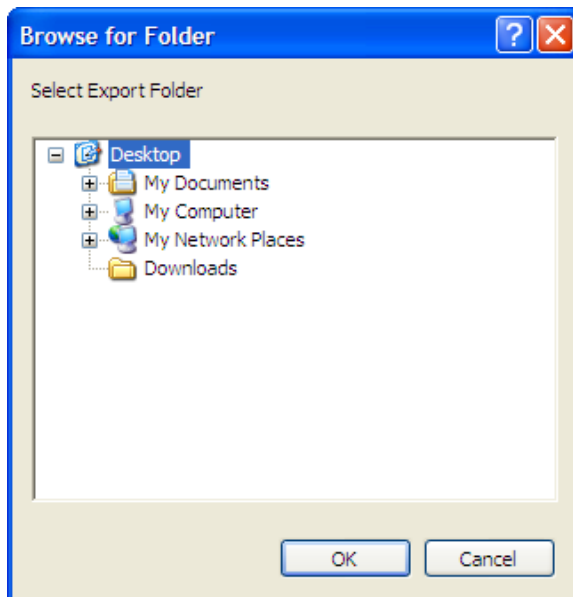
4.9 Exporting a Test Record in Microsoft® Excel® Format

You can export a test record in Microsoft® Excel® format. To export a test record in Excel® format:

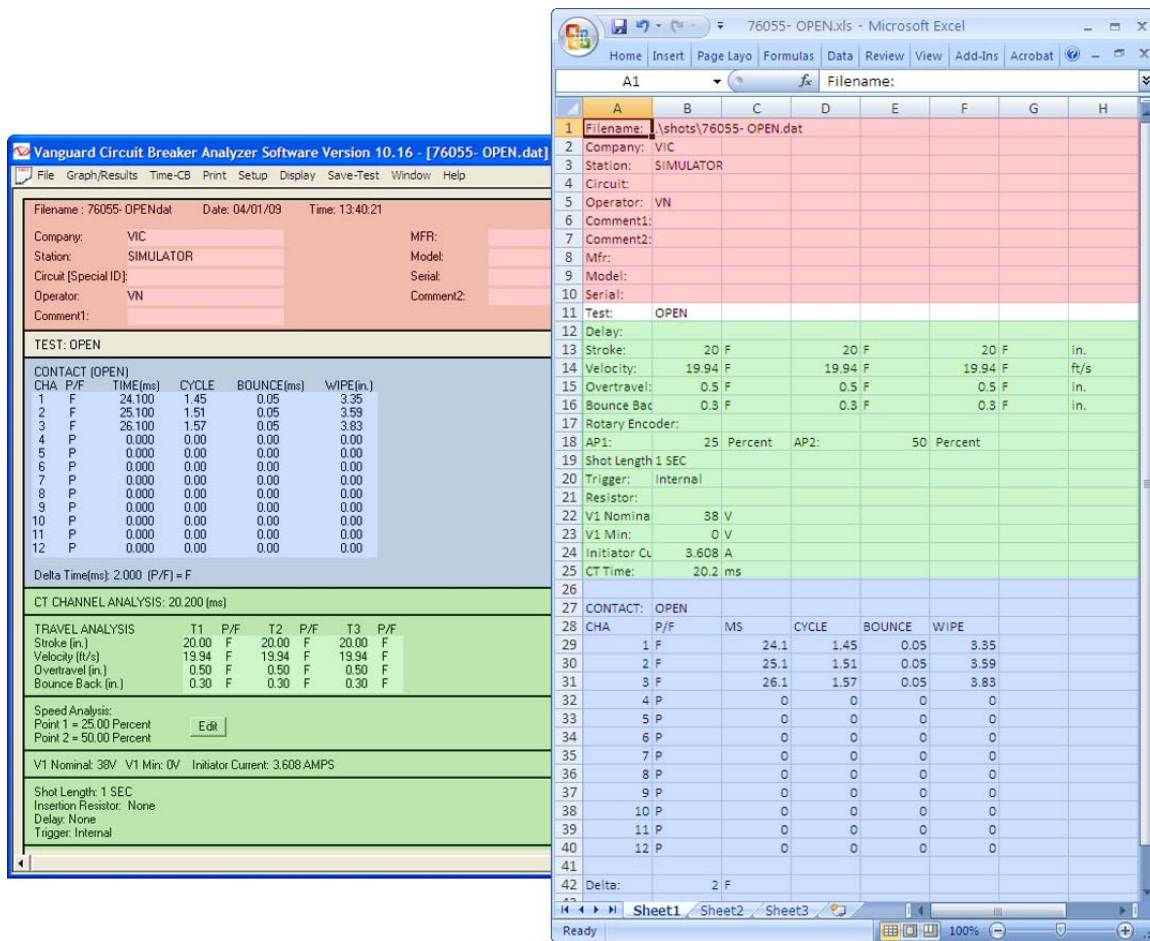
1. From the **File** menu, click on *File Utilities* and then select *Export Test Record to Excel*. The following window will be displayed:



2. If the test record you would like to export is not in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test record to be exported, click on the file name. You may select additional test records by holding down the **[CTRL]** key and clicking on each subsequent file name. Once you have selected the test record(s) to be exported, click on the "OK" button. The following window will be displayed:



3. Browse to the folder where you would like the Excel® files to be saved and click on the "OK" button. Figure 1 shows a test record in the VCBA software compared with the exported data in Excel®.



**Figure 1 Test Record in VCBA Software and Microsoft Excel
(corresponding sections highlighted in color)**

4.10 Viewing and Working with Tabulated Test Results

Once a test record has been retrieved (see sections 4.2 and 4.3 for instructions), the record details will be displayed as shown:

Vanguard Circuit Breaker Analyzer Software Version 10.16 - [76055- OPEN.dat]

File Graph/Results Time-CB Print Setup Display Save-Test Window Help

Filename: 76055- OPEN.dat Date: 04/01/09 Time: 13:40:21

Company: VIC MFR:

Station: SIMULATOR Model:

Circuit [Special ID]: Serial:

Operator: VN Comment2:

Comment1:

TEST: OPEN

CONTACT (OPEN)	CHA	P/F	TIME(ms)	CYCLE	BOUNCE(ms)	WIPE(in.)
1	F		24.100	1.45	0.05	3.35
2	F		25.100	1.51	0.05	3.59
3	F		26.100	1.57	0.05	3.83
4	P		0.000	0.00	0.00	0.00
5	P		0.000	0.00	0.00	0.00
6	P		0.000	0.00	0.00	0.00
7	P		0.000	0.00	0.00	0.00
8	P		0.000	0.00	0.00	0.00
9	P		0.000	0.00	0.00	0.00
10	P		0.000	0.00	0.00	0.00
11	P		0.000	0.00	0.00	0.00
12	P		0.000	0.00	0.00	0.00

Delta Time(ms): 2.000 (P/F) = F

CT CHANNEL ANALYSIS: 20.200 (ms)

TRAVEL ANALYSIS	T1	P/F	T2	P/F	T3	P/F
Stroke (in.)	20.00	F	20.00	F	20.00	F
Velocity (ft/s)	19.94	F	19.94	F	19.94	F
Overtravel (in.)	0.50	F	0.50	F	0.50	F
Bounce Back (in.)	0.30	F	0.30	F	0.30	F

Speed Analysis:
Point 1 = 25.00 Percent
Point 2 = 50.00 Percent

V1 Nominal: 38V V1 Min: 0V Initiator Current: 3.608 AMPS

Shot Length: 1 SEC
Insertion Resistor: None
Delay: None
Trigger: Internal

The menus on the menu bar will also change to provide additional options relevant to working with a test record.



NOTE

You can edit the test record header information (such as Company, Station, etc.) by entering data in the corresponding fields at the top of the screen.

4.10.1. Viewing the Test Plan for a Test Record

You can view the test plan for the test record by pressing the **[Page Down]** key on the keyboard. Below is an example of the test plan screen:

Vanguard Circuit Breaker Analyzer Software Version 10.16 - [76055- OPEN.dat]

File Graph/Results Time-CB Print Setup Display Save-Test Window Help

Filename : 76055- OPEN.dat Date: 04/01/09 Time: 13:40:21

Company: VIC MFR:

Station: SIMULATOR Model:

Circuit [Special ID]: Serial:

Operator: VN Comment2:

Comment1:

TEST: OPEN

Breaker Test Parameters

Contact Analysis

	OPEN (ms)	CLOSE (ms)	C-O (LIVE) (ms)	O-C (DEAD) (ms)
Contact Low	0.0	0.0	0.0	0.0
Contact High	0.0	0.0	0.0	0.0
Contact Delta	0.0	0.0		
Res On Low	0.0	0.0	0.0	0.0
Res On High	0.0	0.0	0.0	0.0
Res On Delta	0.0	0.0		

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: PT#1 (25.00 Percent) PT#2 (50.00 Percent)

Close Analysis: PT#1 (25.00 Percent) PT#2 (50.00 Percent)

Manual Stroke Override: Disabled Velocity Calculation: Normal

You can return to the test record details by pressing the **[Page Up]** key.

You may edit any of the test plan parameters by typing a new value in the input field. Press the **[ENTER]** or **[TAB]** key after entering a value.

Open and Close analysis points can also be changed by clicking on the “Edit” button to the right of each corresponding label.

The Manual Stroke Override can also be changed by clicking on the “Edit” button to the right of the label.



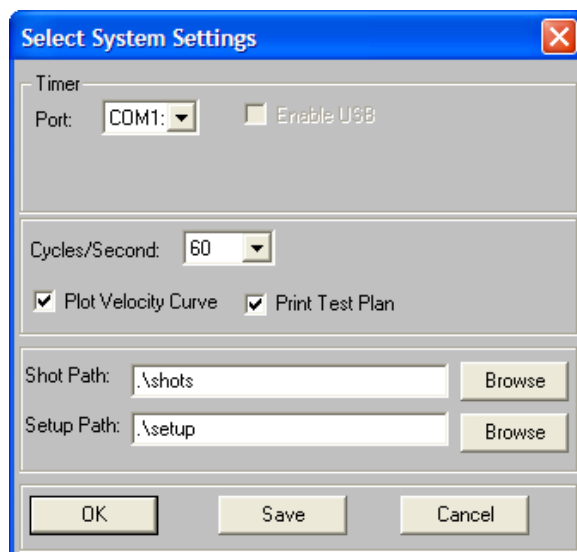
NOTES

- 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 5.6 for further information.
- The Contact Analysis values can also be changed from the menu system. From the **File** menu, click on *Setup* and then click on *Contact Analysis*. Then select the option you would like to edit. If the contact analysis parameters are changed, the Pass/Fail results will be updated based on the new parameters.
- The Travel Analysis values can also be changed from the menu system. From the **File** menu, click on *Setup* and then click on *Travel Analysis*. Then select the option you would like to edit. If the travel analysis values are changed, the Pass/Fail results will be updated based on the new parameters.
- If the Open and Close analysis points are changed, the VCBA software will recalculate the circuit breaker velocity and update the Pass/Fail results.

4.10.2. Printing Tabulated Test Results

To print the tabulated test results:

1. Retrieve the test record that you would like to print (See sections 4.2 and 4.3).
2. If you would like to print the test parameters with the tabulated test results:
 - From the **File** menu click on *System Config* and then click on *System Setup...*
The following window will appear:



Make sure the “Print Test Plan” checkbox is checked. If it is not checked, click on the checkbox and a check mark will appear.

- Click on the “OK” button.
3. Click on the **Print** menu and select *Print Tabulated*.
 4. Select the printer that you would like to print to and click on the “OK” button. The tabulated test results will be printed on the selected printer. A typical CB tabulated test report printout is shown in Figure 2. A typical CB test parameters printout is shown in Figure 3.

CIRCUIT BREAKER TIMING REPORT									
Filename : 76055- OPENDat		Date: 04/01/09		Time: 13:40:21					
Company: VIC Station: SIMULATOR Circuit [Special ID]: Operator: VN Comment1:				MFR: Model: Serial: Comment2:					
TEST: OPEN									
CONTACT (OPEN)									
CHA	P/F	TIME(ms)	CYCLE	BOUNCE(ms)	WIPE(in.)				
1	F	24.100	1.45	0.05	3.35				
2	F	25.100	1.51	0.05	3.59				
3	F	26.100	1.57	0.05	3.83				
4	P	0.000	0.00	0.00	0.00				
5	P	0.000	0.00	0.00	0.00				
6	P	0.000	0.00	0.00	0.00				
7	P	0.000	0.00	0.00	0.00				
8	P	0.000	0.00	0.00	0.00				
9	P	0.000	0.00	0.00	0.00				
10	P	0.000	0.00	0.00	0.00				
11	P	0.000	0.00	0.00	0.00				
12	P	0.000	0.00	0.00	0.00				
Delta Time(ms): 2.000 (P/F) = F									
CT CHANNEL ANALYSIS: 20.200 (ms)									
TRAVEL ANALYSIS									
		T1	P/F	T2	P/F	T3	P/F		
Stroke (in.)		20.00	F	20.00	F	20.00	F		
Velocity (ft/s)		19.94	F	19.94	F	19.94	F		
Overtravel (in.)		0.50	F	0.50	F	0.50	F		
Bounce Back (in.)		0.30	F	0.30	F	0.30	F		
Speed Analysis:									
Point 1 = 25.00 Percent									
Point 2 = 50.00 Percent									
V1 Nominal: 38V V1 Min: 0V Initiator Current: 3.608 AMPS									
Shot Length: 1 SEC									
Insertion Resistor: None									
Delay: None									
Trigger: Internal									
<small>Vanguard Circuit Breaker Analyzer Software, Version 10.16 Vanguard Instruments Co. Inc. www.vanguard-instruments.com</small>									

Figure 2 Typical CB Tabulated Test Report

Filename : 76055- OPENDat Date: 04/01/09 Time: 13:40:21

Company: VIC
 Station: SIMULATOR
 Circuit [Special ID]:
 Operator: VN
 Comment1:

MFR:
 Model:
 Serial:
 Comment2:

TEST: OPEN

Breaker Test Parameters

Contact Analysis	OPEN	CLOSE	C-O (LIVE)	O-C (DEAD)
Contact Low	0.0 ms	0.0 ms	0.0 ms	0.0 ms
Contact High	0.0 ms	0.0 ms	0.0 ms	0.0 ms
Contact Delta	0.0 ms	0.0 ms		
Res On Low	0.0 ms	0.0 ms	0.0 ms	0.0 ms
Res On High	0.0 ms	0.0 ms	0.0 ms	0.0 ms
Res On Delta	0.0 ms	0.0 ms		

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: PT#1 (25.00 Percent) PT#2 (50.00 Percent)
 Close Analysis: PT#1 (25.00 Percent) PT#2 (50.00 Percent)

Manual Stroke Override: Disabled Velocity Calculation: Normal

Figure 3 Typical CB Test Parameters

4.11 Viewing and Working with Graphic Test Results

To display graphic results of a timing record:

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. Click on the **Graph/Results** menu. The graphic results will be displayed as shown in Figure 4. Click on the **Graph/Results** menu again to return to the tabulated test results screen. Alternatively, you can press **[CTRL]+[G]** to toggle between the two views.
3. There are a total of 6 graphic results pages. Press the **[Page Down]** key to view the next page. Press the **[Page Up]** key to view the previous page.

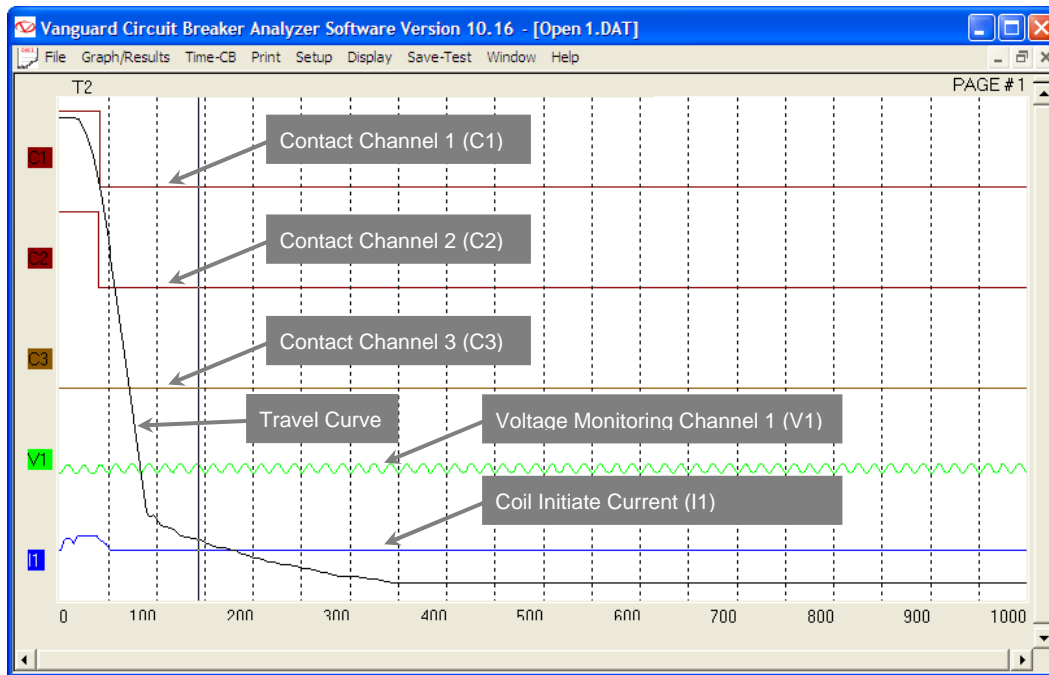


Figure 4 Graphic Test Results



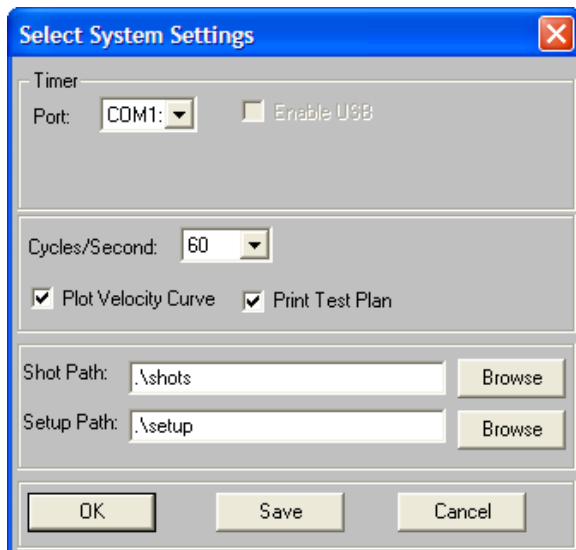
NOTES

- Contact channel ID's are shown as C1, C2, and C3 on the left side of the graph. Up to 12 contact channels can be displayed on one graphic report page.
- Voltage monitoring channel V1 is shown below contact channel C3.
- Coil initiate current is shown as I1.

4.11.1. Toggling the Display of the Velocity Curve

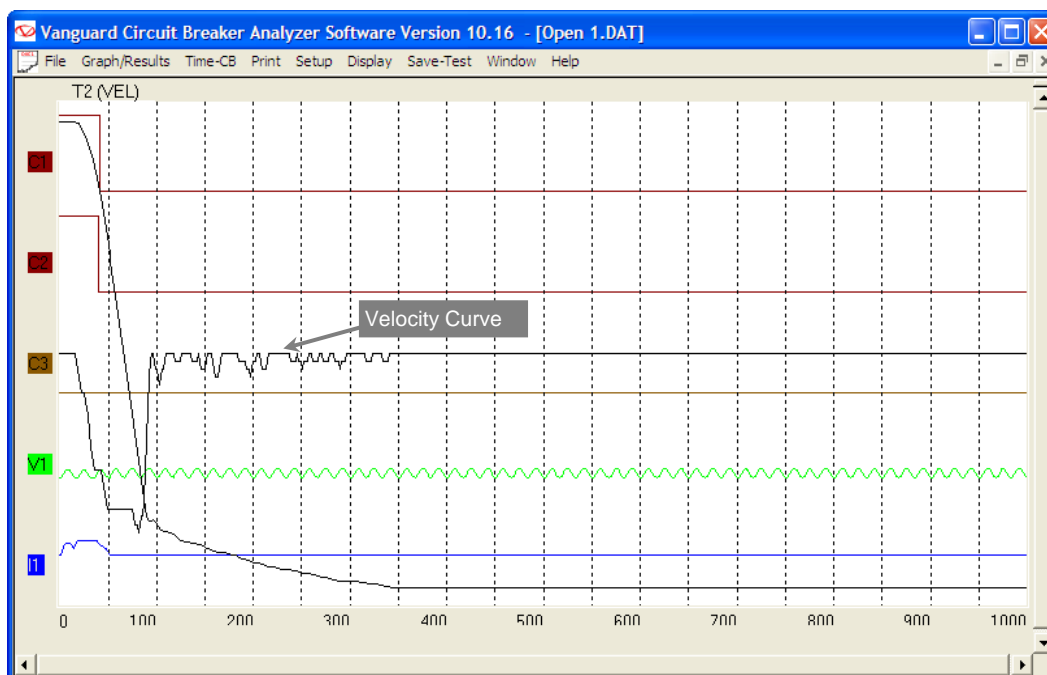
To plot the velocity curve on the graphic test results:

1. From the **File** menu click on *System Config* and then click on *System Setup...* The following window will be displayed:



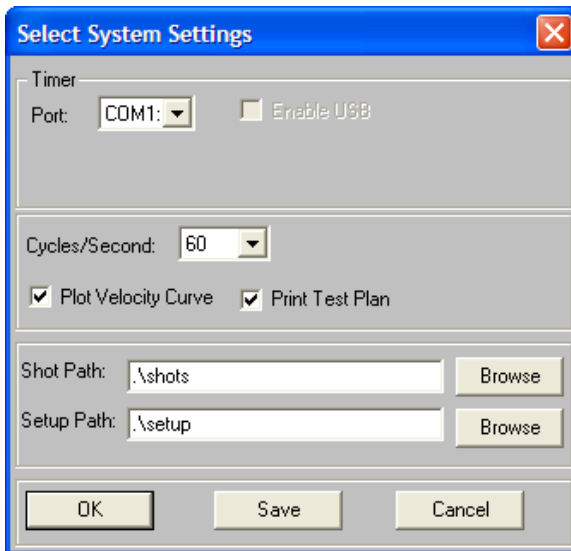
If the “Plot Velocity Curve” checkbox is not already checked, click on the checkbox and a check mark will appear. Click on the “Save” button, and then click on the “OK” button. If you do not click on the “Save” button, any settings you change will only stay active for the current session and will be reset the next time you run the software.

2. Click on the **Graph/Results** menu and the graphic test results will be displayed and will include the velocity curve as shown below:



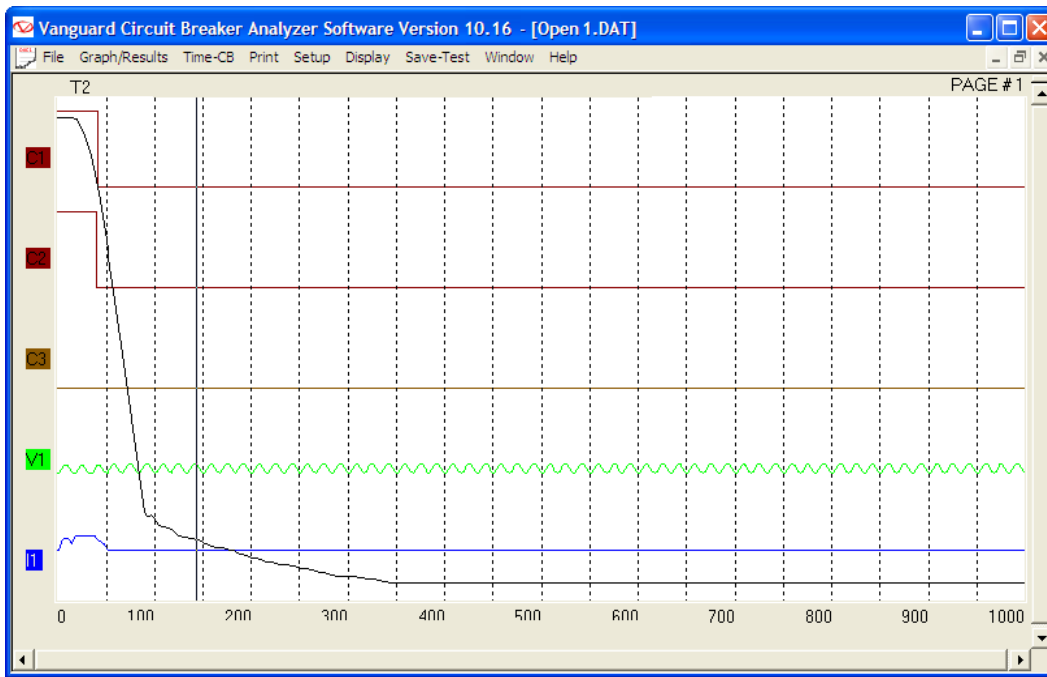
If you do not want to display the velocity curve on the graphic test results:

1. From the **File** menu click on *System Config* and then click on *System Setup...* The following window will be displayed:



If the “Plot Velocity Curve” checkbox is already checked, click on the checkbox to un-check it. Click on the “Save” button, and then click on the “OK” button. If you do not click on the “Save” button, any settings you change will only stay active for the current session and will be reset the next time you run the software.

2. Click on the **Graph/Results** menu and the graphic test results will be displayed without the velocity curve as shown below:



4.11.2. Customizing the Items Displayed on the Graphic Results Screen

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

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. Click on the **Graph/Results** menu to display the graphic test results.
3. Click on the **Display** menu and select *Channel Display...* The following window will be displayed:

4. You can customize what items are displayed on each page of the graphic results screen. Select the page number you would like to customize from the “Page #” drop down list.
5. In each input box, enter the channel number for the item you would like to display. In the example above, Contact Channels 1, 2, and 3 will be displayed on page 1 of the graphic results screen along with Voltage Channel 1, Current Channel 1, and Travel Channel 1. Be sure to enter 0 for all channels you do not want to display.

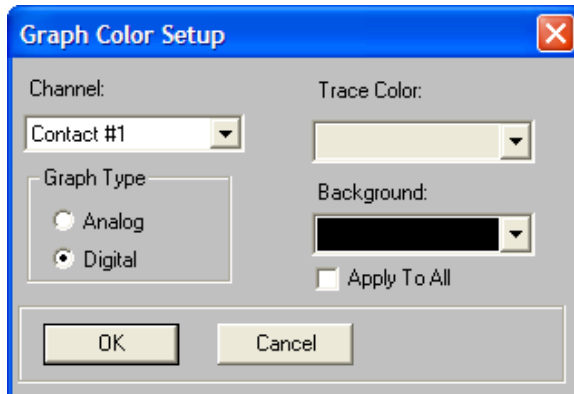
As another example, if you would like page 2 of the graphic results screen to show contact channels 4, 5, and 6, click on the “Page #” drop down list and select page 2. Then under the “Contact (1-24)” heading, enter 4, 5, and 6 in the first 3 boxes. Click on the “OK” button. Page two of the graphic results screen will now show the traces for contact channels 4, 5, and 6 while page one will display contact channels 1, 2, and 3.

6. Click on the “OK” button and the graphic test results screen will be updated with the new settings.

4.11.3. Customizing the Graph Colors

The foreground and background color of each Contact, Travel, Current, and Voltage trace can be customized. To change the trace colors:

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. Click on the **Graph/Results** menu to display the graphic test results
3. Click on the **Display Menu** and select *Graph Color...* The following window will be displayed:



4. From the “Channel” drop down list, select the channel that you would like to set the graph colors for. From the “Trace Color” drop down list, select the foreground color for the selected channel. From the “Background” drop down list, select the background color for the selected channel. You can repeat this process for each channel that you would like to customize.
5. Select the graph type by clicking either on the “Analog” or “Digital” radio button.



NOTE

A “Digital” graph type will display the contact trace as steps from open to close. An “Analog” graph type will display the contact trace as an analog waveform.

6. If you would like to apply the same color settings to all channels, click on the “Apply To All” checkbox.
7. Click on the “OK” button and the graphic test results screen will be updated with the new colors.

4.11.4. Overlaying Two Timing Shots

You can graphically compare two timing shots on the screen by overlaying them. 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.

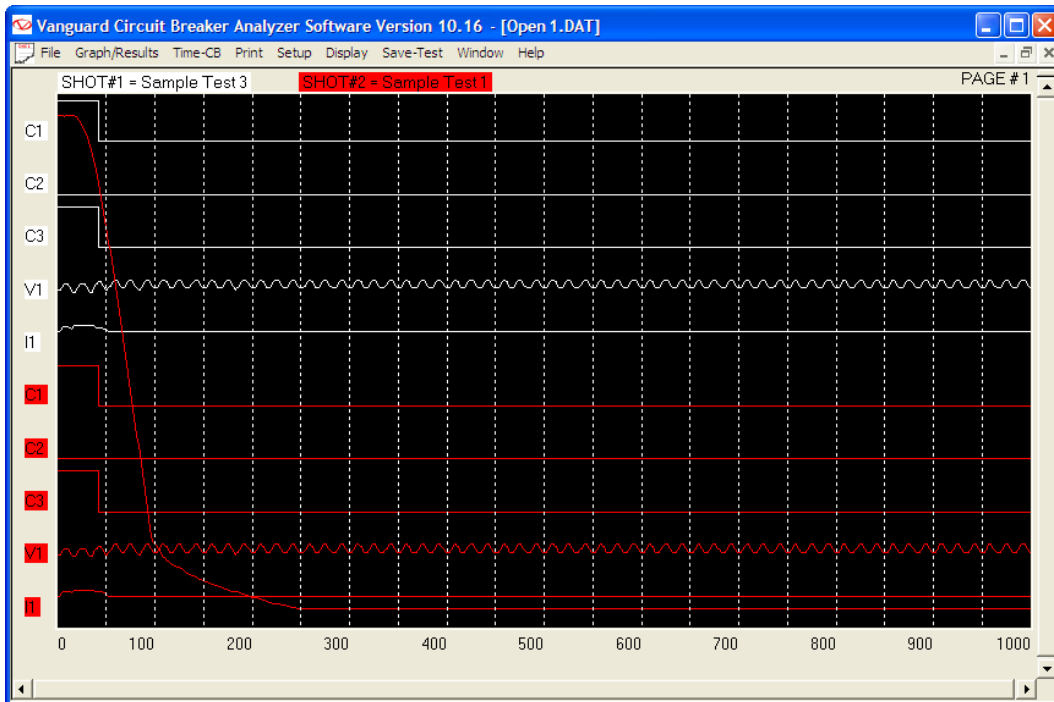
To graphically overlay two timing shots:

1. Click on the **File** menu and select *Overlay Test Records...* The following window will be displayed:



2. If the test records are not located in the current path, click on the "Path" button at the top left of the window and locate the folder on your computer containing the test records you would like to overlay.
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:



NOTES

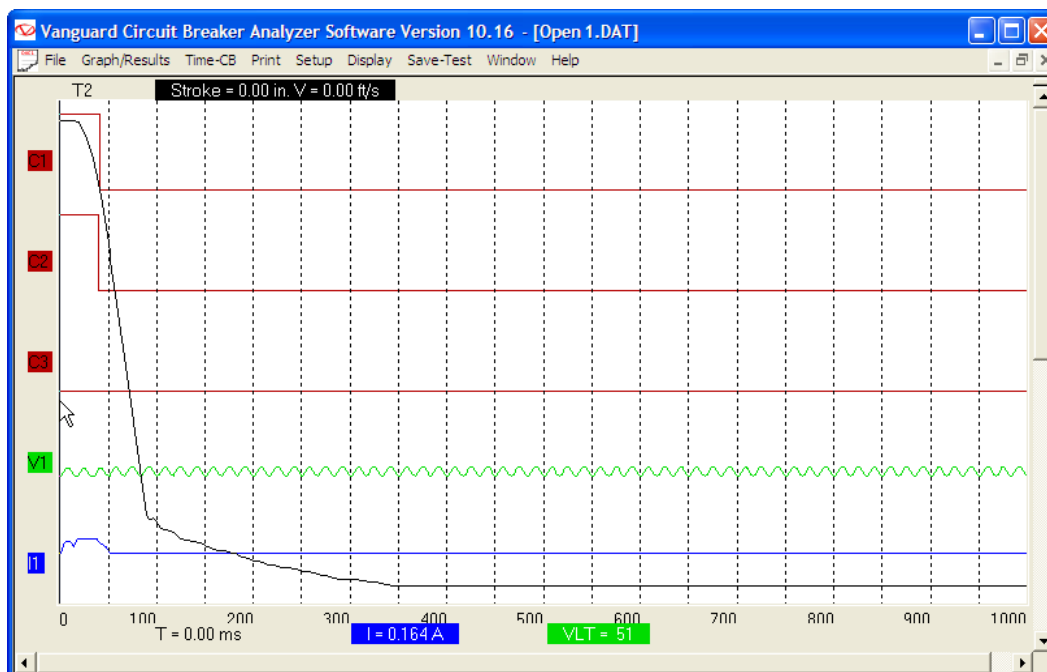
- Press the [**Page Down**] key to view the next page. Press the [**Page Down**] key to view the previous page.
- You can customize the test record overlay graph colors. Please see section 3.3 for further information.

5. If you would like to print the overlay graphs, click on the **Print** menu and select *Print Graphic*. If you would like to print the tabulated test results for both test records, click on the **Print** menu and select *Print Tabulated*.

4.11.5. 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 from 0ms to 300ms:

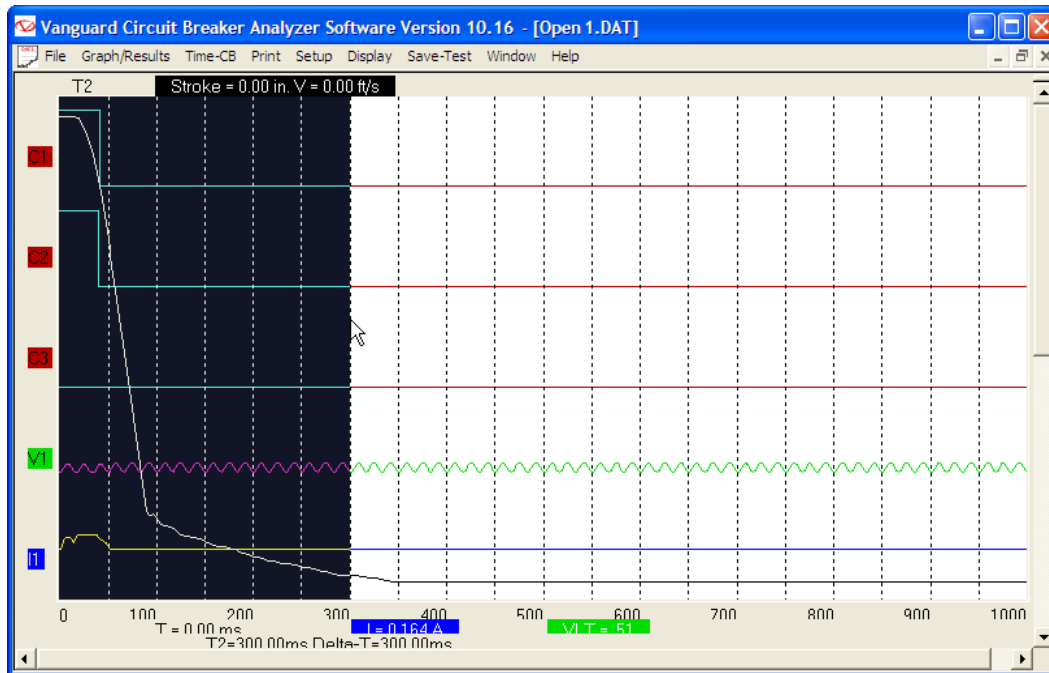
1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. Click on the **Graph/Results** menu to display the graphic test results.
3. Move the cursor over the graph area. A vertical hairline will appear at the cursor location. Also, the bottom of the graph will display the text “T=xx.xx ms” indicating the current location of the cursor. Move the cursor so that the vertical hairline is at 0ms and the text at the bottom of the graph reads “T=0.00ms” as shown below:



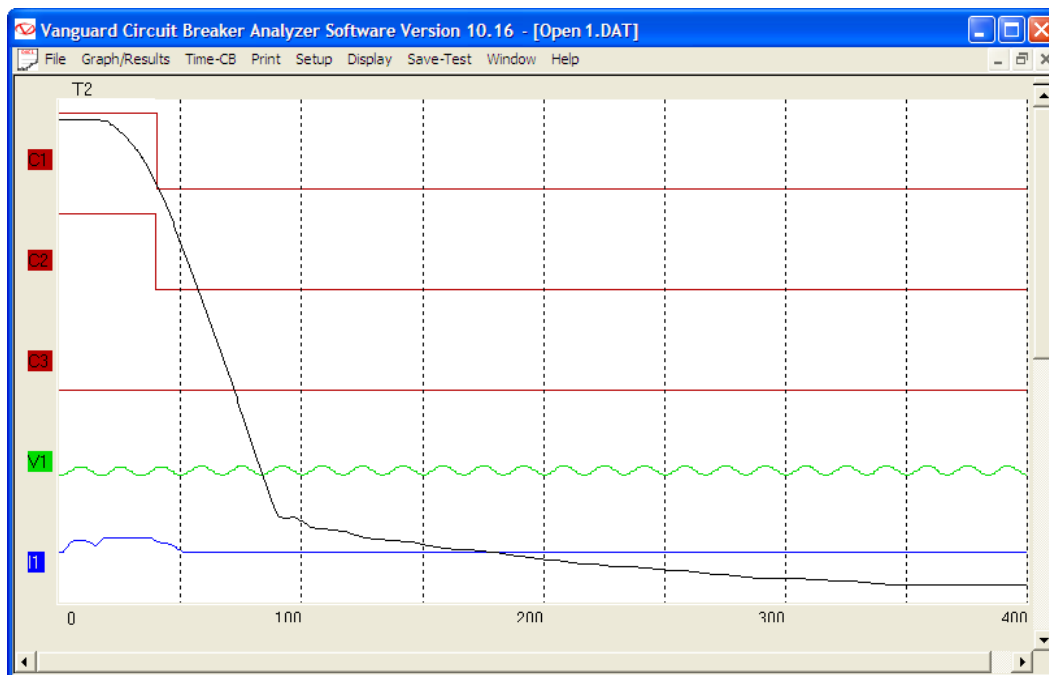
NOTES

When you move the cursor over a point on the graph, the Stroke and Velocity values are displayed above the graph, and the Time, Current, and Voltage are displayed below the graph.

4. Hold down the left mouse button and drag the cursor to the right till the vertical hairline is at 300ms and the text at the bottom of the graph reads "T=300.00 ms" as shown below:



5. Release the mouse button and an expanded graph of the selected region will be displayed as shown below:



6. You can further expand the expansion graph by using the steps above. The maximum expansion that can be viewed is a range of 100ms.

7. Click anywhere on the graph area to view the entire graph again.

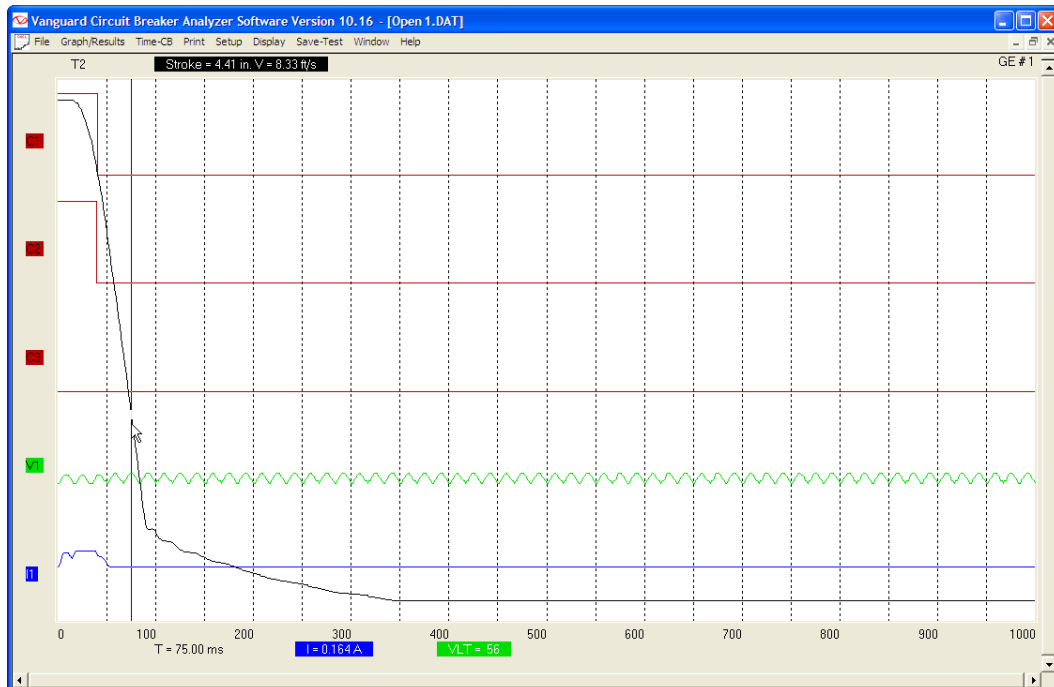
**NOTES**

- You can view an expansion of any of the graphic results pages. Simply press the **[Page Up]** and **[Page Down]** keys to view the desired graph page, and then follow the steps above to view an expansion.
- You can also use the steps above to view an expansion of a graphic overlay screen (see section 4.11.4 for further information about overlaying timing shots)

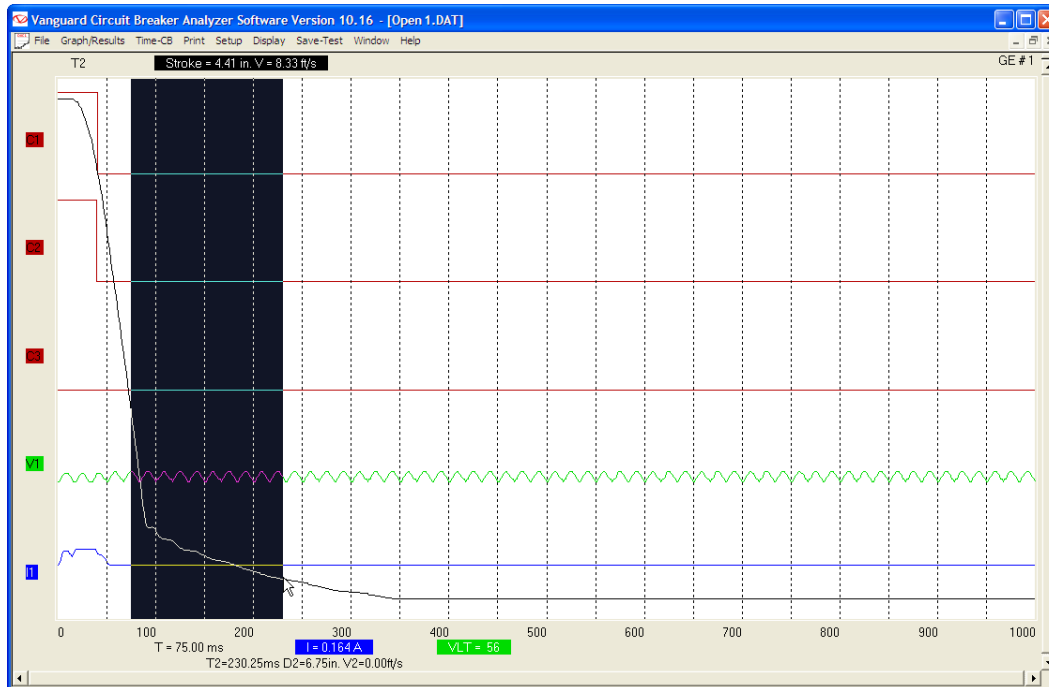
4.11.6. Calculating the Average Velocity From the Graphic Test Results

When viewing the graphic test results, you can view the velocity value at any point by moving the cursor over the point on the graph. The stroke and velocity value will be displayed at the top of the screen. You can also calculate the average velocity between two points by using the steps below:

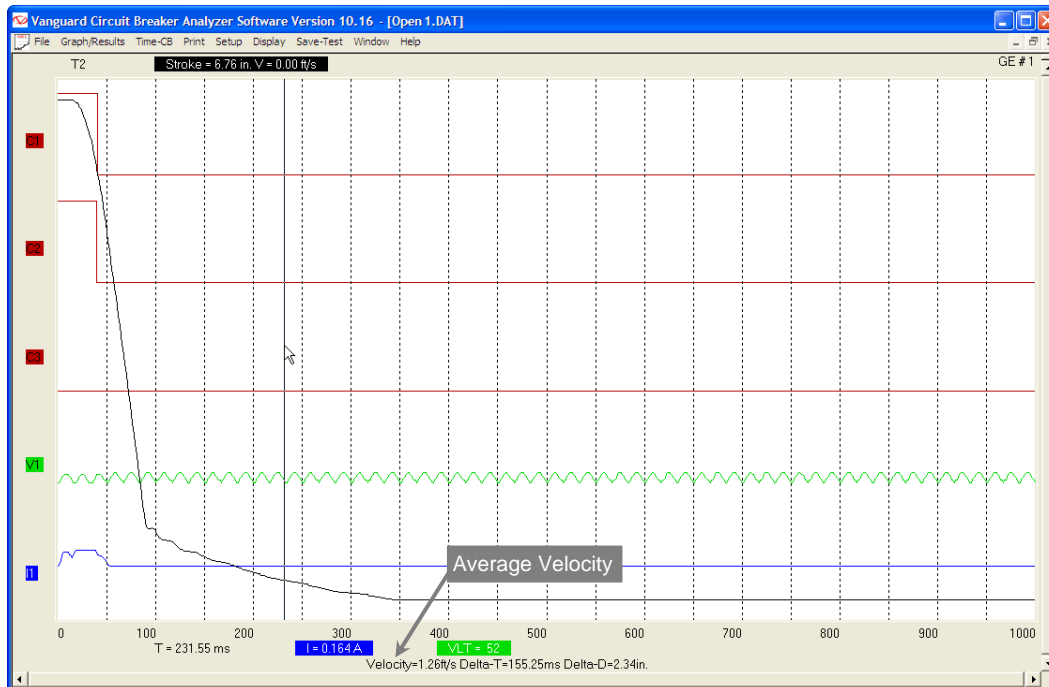
1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. Click on the **Graph/Results** menu to display the graphic test results.
3. Move the cursor to the first point on the travel curve. A vertical hairline will appear at the cursor location as shown below:



4. Hold down the **RIGHT** mouse button and drag the cursor to the second point on the travel curve:

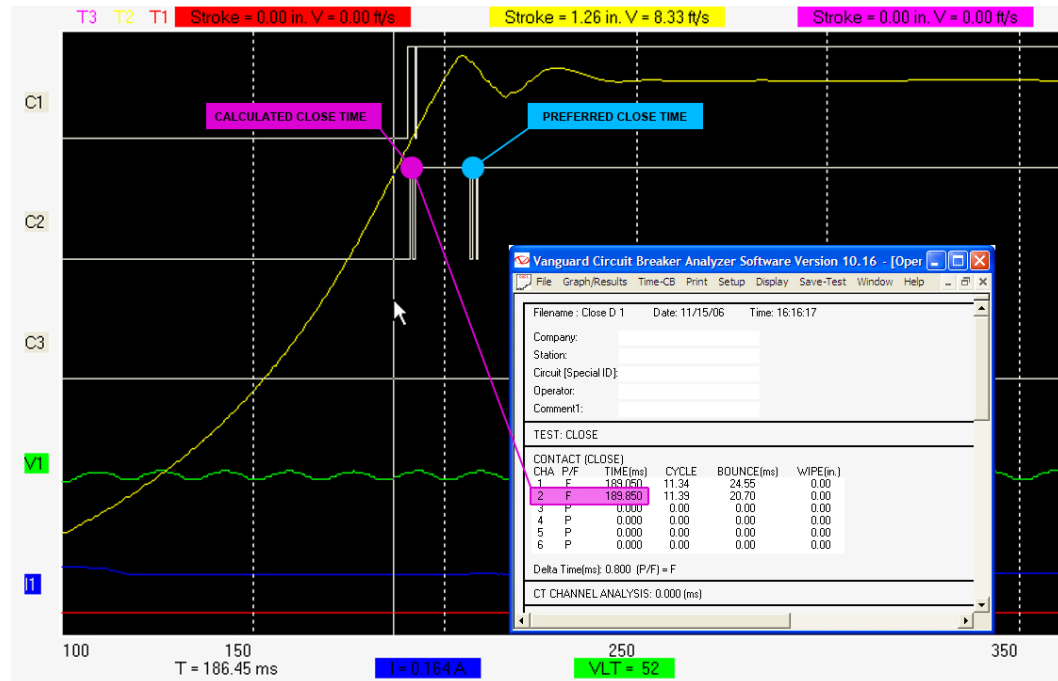


5. Release the mouse button and the average velocity between the selected two points (in m/s or ft/s) will be displayed at the bottom of the screen:



4.11.7. Manually Overriding Contact Time/Resistor Contact Time or Contact Wipe

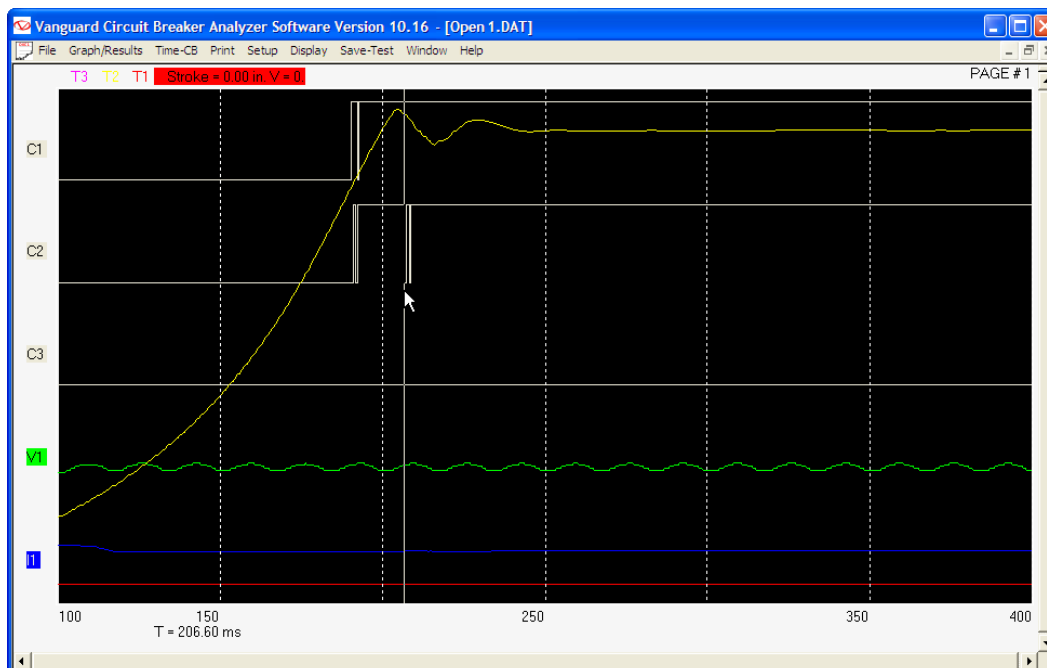
You can override the calculated Contact Time, Resistor Time, or Contact Wipe readings in the tabulated test results. This is a useful feature for situations where a manual calculation is preferred. For example, in the figure below, the calculated CLOSE time for channel 2 can be overridden with the preferred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



To override the calculated CLOSE time with the preferred time for the above example:

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3). The tabulated test results will be displayed.

- Click on the **Graph/Results** menu to display the graphic test results. Then move the cursor to the preferred time that you would like to use as the override value. In this example, the cursor is positioned at 206.60 ms as shown below (note that the time at the cursor position will be displayed at the bottom of the graph as T = x.x ms):



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

	Calculated	Override	Enable
Close:	189.050	0	<input type="checkbox"/>
Resistor:	0.000	0	<input type="checkbox"/>
Wipe:	0.000	0	<input type="checkbox"/>
	0.000	0	<input type="checkbox"/>
Resistor:	0.000	0	<input type="checkbox"/>
	0.000	0	<input type="checkbox"/>
Resistor:	0.000	0	<input type="checkbox"/>

- 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:

The dialog box titled "Contact Override" has a blue header bar with a close button. Below the header, there is a "Contact:" dropdown menu showing "2" and a "Time:" label with the value "206.600". The main area contains a table with two columns: "Calculated" and "Override". The rows are: "Close:" with "189.850" and an "Override" input field containing "0" and an "Enable" checkbox; "Resistor:" with "0.000" and an "Override" input field containing "0" and an "Enable" checkbox; "Wipe:" with "0.000" and an "Override" input field containing "0" and an "Enable" checkbox; another "Resistor:" row with "0.000" and an "Override" input field containing "0" and an "Enable" checkbox; and a final "Resistor:" row with "0.000" and an "Override" input field containing "0" and an "Enable" checkbox. At the bottom are "OK" and "Cancel" buttons.

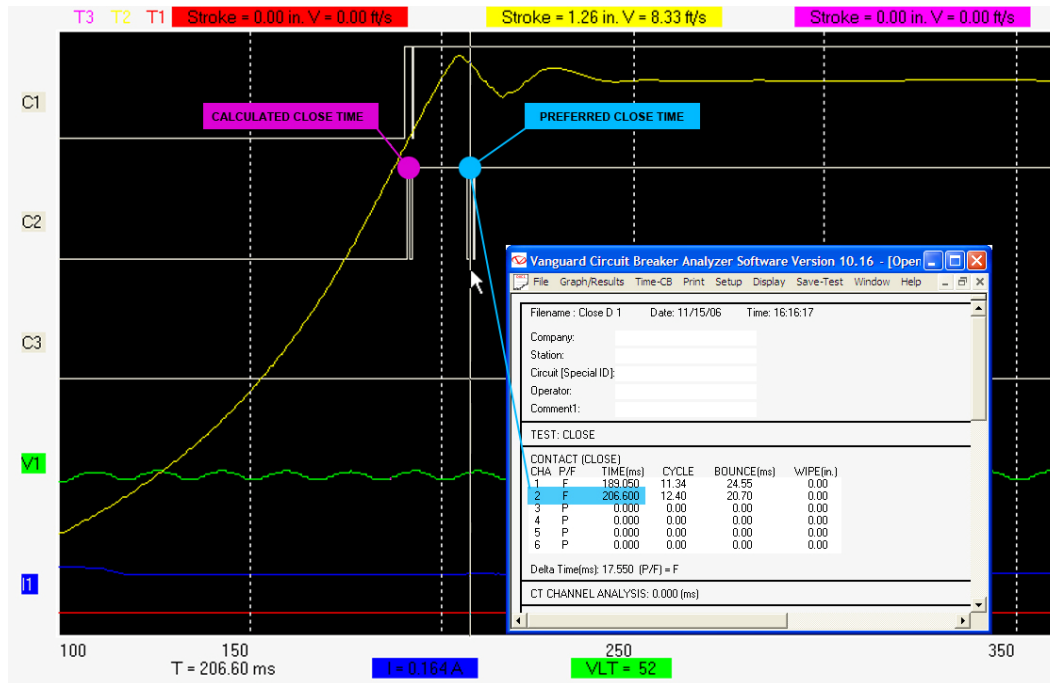
	Calculated	Override
Close:	189.850	0 <input type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable
Wipe:	0.000	0 <input type="checkbox"/> Enable
	0.000	0 <input type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable
	0.000	0 <input type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable

- 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 input area. Once enabled, the value from the cursor position will be inserted in the input area as shown:

The dialog box is the same as the previous one, but the "Close:" row now shows the "Override" input field containing "206.6" and the "Enable" checkbox checked. The other rows remain unchanged.

	Calculated	Override
Close:	189.850	206.6 <input checked="" type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable
Wipe:	0.000	0 <input type="checkbox"/> Enable
	0.000	0 <input type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable
	0.000	0 <input type="checkbox"/> Enable
Resistor:	0.000	0 <input type="checkbox"/> Enable

- Click on the “OK” button. The override value will be inserted in the tabulated test results as shown:



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:

- Retrieve the test record that you would like to view (See sections 4.2 and 4.3). The tabulated test results will be displayed.
- Press the **[F8]** key in either the tabulated results view or the graphic results view.
- The “Contact Override” window will be displayed as in the previous example above. Select the contact number from the “Contact:” dropdown list.
- 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.
- Click on the “OK” button and all enabled override values will be inserted in the tabulated test results.

4.11.8. Printing the Graphic Test Results

To print the graphic test results:

1. While viewing the tabulated or graphics test results of a test record, click on the **Print** menu and select *Print Graphic*.
2. Select the printer you would like to print to and click on the “OK” button. All graphic test results pages will be printed. A typical graphic results printout is shown in Figure 5 below.

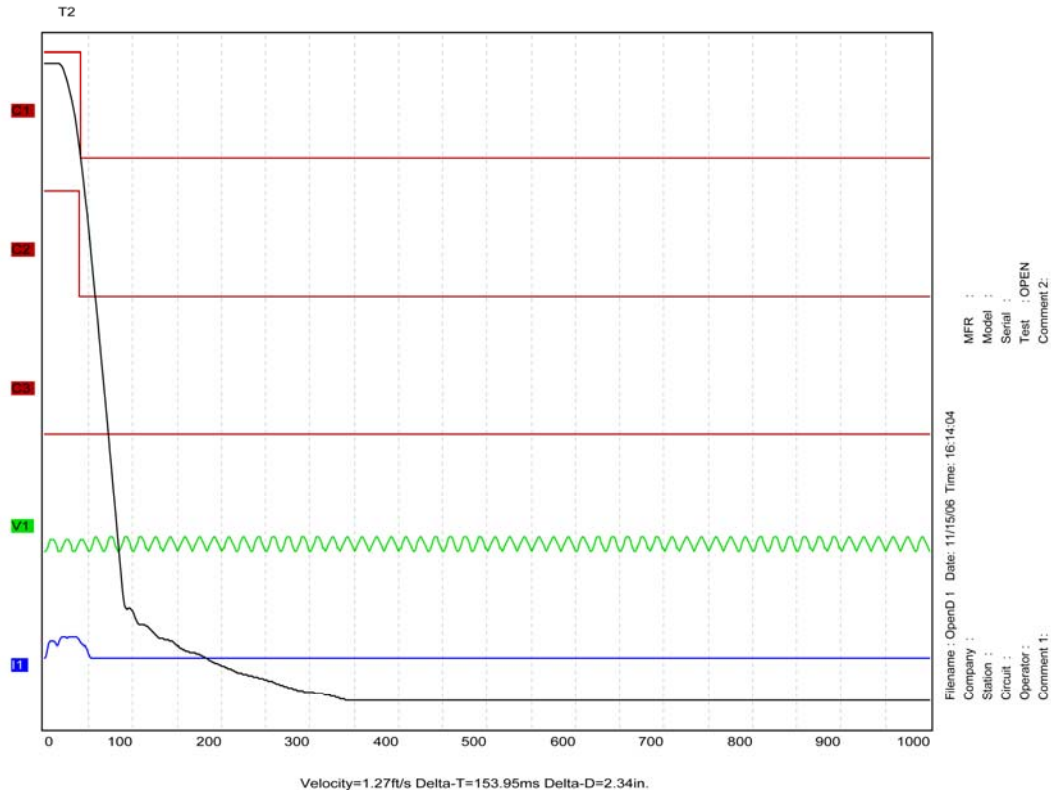


Figure 5 Typical Graphic Results Printout



NOTES

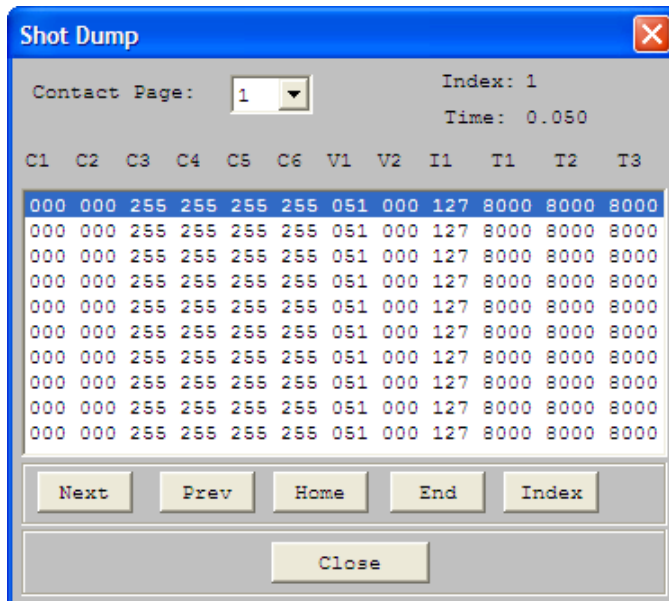
- The printout will have the same expansion scale as the scale displayed on the screen, so if you were viewing an expansion, the expansion graph will be printed.
- If you had checked the “Plot Velocity Curve” checkbox in the System Settings dialog box, the printout will include the Velocity Curve. Please see section 4.11.1 for further information on how to change this setting.
- Any customizations made to the graphic display (see sections 4.11.1, 4.11.2, and 4.11.3) will also apply to the printout. However, the background color of the printout will always be white.

4.12 Test Record Diagnostic Tools

4.12.1. Viewing Raw Shot Data

The VCBA software has the ability to view the raw test record data. To view a dump of this data:

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. From the **File** menu, click on *Diagnostics* and then select *Dump Shot Data...* The following window will be displayed:

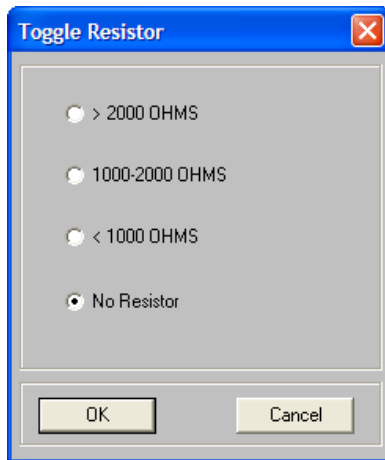


3. You can browse the raw shot data by clicking on the navigation buttons at the bottom of the window. Click on the “Close” button to close the window.

4.12.2. 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 (please see section 6.0 for information on how to perform timing tests). If this value is not entered for some reason, incorrect test results may be obtained. However, this can be corrected using the VCBA software. To set the resistor value for a test record:

1. Retrieve the test record that you would like to view (See sections 4.2 and 4.3).
2. From the **File** menu, click on *Diagnostics* and then select *Toggle Resistor Flag*. The following window will be displayed:



3. Select the insertion resistor value and click on the "OK" button. The VCBA software will calculate the main contact time and the resistor contact time based on the resistance value provided. The tabulated test results will be updated with the correct calculated values.



NOTES

To permanently apply the changes, be sure to save the test record after toggling the resistor flag. Please see section 4.4 for further information on how to save test records.

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 software and can be stored on the hard drive or transferred to a CB analyzer.

5.1 Exploring the Test Plans Directory

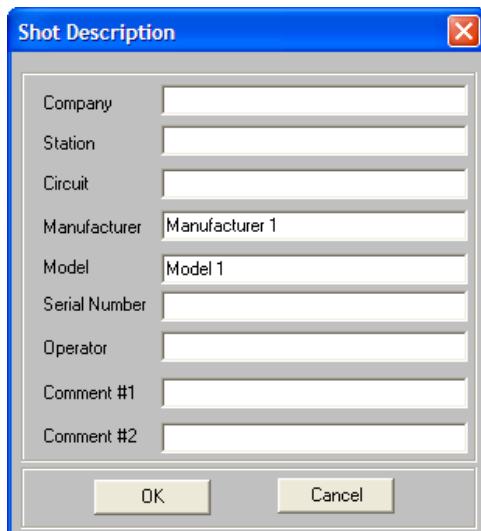
You can access the default test plans directory (please see section 3.4 for information on how to set the default test plan directory) either via Windows Explorer or from within the VCBA software. To open the test plans directory:

1. From the **File** menu, click on *System Config* and then select *Explore Test Plan Directory...* The default test plans directory will be opened in Windows Explorer.
2. Use standard Windows Explorer commands to organize, rename, copy, or delete the test plan files. You can also create folders in this directory to logically organize the test plans.

5.2 Creating a Circuit Breaker Test Plan

To create a circuit breaker test plan:

1. Close any open test plans or test records.
2. Click on the **Test-Plan** menu and select *Create Test Plan...* The following window will be displayed:

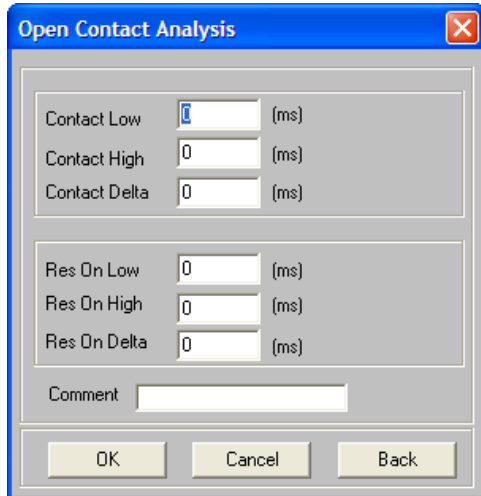


The image shows a 'Shot Description' dialog box with the following fields and values:

Field	Value
Company	
Station	
Circuit	
Manufacturer	Manufacturer 1
Model	Model 1
Serial Number	
Operator	
Comment #1	
Comment #2	

Buttons: OK, Cancel

3. Click on each input field and enter the relevant header data for each field. Two comment fields are also provided for any other relevant information. Click on the "OK" button. The following window will be displayed:



The dialog box titled "Open Contact Analysis" contains the following fields and controls:

- Contact Low:** A text box with the value "0" and a "(ms)" label.
- Contact High:** A text box with the value "0" and a "(ms)" label.
- Contact Delta:** A text box with the value "0" and a "(ms)" label.
- Res On Low:** A text box with the value "0" and a "(ms)" label.
- Res On High:** A text box with the value "0" and a "(ms)" label.
- Res On Delta:** A text box with the value "0" and a "(ms)" label.
- Comment:** A text box for entering a comment.
- Buttons:** "OK", "Cancel", and "Back" buttons at the bottom.

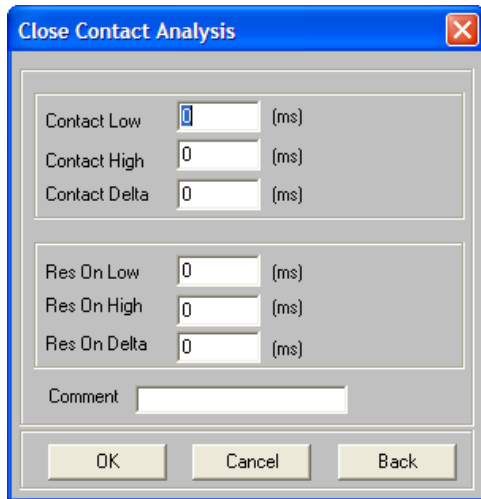
4. This dialog box is used to define the Open Contact Analysis parameters. Enter the Contact Low, Contact High, Contact Delta, Resistor On Low, Resistor On High, and Resistor On Delta times (in milli-seconds) in each corresponding field.



NOTES

- Contact Low is the fastest Open time of the circuit breaker main contacts.
- Contact High is the slowest Open 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 Open time of the circuit breaker insertion-resistor contacts.
- Resistor On High is the slowest Open Time of the circuit-breaker insertion-resistor contacts.
- Resistor On Delta is the maximum time between the fastest and slowest resistor contact time.
- Up to 20 characters can be entered in the Comment field.

After entering all the values, click on the “OK” button. The following window will be displayed:



The image shows a Windows-style dialog box titled "Close Contact Analysis". It has a blue title bar with a close button (X) in the top right corner. The dialog box contains several input fields for time values in milliseconds (ms). The fields are organized into two groups: "Contact" and "Res On". The "Contact" group includes "Contact Low", "Contact High", and "Contact Delta". The "Res On" group includes "Res On Low", "Res On High", and "Res On Delta". Each field has a text input box and a unit label "(ms)". Below these fields is a "Comment" label followed by a text input box. At the bottom of the dialog box are three buttons: "OK", "Cancel", and "Back".

Parameter	Value	Unit
Contact Low	0	(ms)
Contact High	0	(ms)
Contact Delta	0	(ms)
Res On Low	0	(ms)
Res On High	0	(ms)
Res On Delta	0	(ms)

Comment:

Buttons: OK, Cancel, Back

5. This dialog box is used to define the Close Contact Analysis parameters. Enter the Contact Low, Contact High, Contact Delta, Resistor On Low, Resistor On High, and Resistor On Delta times (in milli-seconds) in each corresponding field.

**NOTES**

- Contact Low is the fastest Close time of the circuit breaker main contacts.
- Contact High is the slowest Close 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 Close time of the circuit breaker insertion resistor contacts.
- Resistor On High is the slowest Close time of the circuit breaker insertion resistor contacts.
- Resistor On Delta is the maximum time between the fastest and the slowest resistor contact time.
- Up to 20 characters can be entered in the Comment field.

After entering all the values, click on the “OK” button. The following window will be displayed:

Live Time

Contact C-O (Live Time)

Min: 0 (ms)

Max: 0 (ms)

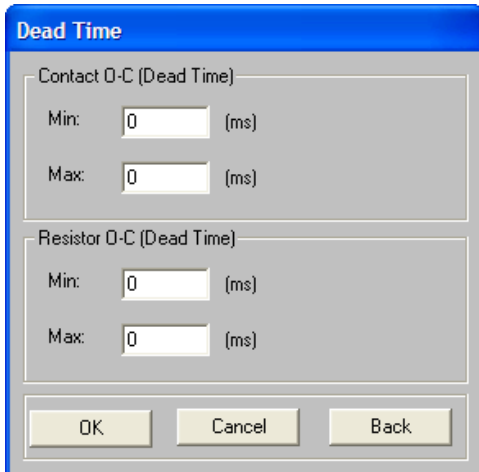
Resistor C-O (Live Time)

Min: 0 (ms)

Max: 0 (ms)

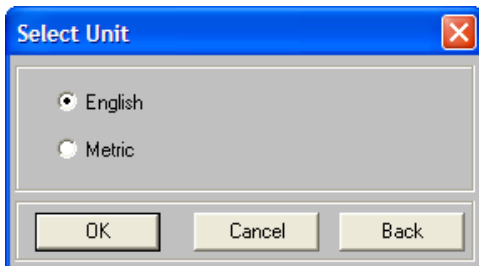
OK Cancel Back

6. This dialog box is used to define the Contact and Resistor Close-Open Times or “Contact Live Times” (in milli-seconds). Input the corresponding values for each field and click on the “OK” button. The following window will be displayed:



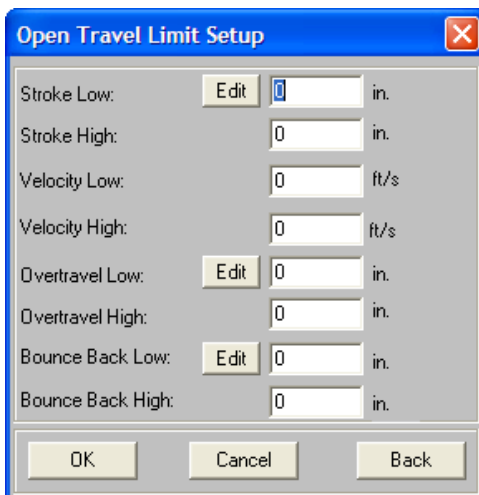
The **Dead Time** dialog box is used to define the Contact and Resistor Open-Close Times or "Contact Dead Times" (in milli-seconds). It features two sections: "Contact O-C (Dead Time)" and "Resistor O-C (Dead Time)". Each section contains "Min:" and "Max:" labels followed by a text input field set to "0" and a "(ms)" unit label. At the bottom are "OK", "Cancel", and "Back" buttons.

7. This dialog box is used to define the Contact and Resistor Open-Close Times or "Contact Dead Times" (in milli-seconds). Input the corresponding values for each field and click on the "OK" button. The following window will be displayed:



The **Select Unit** dialog box allows users to choose between English and Metric units of measure. It contains two radio buttons: "English" (selected) and "Metric". At the bottom are "OK", "Cancel", and "Back" buttons.

8. The VCBA's tabulated report supports both English and Metric units of measure. Click on the English or Metric radio button to set the units of measure, and then click on the "OK" button. The following window will be displayed:



The **Open Travel Limit Setup** dialog box is used to define the breaker's Open stroke, velocity, over-travel, and bounce-back limits. It contains eight rows of settings, each with a label, an "Edit" button, a text input field set to "0", and a unit label. The settings are: Stroke Low (in.), Stroke High (in.), Velocity Low (ft/s), Velocity High (ft/s), Overtravel Low (in.), Overtravel High (in.), Bounce Back Low (in.), and Bounce Back High (in.). At the bottom are "OK", "Cancel", and "Back" buttons.

9. This dialog box is used to define the breaker's Open 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 should always be zero.
- Overtravel High is the maximum contact distance travel above the Open position.
- Bounce Back Low is the minimum contact distance travel under the Open position and is usually set to zero.
- Bounce Back High is the maximum contact distance travel under the Open position.

Input the corresponding values for each field and click on the “OK” button. The following window will be displayed:

The dialog box titled "Close Travel Limit Setup" contains the following fields and controls:

Parameter	Unit	Current Value	Control
Stroke Low:	in.	3	Edit
Stroke High:	in.	5	
Velocity Low:	ft/s	0	
Velocity High:	ft/s	0	
Overtravel Low:	in.	0	Edit
Overtravel High:	in.	0	
Bounce Back Low:	in.	0	Edit
Bounce Back High:	in.	0	

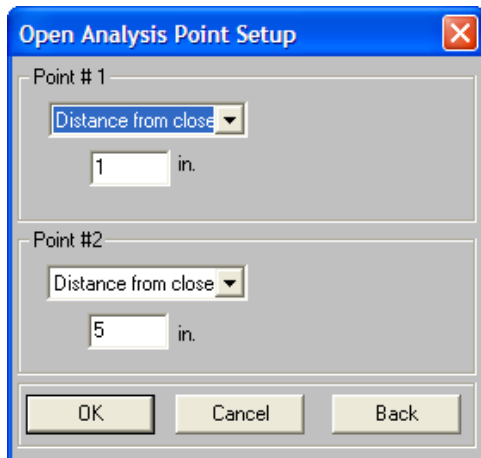
At the bottom of the dialog are three buttons: OK, Cancel, and Back.

10. This dialog box is used to define the breaker's Close stroke, velocity, over-travel, and bounce-back limits.

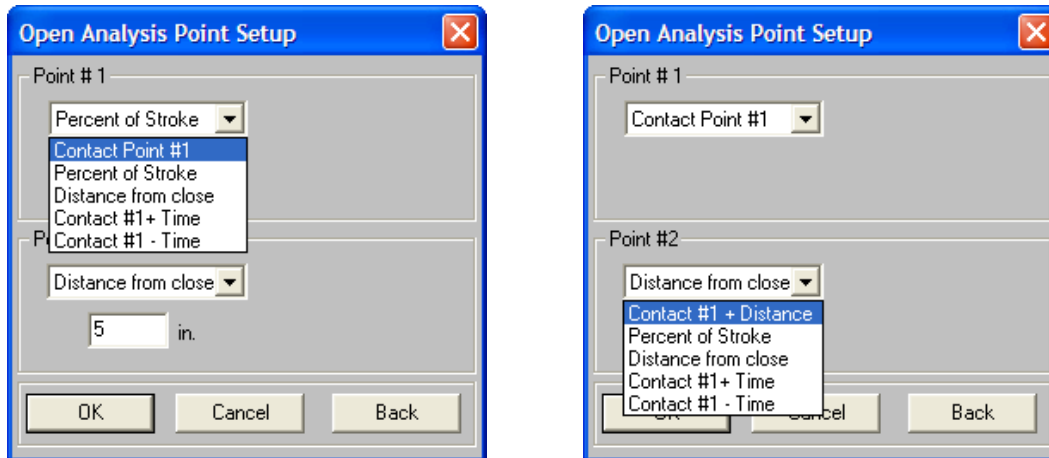
**NOTES**

- Stroke Low is the minimum distance of contact travel.
- Stroke High is the maximum distance of contact travel.
- Velocity Low is the minimum contact Close velocity.
- Velocity High is the maximum contact Close velocity.
- Overtravel Low should always be zero.
- Overtravel High is the maximum contact travel distance above the Close position.
- Bounce Back Low is the minimum contact travel distance under the Close position and is usually set to zero.
- Bounce Back High is the maximum contact travel distance under the Close position.

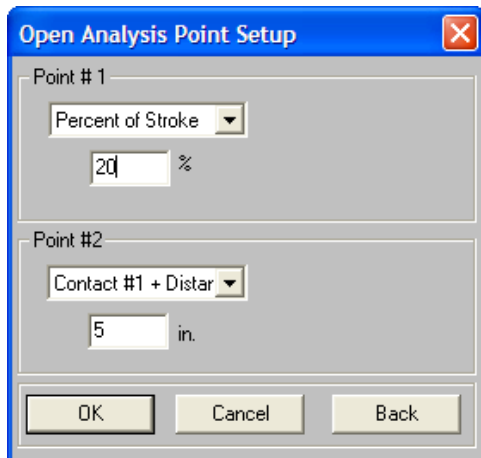
Input the corresponding values for each field and click on the “OK” button. The following window will be displayed:



11. This dialog box is used to set the Open Analysis Points (velocity calculation points). Click on each drop down list and select the desired option, and then input the relevant value in the input box below the drop-down list. The options for each analysis point are shown below:



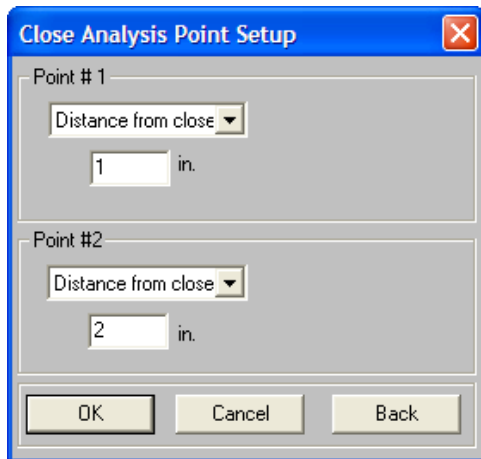
For example, if you would like the Open Analysis Point #1 value to be 20% of stroke, click on the “Point #1” drop down list, select “Percent of Stroke” and input 20 in the input field below the drop down list as shown below:



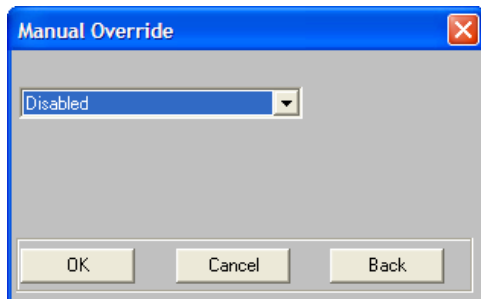
NOTES

- 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.

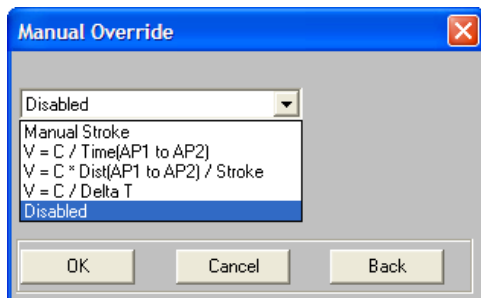
After you have set the values for both contact points, click on the “OK” button. The following window will be displayed:



12. This dialog box is used to set the Close Analysis Points. Set these values using the instructions in step 11 above. After you have set the values for both contact points, click on the "OK" button. The following window will be displayed:



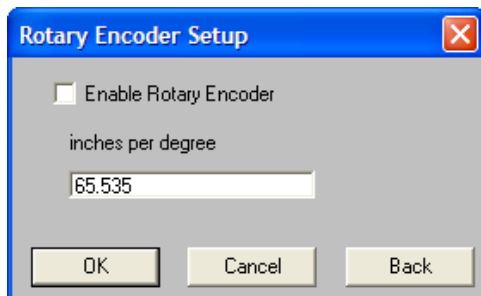
13. This dialog box can be used to select a velocity calculation formula. To select a formula, click on the drop down list and select the preferred calculation method. The available options are shown below:



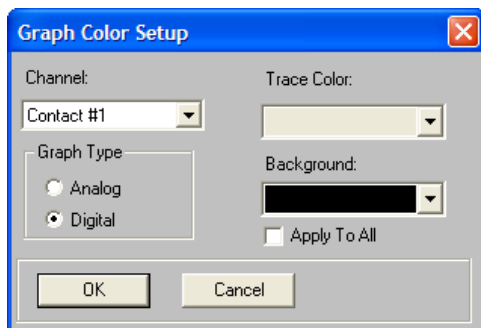
**NOTES**

- 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.
- $V = C / \text{Time}(\text{AP1 to AP2})$: Velocity is calculated by a user-defined constant divided by the time (in milli-seconds) between analysis point #1 and analysis point #2.
- $V = C * \text{Dist}(\text{AP1 to AP2}) / \text{Stroke}$: 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.

Click on the “OK” button and the following window will be displayed:

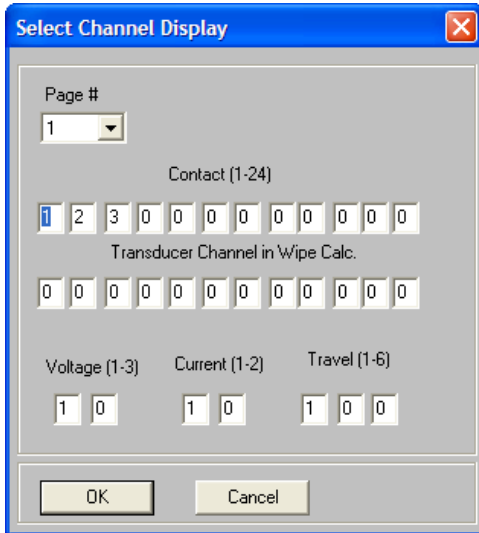


14. This dialog box can be used to enable the Rotary Encoder, if desired. If you would like to use this mode, click on the “Enable Rotary Encoder” check box and then input the number of inches per degree (or milli-meters per degree) in the input field below the check box. Click on the “OK” button to continue. The following window will be displayed:

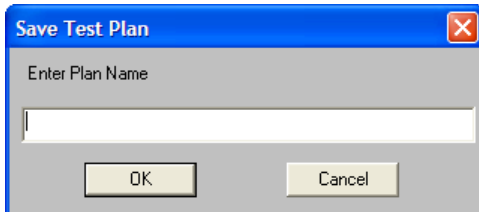


15. This dialog box can be used to set the foreground and background color of each Contact, Travel, Current, and Voltage trace. Please see section 4.11.3 for further information.

Once you have set the trace colors per the instructions in section 4.11.3, click on the “OK” button. The following window will be displayed:



16. This dialog box allows you to select which contact, travel, and voltage traces are displayed in the graphic test results. Please refer to section 4.11.2 for further information. Once you have input the values per the instructions in section 4.11.2, click on the “OK” button. The following window will be displayed:



17. Enter the file name for the test plan and click the “OK” button. The test plan will be saved on the hard drive in the default test plan directory and the details will be displayed on the screen.

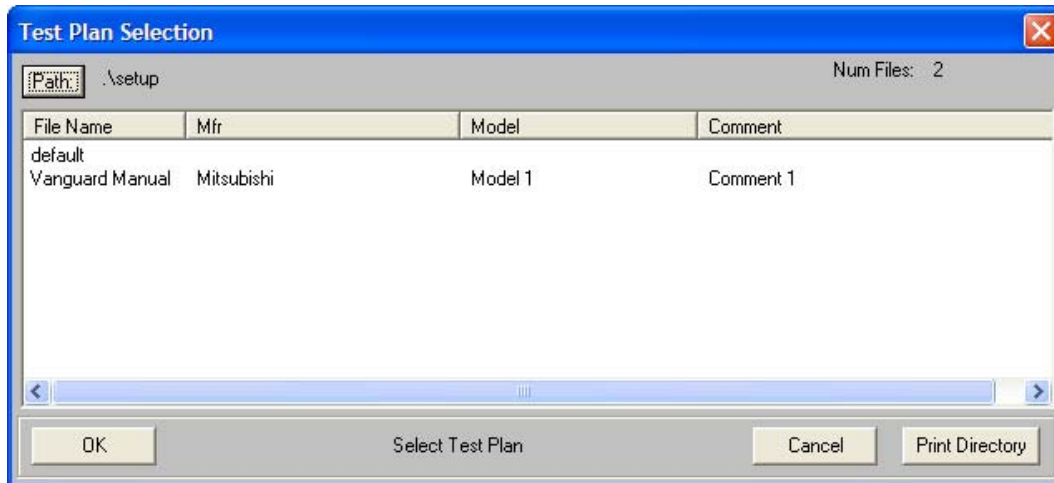
**NOTE**

You can change the default test plan directory. Please see section 3.4 for further information.

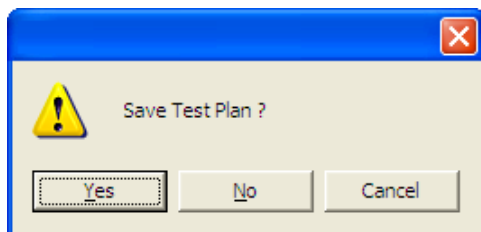
5.3 Modifying an Existing Circuit Breaker Test Plan

To modify an existing test plan:

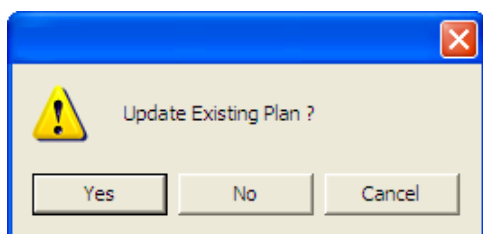
1. Close any open test records or test plans.
2. Click on the **Test-Plan** menu and select *Modify Test Plan...* The following window will be displayed:



3. The timing plans in the current directory will be listed. You may click on the “Path” button at the top of the window to browse to another location on your computer. Once you have located the test plan file, click on the file name, and then click on the “OK” button. The test plan file will be loaded.
4. You will then be presented with the same sequence of parameter windows as in section 5.2. Each window will display the corresponding data from the loaded timing plan. Make any necessary changes per the instructions in section 5.2. You may also click on the “Cancel” button and just view the tabulated test plan information.
5. After you have made the changes to the timing plan (or if you clicked on the “Cancel” button during the process), you will be asked if you would like to save the test plan:



6. If you do not want to save the changes to the test plan at this time, click on the “No” or “Cancel” button. If you would like to save the changes to the test plan, click on the “Yes” button. You will then be asked if you would like to overwrite the existing test plan file:



If you would like to overwrite the current test plan file on the hard drive, click on the “Yes” button. If you would like to provide a different file name, click on the “No” button. You will be asked to enter a new plan name. Enter the new file name for the plan and click on the “OK” button. The test plan will be saved with the new file name.

7. You will then be presented with the tabulated test plan information as shown below:

Vanguard Circuit Breaker Analyzer Software Version 10.16 - [Vanguard Manual.SET]

File Graph/Results Time-CB Print Setup Display Save-Test Window Help

Filename : c:\vanguard\VCBA\setup\Vanguard Manual.SET Date: 11/15/06 Time: 16:14:04

Company:	5.00	MFR:	Mitsubishi
Station:	Ontario	Model:	Model 1
Circuit (Special ID):	2	Serial:	1234567890
Operator:	Operator 1	Comment2:	Comment 2
Comment1:	Comment 1		

TEST: OPEN

Breaker Test Parameters

Contact Analysis	OPEN (ms)	CLOSE (ms)	C-O (LIVE) (ms)	O-C (DEAD) (ms)
Contact Low	54.0	121.5	12.0	5.0
Contact High	25.0	115.5	18.0	10.0
Contact Delta	15.2	90.0		
Res On Low	12.5	111.5	12.0	5.0
Res On High	8.4	119.4	18.0	10.0
Res On Delta	12.9	132.3		

Travel Analysis	OPEN		CLOSE	
Stroke Low	3.00	in.	3.00	in.
Stroke High	5.00	in.	5.00	in.
Velocity Low	2.00	ft/s	3.00	ft/s
Velocity High	5.00	ft/s	2.00	ft/s
Overtravel Low	0.00	in.	0.00	in.
Overtravel High	5.00	in.	5.00	in.
Bounce Back Low	0.00	in.	0.00	in.
Bounce Back High	10.00	in.	5.00	in.

Open Analysis: PT#1 (1.00 Percent) PT#2 (5.00 in.)

Close Analysis: PT#1 (1.00 in.) PT#2 (2.00 in.)

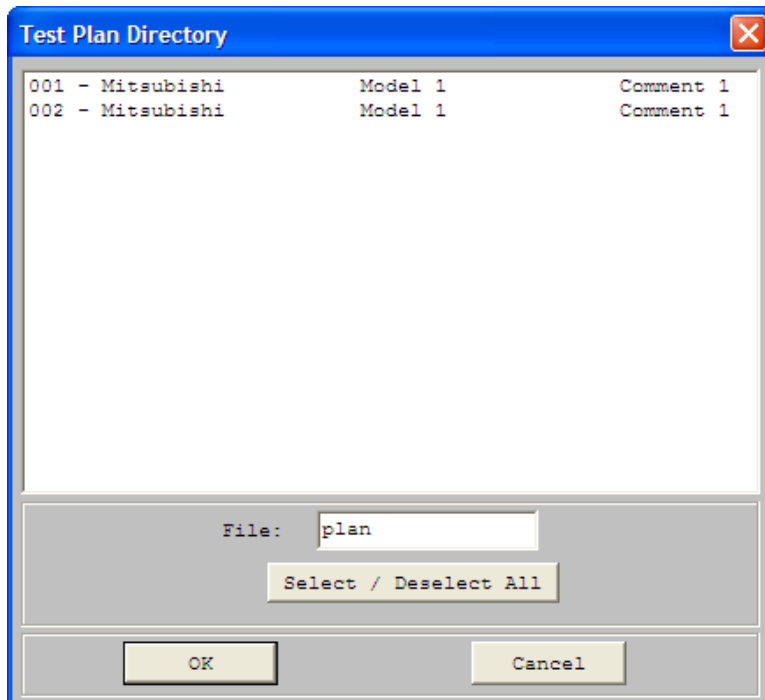
Manual Stroke Override: Disabled Velocity Calculation: Normal

8. You can make further changes to the timing plan by editing the tabulated values. Simply click on an input box and enter the new value, then press the **[TAB]** or **[ENTER]** key.

5.4 Retrieving a Test Plan from a CB Analyzer

To retrieve a test plan from a CB analyzer:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. The CB analyzer should enter Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Retrieve Test Plan from Timer...* The following window will be displayed:



4. Click on the test plan number that you would like to retrieve. You can select multiple test plans by clicking on the first plan number and then holding down the **[CTRL]** key and clicking on subsequent test plan numbers. You can also select all the test plans by clicking on the “Select/Deselect All” button. Clicking on the button again will deselect all test plans.
5. The “File” input field allows you to enter a word that will be used as prefix for the file name when it is transferred to the PC. When the test plan is transferred to the hard drive, the file name is in the following format:

plan01.SET

Text	CB Analyzer	File
from	Memory	Extension
“File”	Location	
Field	Number	

So if you would like the file name to be *“TESTPLAN01.SET”*, enter the word TESTPLAN in the “File” input field.

6. Click on the “OK” button to retrieve the selected test plans. The test plans will be stored in the default test plans directory.

**NOTE**

You can change the default test plan directory. Please see section 3.4 for further information.

5.5 Saving a Test Plan

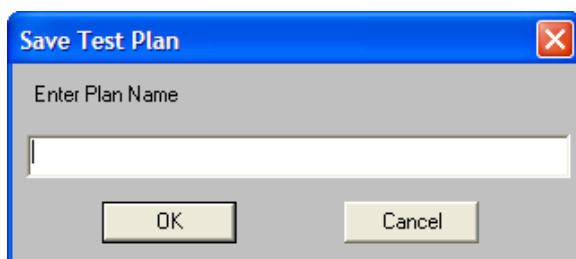
To save an open test plan:

1. Click on the **Setup** menu and select *Save Test Plan...*
2. The test plan will be saved with the current file name.

5.6 Saving a Test Plan from a Test Record

If you are viewing the tabulated test results of a test record, you can press the **[Page Down]** key to view the test plan portion of the test record. You can save the test plan by itself as a test plan file for future use. To save the test plan from a test record:

1. Retrieve the test record from the CB analyzer or from the PC hard drive per the instructions in section 4.2 or 4.3, respectively.
2. Click on the **Setup** menu and select *Save Test Plan...* The following window will be displayed:



3. Enter the file name for the test plan and click on the “OK” button. The test plan will be saved to the hard drive in the default test plan directory.



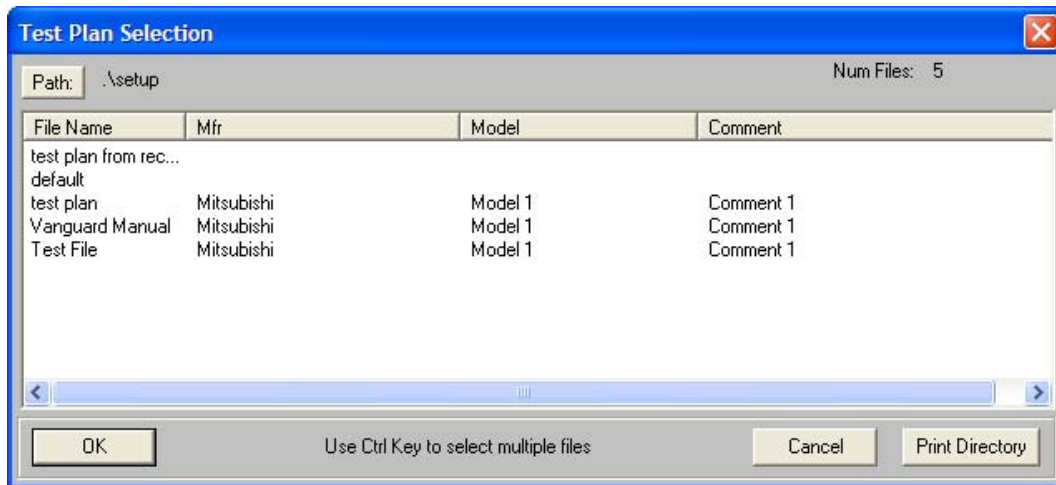
NOTE

You can change the default test plan directory. Please see section 3.4 for further information.

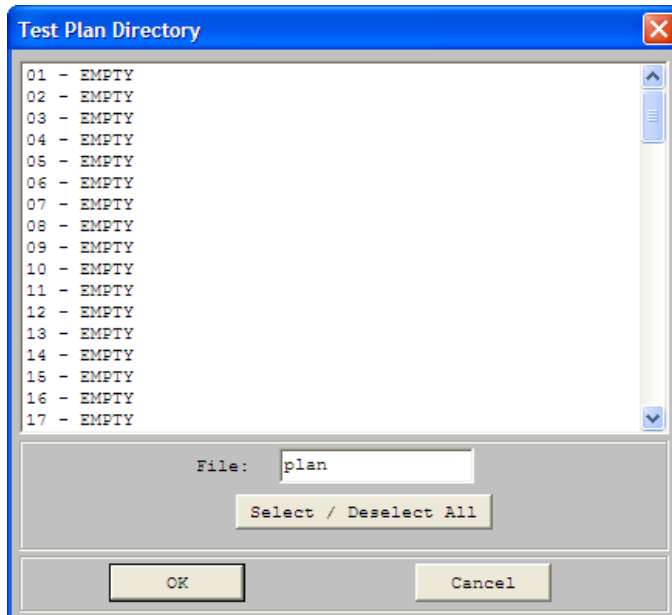
5.7 Transferring a Test Plan to a CB Analyzer

To transfer a test plan from the PC to a CB analyzer:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. The CB analyzer should enter Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Transfer Test Plan to Timer...* The following window will be displayed:



4. If the test plan you would like to transfer is not listed in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test plan file, click on the file name and then click on the "OK" button. The following window will be displayed:

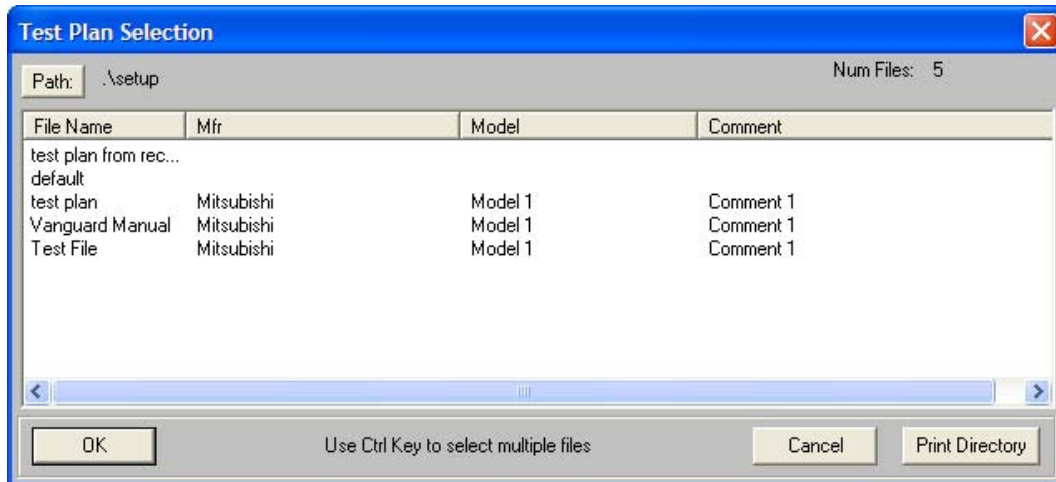


5. This is a directory listing of the test plan locations in the CB analyzer's Flash EEPROM and the test plans stored at each location. You can select an empty location to save to or you can click on a test plan name and replace the existing test plan at that location. Once you have selected a memory location to save to, click on the "OK" button.
6. You will hear some audible tones from the CB analyzer as the test plan is transferred to its Flash EEPROM.

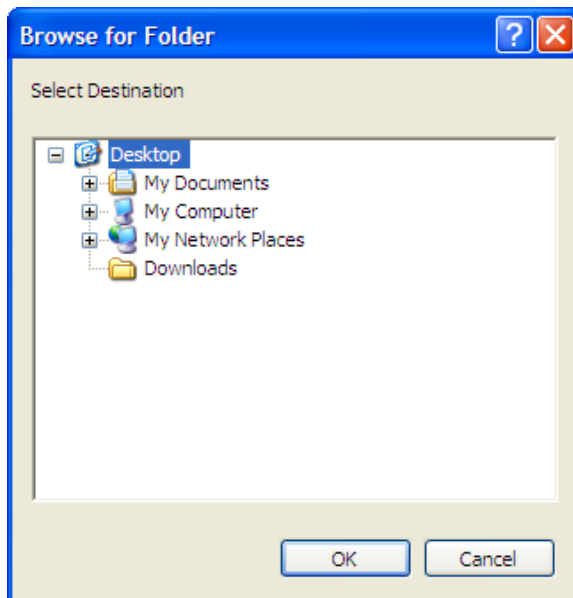
5.8 Copying a Test Plan to a Different Location

To copy a test plan from one location to another location:

1. From the **File** menu, click on *Setup* and then select *Copy Test Plan...* The following window will be displayed:



2. If the test plan you would like to copy is not listed in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test plan file, click on the file name to select it. You may select multiple files by holding down the [CTRL] key and then clicking on each subsequent file name. Once you have selected the test plan file(s) to be copied, click on the "OK" button. The following window will be displayed:

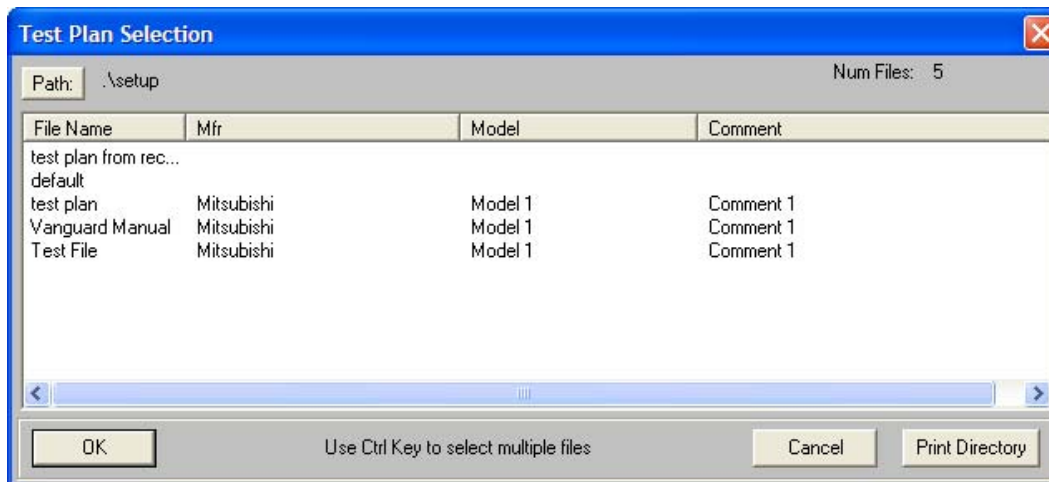


3. Browse to the folder where you would like the test plan file to be copied to and then click on the "OK" button. The test plan file will be copied to this directory with the same file name as the original file.

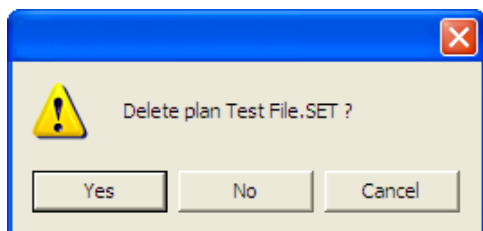
5.9 Deleting a Test Plan

To delete a test plan:

1. From the **File** menu, click on *Setup* and then select *Delete Test Plan...* The following window will be displayed:



2. If the test plan you would like to delete is not listed in the current directory, click on the "Path" button at the top of the window and browse to the directory containing the file. Once you have located the test plan file, click on the file name to select it. You may select multiple files by holding down the **[CTRL]** key and then clicking on each subsequent file name. Once you have selected the test plan file(s) to be deleted, click on the "OK" button. You will be presented with the following confirmation window for each file:

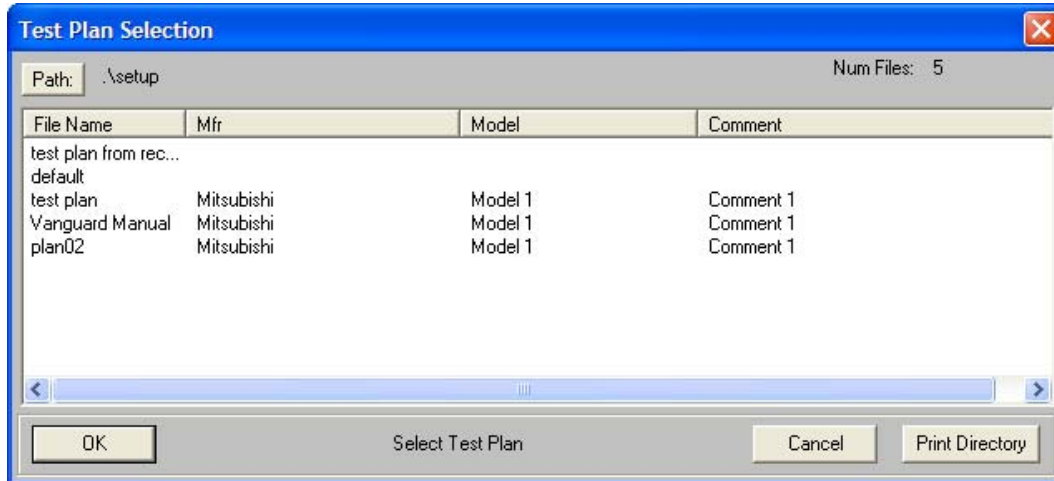


3. If you do not want to delete the selected file, click on the "No" or "Cancel" button. To delete the selected file, click on the "Yes" button. The selected test plan file will be deleted.

5.10 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 6.0 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 **Test-Plan** menu and select *Use Test Plan...* 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 "Path" button at the top 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 6.0. 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 software.

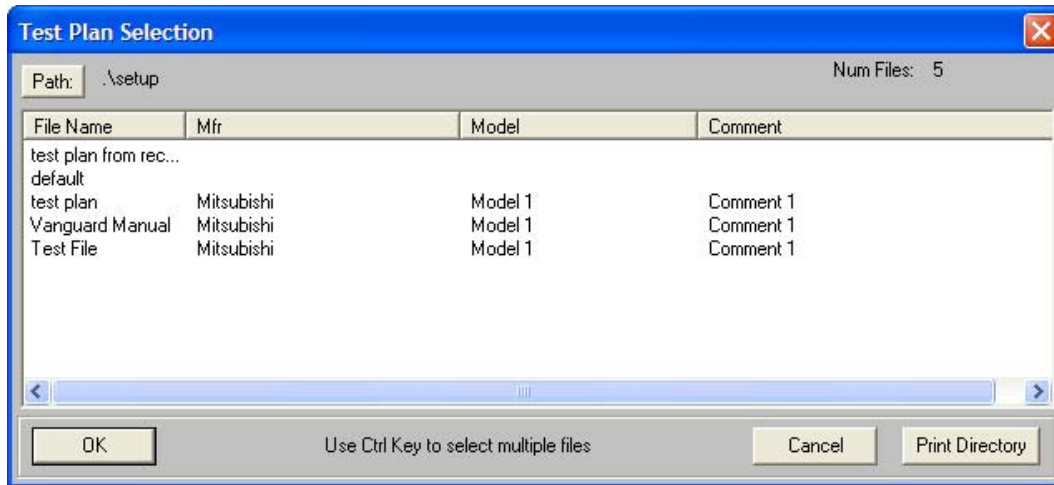
5.11 Printing a Test Plan

If you currently have a test plan open and would like to print it:

1. Click on the **File** menu and select *Print Tabulated*.
2. Select the printer you would like to print to and click on the “OK” button. The tabulated test results will be printed.

If you would like to print a test plan file that is not currently open:

1. From the **File** menu, click on *Setup* and then select *Print Test Plan*. The following window will be displayed:



2. If the test plan file you would like to print is not in the current directory, click on the “Path” button at the top of the window and browse to the directory containing the file. You can also print a listing of the current test plan directory by clicking on the “Print Directory” button. Following is a sample test plan directory printout:

Test Plan Directory c:\vanguard\vcba\shots				Page # 1
Filename	Mfr	Model	Comment	
test plan from record				
default				
test plan	Mitsubishi	Model 1	Comment 1	
Vanguard Manual	Mitsubishi	Model 1	Comment 1	
plan02	Mitsubishi	Model 1	Comment 1	

Once you have located the test plan, click on the file name and then click on the “OK” button.

3. Select the printer you would like to print to and click on the “OK” button. The tabulated test results will be printed.

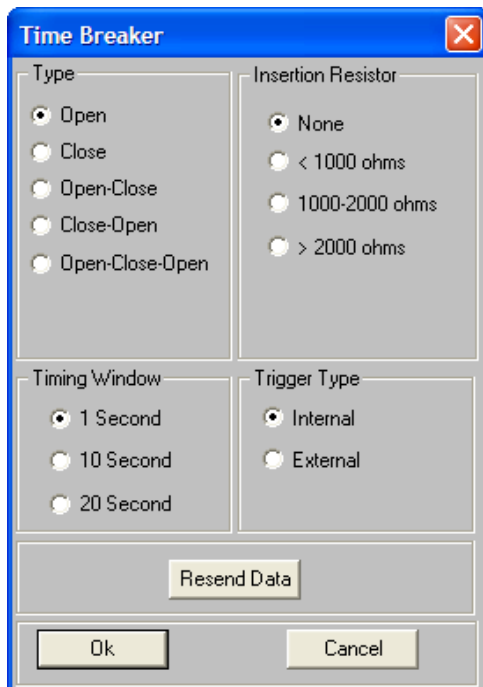
6.0 TIMING A CIRCUIT BREAKER USING THE VCBA SOFTWARE

The VCBA 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 5.10 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 or CLOSE test

To perform an OPEN or CLOSE test:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Time Breaker* (alternatively you can click on the **Time-CB** menu from the Main menu bar). The following window will be displayed:



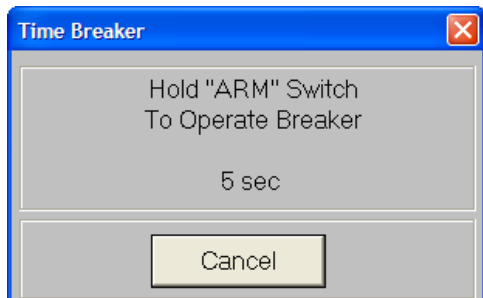
4. From the “Type” radio box group, select either “Open” or “Close”.
5. From the “Timing Window” radio box group, select the desired timing window.



NOTE

- For the 1-second timing window, the timing resolution is ± 100 micro-seconds
- For the 10-second timing window, the timing resolution is ± 1.0 milli-seconds
- For the 20-second timing window, the timing resolution is ± 2.0 milli-seconds

6. From the “Insertion Resistor” radio box group, select the desired insertion resistance value.
7. From the “Trigger Type” radio box group, select the trigger type.
8. Click on the “OK” button. The following window will be displayed:



9. 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 tabulated results will be displayed in the VCBA software main window. The test record will also be saved to a file named TEMP001.DAT in the default test record directory.

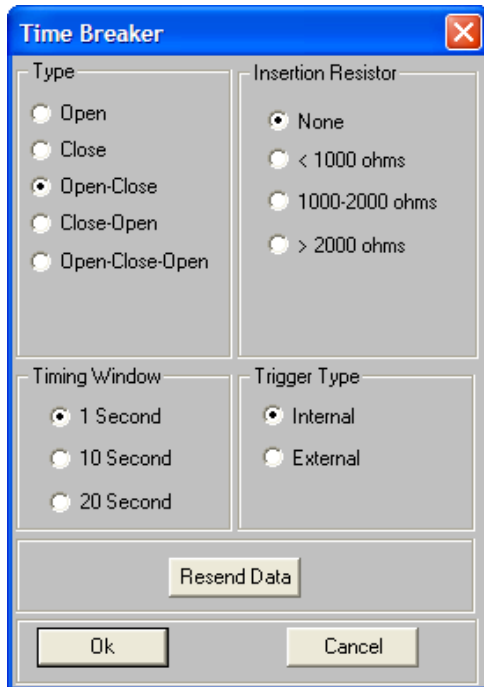
**NOTE**

You can change the default test record directory. Please see section 3.4 for further information.

6.2 Performing an OPEN-CLOSE test

For an OPEN-CLOSE test, the CB analyzer will first open then close the circuit breaker after a preset time (in milli-seconds). To perform an OPEN-CLOSE test:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Time Breaker* (alternatively you can click on the **Time-CB** menu from the Main menu bar). The following window will be displayed:



4. From the “Type” radio box group, select “Open-Close”.
5. From the “Timing Window” radio box group, select the desired timing window.

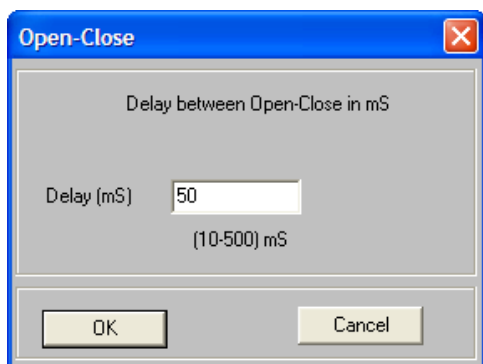


NOTE

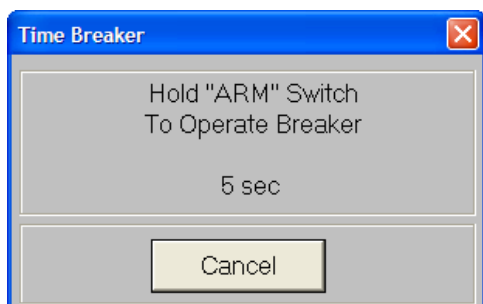
- For the 1-second timing window, the timing resolution is ± 100 micro-seconds
- For the 10-second timing window, the timing resolution is ± 1.0 milli-seconds
- For the 20-second timing window, the timing resolution is ± 2.0 milli-seconds

6. From the “Insertion Resistor” radio box group, select the desired insertion resistance value.
7. From the “Trigger Type” radio box group, select the trigger type.

8. Click on the “OK” button. The following window will be displayed:



9. Type the delay time (in milli-seconds) in the input area and 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 tabulated results will be displayed in the VCBA software main window. The test record will also be saved to a file named TEMP001.DAT in the default test record directory.

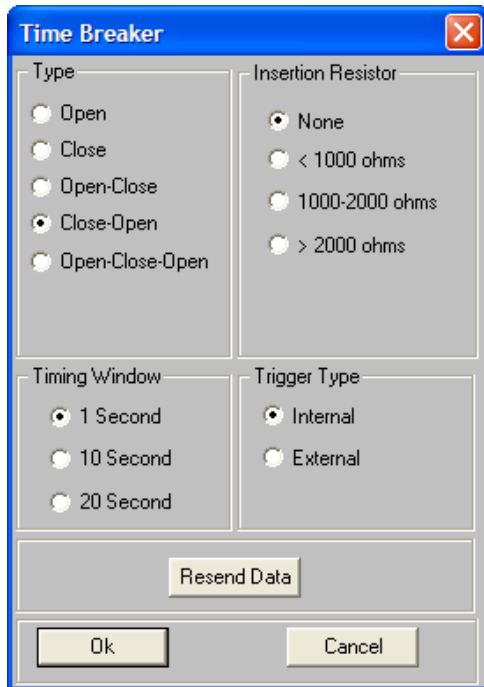
**NOTE**

You can change the default test record directory. Please see section 3.4 for further information.

6.3 Performing a CLOSE-OPEN test

For a CLOSE-OPEN test, the CB analyzer will first close then open the circuit breaker. To perform a CLOSE-OPEN test:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Time Breaker* (alternatively you can click on the **Time-CB** menu from the Main menu bar). The following window will be displayed:



4. From the “Type” radio box group, select “Close-Open”.
5. From the “Timing Window” radio box group, select the desired timing window.

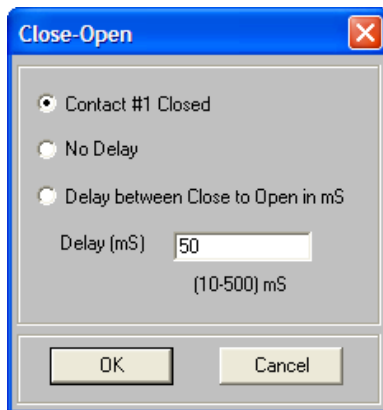


NOTE

- For the 1-second timing window, the timing resolution is ± 100 micro-seconds
- For the 10-second timing window, the timing resolution is ± 1.0 milli-seconds
- For the 20-second timing window, the timing resolution is ± 2.0 milli-seconds

6. From the “Insertion Resistor” radio box group, select the desired insertion resistance value.
7. From the “Trigger Type” radio box group, select the trigger type.

8. Click on the “OK” button. The following window will be displayed:



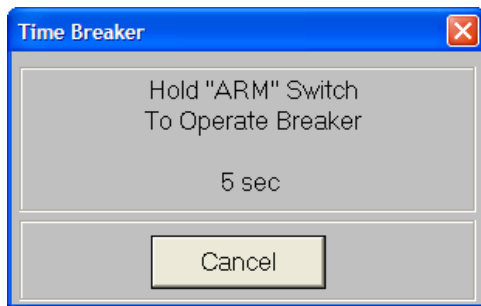
9. You can select to initiate the trip command from this window. The following options are available:

“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 in mS”: 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 corresponding input field.

Select the desired option by clicking on the corresponding radio box and then 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 tabulated results will be displayed in the VCBA software main window. The test record will also be saved to a file named TEMP001.DAT in the default test record directory.



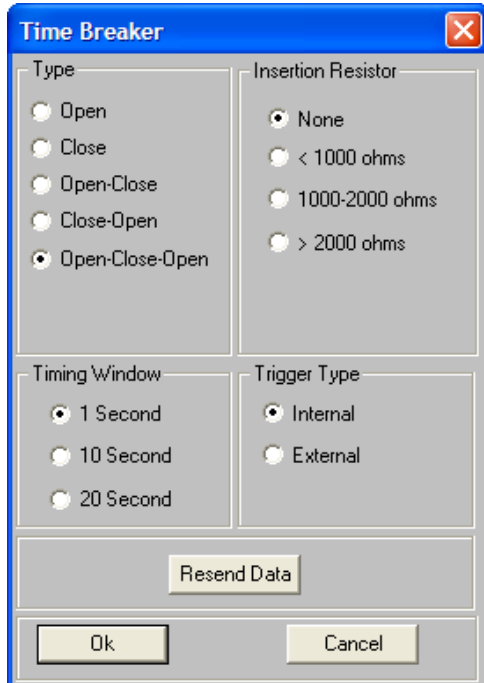
NOTE

You can change the default test record directory. Please see section 3.4 for further information.

6.4 Performing an OPEN-CLOSE-OPEN test

To perform an OPEN-CLOSE-OPEN test:

1. Make sure the VCBA software is running. Connect the CB analyzer to the PC via the RS-232C port.
2. Put the CB analyzer in Computer Interface Mode. Please see section 3.2 for details.
3. Click on the **File** menu and select *Time Breaker* (alternatively you can click on the **Time-CB** menu from the Main menu bar). The following window will be displayed:



4. From the “Type” radio box group, select “Open-Close-Open”.
5. From the “Timing Window” radio box group, select the desired timing window.

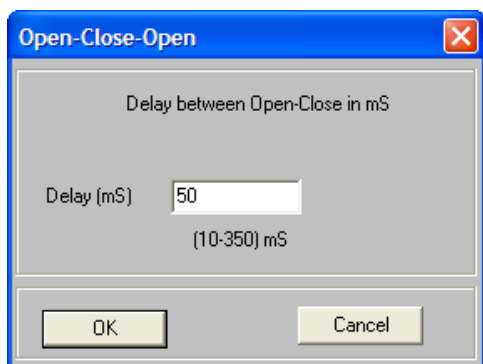


NOTE

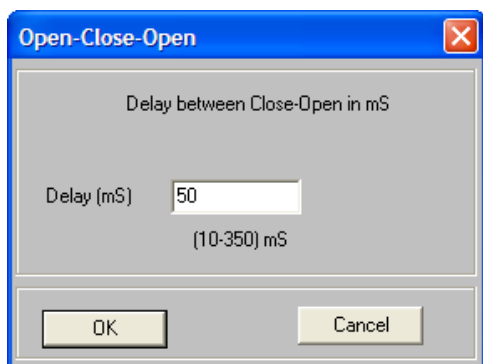
- For the 1-second timing window, the timing resolution is ± 100 micro-seconds
- For the 10-second timing window, the timing resolution is ± 1.0 milli-seconds
- For the 20-second timing window, the timing resolution is ± 2.0 milli-seconds

6. From the “Insertion Resistor” radio box group, select the desired insertion resistance value.
7. From the “Trigger Type” radio box group, select the trigger type.

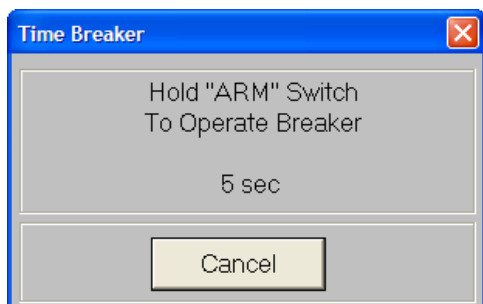
8. Click on the “OK” button. The following window will be displayed:



9. Type the delay time (in milli-seconds) between the first Open command and the Close command. Click on the “OK” button. The following window will be displayed:



10. Type the delay time (in milli-seconds) between the Close command and the second Open command. 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, and when the test is complete, the tabulated results will be displayed in the VCBA software main window. The test record will also be saved to a file named TEMP001.DAT in the default test record directory.

**NOTE**

You can change the default test record directory. Please see section 3.4 for further information.