WinScan™ Analysis Software User's Manual

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Foreword

We founded Power Monitors Inc. (PMI) to provide state-of-the art, easy-to-use, and affordable electronic test equipment to the power industry. Our products have been developed by working directly with electric utilities to determine their specific needs. These products are designed for only one purpose: to collect and assist in the analysis of field-recordable data for electric utilities.

The Scanner line was developed with your needs in mind. We created them to meet the needs of a large utility, and based their unique capabilities on our years of experience building versatile voltage recording and analysis equipment. Inside lightweight, weatherproof, rugged enclosures, state-of-the-art electronics measure and record true RMS voltage and current on four channel connections. The units require so little power, they operate on the voltage from one of the attached lines. There are no batteries to charge prior to use. Each unit has been individually calibrated to ensure high accuracy and stability over a wide range of temperatures.

PMI scanners remain the only products on the market that will allow both electronic "stripchart" recording and a number of specialized recording modes tailored to the power industry. The specialized reports are merged with unique data collection techniques to provide accurate information that is easy to understand. Features such as flicker monitoring, event recording, and min/max recording of both voltage and current make PMI scanners the ideal products for distribution monitoring.

The Scanner features:

- True RMS voltage and current measurement on each of four channels
- Programmable abnormal voltage recording
- On-site, real-time display of voltage, current and power
- Single-cycle response (16 msec)
- More than 122,000 samples per second
- 0-600 volt RMS operating range (0-200 volts on Substation Scanners)
- 0-10, 100, 500 and 1,000 Amp current input ranges (5000Amp on ViP, 0-10 Amp only on Substation Scanners)
- Up to 4,096K FLASH EPROM memory
- Memory capacity for more than one year of summary data, 500 event records, 1000 records of significant change, 1000 records of flicker data
- Rugged, weatherproof enclosure
- All channels captured simultaneously in one cabinet

Scanner/WinScan™ graphs and reports include:

- Stripchart and histogram analysis for RMS voltage, RMS current, power factor, displacement power factor, real power, apparent power, reactive power, volt-amps, and phase angle
- Power outage report
- Abnormal voltage report
- Current or voltage out of limits report
- Significant change report
- Event change report
- Flicker report

Because of these capabilities, the PMI Scanners are the perfect instruments for analyzing and solving power quality and quantity problems. After looking through this manual and using your Scanner, please contact us with any questions about its operation, or with ideas for new features or products. We want you to be happy with this product, and we always appreciate any input that helps us develop products to meet your future needs.

Thank you,

Walter M. Curt
Owner, Power Monitors Inc.

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Section 1

1.1 General Information

The Power Monitors series of Scanners are easy-to-use, true RMS, micro-computer-based voltage, amperage and power recording device that produce accurate readings and professional reports. These scanners can help you resolve customer voltage and power quality complaints, record flicker, conduct long-term voltage and current surveys, and detect voltage and current variations as brief as one cycle. The Scanners will not disrupt normal power supply; rather, it uses a minimal amount of voltage from one of the lines it is monitoring.

Each Scanner gathers and stores stripchart data, recording the average, minimum and maximum readings for a selected interval with one-cycle resolution. Even events lasting less than one cycle are revealed in WinScan™ reports if the Scanner is configured to capture the information. The Scanner also calculates derivative power measurements such as power factor, phase angle, reactive power, and others.

Installing the Scanner is relatively simple, although using the unit requires the same attention to safety as working with any other high-voltage device. Once the unit has been installed and the data you need have been recorded, the data can be downloaded using either a modem (if your Scanner is so equipped) or serial cable. Real-time data can be checked using the keypad and liquid crystal display (LCD) on the unit's front, or by using PMI's PalmScan or PalmView software on a PDA (Personal Digital Assistant).

You can then view and analyze the data using the WinScan™ software. With the software, you can create an array of graphs and reports, each of which provides you with useful, clearly presented power data.

This manual covers WinScan™, Version 1.70, application software that supports the PMI family of data scanners. It contains all the necessary information to allow you to use the software. The software can be used to plot, annotate, analyze and produce hard copy reports and charts from the data collected by the scanners. The sections contained in this manual provide complete coverage on all aspects of the WinScan™ program including installation, connecting to the data scanner, playing back the data, and producing useful output documents.

1.1.1 What It Does

WinScan™ is a Windows based application program that runs on an IBM® or IBM® compatible personal computer (PC). It provides you with the necessary tools to extract data from scanners and produce it in graphical and report format for review and analysis. WinScan™ allows easy access to the data through the use of straightforward icons, menus and dialog boxes. Selection of commands and instructions are accomplished by simply pointing and clicking the mouse. The main features of the program include:

- Transfer and save remotely collected data from PMI scanners
into computer memory
- Convert the data to graphs and reports
- Plot graphs from raw or processed data
- Compare data from a large number of graphs at the same time
- Change the graphs features, i.e. grid lines, tick marks, axis scale
- Analyze points and areas of the graph
- Zoom in on sections of a graph
- Graph snapshots of harmonic waveform distortions
- Cut and paste data to and from other applications onto a view using Object Linking and Embedding.

To properly understand, access and utilize the above listed capabilities, it is essential that you become familiar with the WinScan™ application software, and the system of screen menus it produces. The use of this manual will provide you with the knowledge to become an efficient user of the WinScan™ system.

1.1.2 An Overview Of The User's Guide

A brief outline of the contents of WinScan™ User's Guide is given below.
The layout of this Manual is by Section and numbered Paragraphs.

A. Section

Section 1 – Introduction (this Section). Tells you how to install WinScan™, how to start it, what the main features of the WinScan™ screen are, how to choose commands and how to quit WinScan™.

Section 2 – The Basics. Provides an overview of WinScan™ including what it does, how it interfaces with a scanner and gives you a "hands on" feel for WinScan™'s features by using the built-in example file. The example file lets you create graphs and reports.

Section 3 – Connecting To The Scanner. Describes the physical and logical arrangements for connecting your PC (with WinScan™ installed) to local and remote scanners.

Section 4 – Configuring The Scanner. Explains how to configure scanners from your PC using WinScan™.

Section 5 – Controlling The Scanner. Discusses WinScan™'s features that let you control both local and remotely connected scanners from your PC.

Section 6 – Playing Back Data. This section describes playing back recorded data from a scanner and storing it in a file using WinScan™'s menus.

Section 7 – Graphs. Provides complete coverage on WinScan™'s graphing function to develop, format and annotate graphs of the recorded data.

Section 8 – Reports. Describes WinScan™'s capability of producing a scanner's recorded output in a numerical format as a tabular listing.

B. Paragraphs

Paragraphs are numbered sequentially with the first number corresponding to the Chapter number, the second number corresponding to the topic, and the third indicating number paragraph within that topic. Alpha characters indicate subparagraphs of the main paragraph.

C. Formats used in this manual

This manual uses various type styles to indicate what kind of item is being referred to.

< >: Angle brackets indicate letters or words found on your keyboard. The manual might ask you to type something contained in the angle brackets, like:

        <ENTER>,
        <ALT+R>, or
        <R>.

In the first example, you should press the **<ENTER>** key. In the second example, you should type the **<R>** key while holding down the **<ALT>** key. In the third example, you should type only the **<R>** key.

Note: The term "arrow keys," though not enclosed in angle brackets, refers to the cursor control keys which move the cursor up and down, left and right. However, if a specific arrow key is required, it will be indicated like this: **<RIGHT ARROW>**.

[ ]: Square brackets enclose the name of a button on the screen, like:

        [OK] or
        [CANCEL].

To use one of the buttons, click on it. If a screen button has a darker outline than the other buttons, you may use it by typing **<ENTER>**. In most windows, the **[OK]** or other acceptance button has this darker outline.

All menu options appear in bold type, small capitals. Some examples are:

        SCANNER CONTROL and
        RMS STRIPCHARTS.

The titles of windows are printed in quotation marks and bold type, like:

        "Header Report" or
        "Change Scanner Configuration."

The names of <u>some options within a window</u> are printed in bold type, like:

Abnormal LED Trigger Duration or

Significant Change Threshold.

The names of <u>choices within an option</u> are printed in quotation marks in regular type. Examples include:
"Portrait" and
"Landscape."

1.2 WinScan™ menus

The menu that appears when you begin WinScan™ is known as the <u>main menu</u>. The main menu has two choices: FILE and HELP. The main menu is in the form of a **menu bar**. That is, the choices appear in a strip across the top of the screen. To select an option from a menu bar, you can:

- point to the option with the cursor (the arrow or pointer) and click on it,

or

- hold down the **<ALT>** key and type the underlined letter in the option. For example, you may select the option "**FILE**" by typing **<ALT+F>**.

WinScan™ also makes use of two other types of menus: the pull-down menu and the foldout menu.

A **pull-down menu** appears below an option in a menu bar. Its options are in a list, top to bottom. To select an option from a pull-down menu, you can:

- point to the option with the cursor and click on it,

or

- type the letter that is underlined (if there is one). For example, you may select the option **LOAD** by typing **<L>**,

or

- use the up and down arrow keys to move to the option (known as highlighting the option) and type **<ENTER>**.

Note: If an option in a pull-down menu is followed by a solid black arrowhead (▶), selecting that option will produce a foldout menu (see below). To select such an option, point to it with the cursor and wait a second until the new menu appears, then move the cursor to the right onto the new menu. You can also use the up and down arrow keys to highlight the option and type **<RIGHT ARROW>** or **<ENTER>**.

A **foldout menu** extends to the right of an option in a pull-down menu. Its options also appear in a list and can be selected in the same ways you select options from a pull-down menu. To leave a foldout menu (to fold it back up and return to the menu to the left), you can type **<LEFT ARROW>** or click on the menu to the left.

1.3 Installation

To use WinScan™, you must first install the program on your computer's hard drive as described in this chapter. Before following the installation instructions in this section, make sure your computer meets the following hardware requirements:

- 5 MB or more available space on your hard drive,
- 8 MB or more RAM, and
- a 486 or higher processor running Windows® 95, 98, 2000, Me, NT, XP.

Before installing WinScan™ be sure that no other programs are running, including any anti-virus programs, during the installation. **Note:** "No other programs" should include shutting down programs such as Microsoft® Office™ and Lotus® SmartSuite™**.**
To install WinScan™ on your computer,

Insert the WinScan™ CD into your CD drive (usually D drive). From the .
Win 95: Click Start - Run - Browse - drive the disk is in - Setup.exe

Figure 1-1: Browse Dialog

Figure 1-2: Run Dialog

The setup wizard will appear, insure all other programs are shut down (you can do this from the taskbar **<ctrl, Alt, Delete>** will bring it
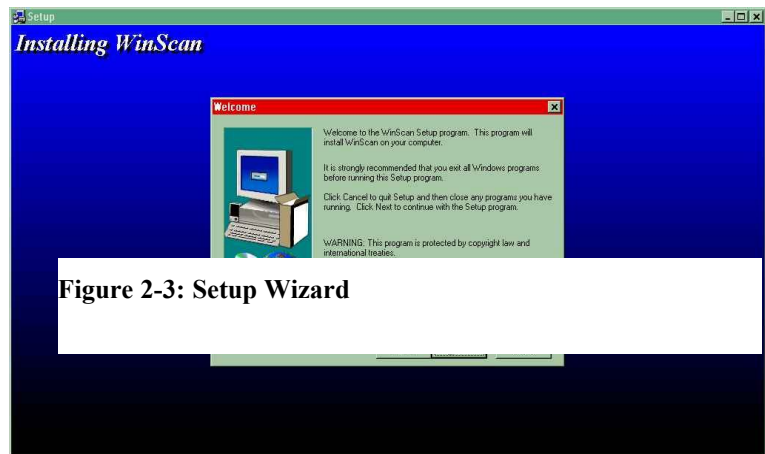

Figure 2-3: Setup Wizard

Figure 1-4: Close Program Dialog

up. Click on the program you want to end, then click on end task. You will need to keep setup, explorer, and systray running. Once all the programs are ended, click on next.

Figure 1-5: Installation Dialog 2

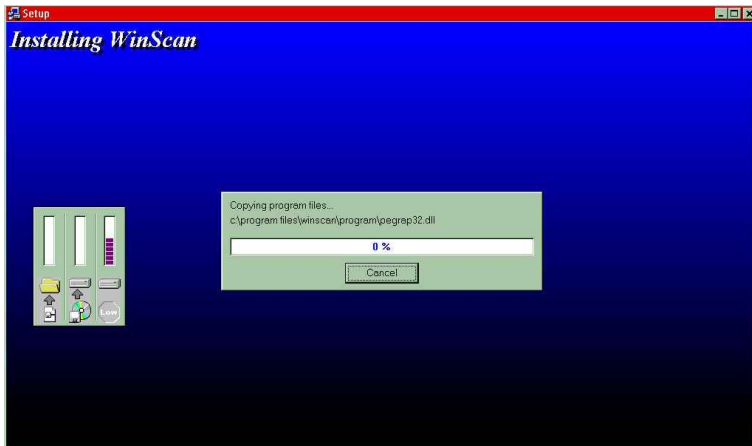It asks if you want the program to be installed into c:\program files\WinScan™. Click next.

Figure 1-6: Copy Program Flies Dialog

A bar will appear indicating the progression of the installation.

Figure 1-7: Setup Complete Dialog

A dialog box will appear asking if you would like a shortcut on the desktop and if you would like to view the readme file. Click Finish.

Figure 1-8: ReadMe.TXT

The readme file will appear showing the release notes of the program. Close this by clicking on the x in the upper right hand corner.

1.4 Starting Up WinScan™

From Windows main screen, click on "Start", then "Select Programs" and then click on "WinScan™" to start the application.

Installing WinScan™ according to these instructions will also register the program and its accompanying files in the "**Programs**" listing found in the Windows 95 "**Start**" menu. You can open WinScan™ from the Start menu, through Windows Explorer, or by way of a shortcut or desktop icon you create. See the windows on-line help for more information.
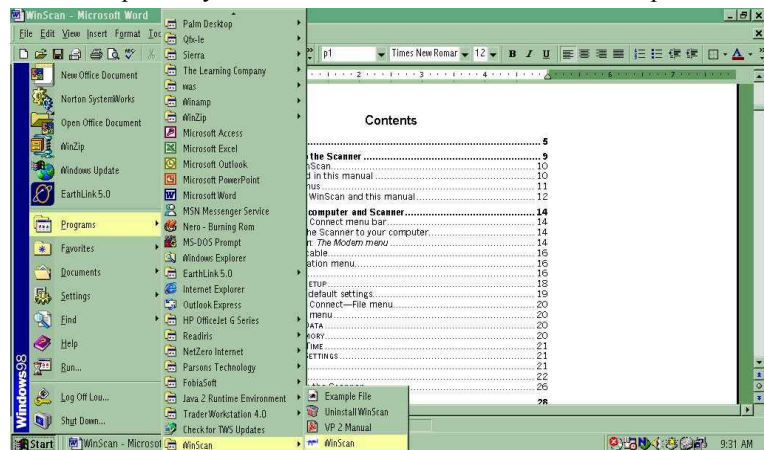

Or you may click on the icon on the desktop.

Figure 1-9: Start Menu 0

WinScan.lnk

Figure 1-10: Icon

When WinScan™ opens it is displayed in a Window. This window has certain standard features that allow you to move and/or resize it.

1.4.1 The WinScan™ Screen

When you start WinScan™, the WinScan™ window will appear on the screen, as shown on Figure 1-1. The window has a title bar, a control box, a menu bar, a toolbar, and a status bar.
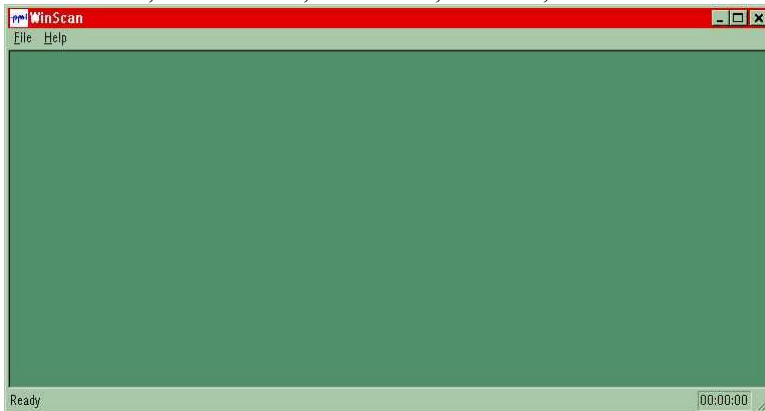

Figure 1-11: WinScan™ Main

A. Controlling WinScan™

WinScan™ uses all the standard features of a Windows application including icons, menus, dialog boxes, and buttons. Throughout the remainder of this manual, it is assumed that the user is familiar with the operation of a Windows program.

B. An outline of WinScan™

Illustrates the basic structure of WinScan™. As you can see, the main menu option **HELP** leads to information on the program, while the option **FILE** leads to operations involving the Scanner, the data it collects, and the tools needed to interpret that data.

The most useful options in the **FILE** menu are **SCANNER CONNECT** and **LOAD**.

As shown in the diagram, **SCANNER CONNECT** leads to options that adjust settings on the Scanner and computer. These options regulate the collection and retrieval of data by the Scanner.

Figure 3-12: Software outline

⇒ **Setting up the computer and the Scanner** (the next chapter) discusses instructions you can give the Scanner and computer.

⇒ Setting up the Scanner for data collection is covered in the Scanner Manual, **Installing the Scanner**.

⇒ Downloading the collected data is the subject of Chapter , **Retrieving data from the Scanner**.

The other important option, **LOAD**, is the gateway to creating, viewing and printing WinScan™ graphs and reports.

⇒ Most of the options available when you select **LOAD** are discussed in Chapter , **Working with Scanner data**..

⇒ *Appendix 2*, provides a list of graphs and reports that WinScan™ can create.

⇒ *Appendix 3*, explains how to interpret some of the graphs and reports.

Familiarize yourself with all the operations of WinScan™ as described in this manual before attempting to use your Scanner. After you are familiar with WinScan™, use the **Quick Guide**, as a reminder of the steps required for certain operations.
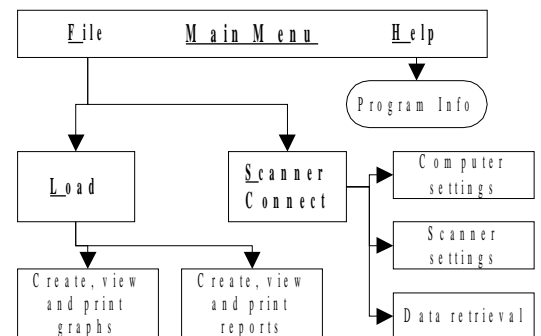
For your own protection, please take the time to read **Safety Issues** in your Scanner Manual, before installing or operating the Scanner.
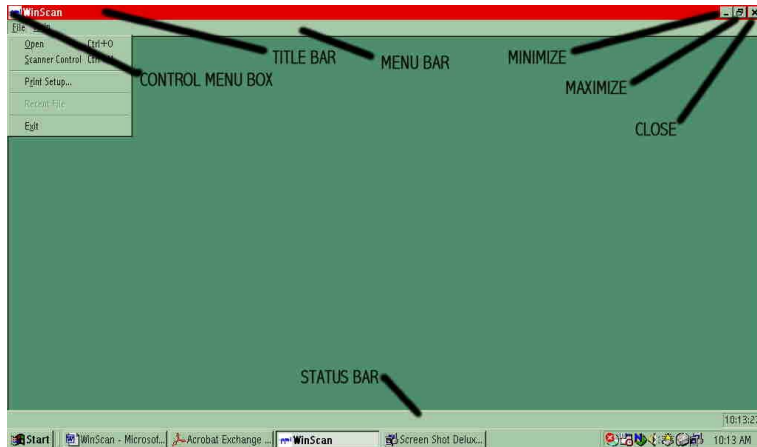

Figure 1-13: Main Menu

Inexperienced Windows users can find many excellent publications for beginning Windows users at most technical bookstores.

1. The Title Bar
The title bar (Figure 1-13) contains the name of the application and the currently open document window, if there is one. When the window is active, the title bar is highlighted with a different color from all other windows on the screen. You can use the title bar to move the window to a new position by dragging it with the mouse. On the title bar you will find the control menu box, maximize button, minimize button and close button.

2. The Menu Bar
The menu bar (Figure 1-13) lies directly below the title bar. It contains the menus from which you can select options that will perform a particular function. You can display the contents of a menu by clicking the menu heading with the mouse, or by holding down the ALT key and pressing the character which corresponds with the underlined letter on the menu heading. For example, <ALT> and <F> opens the 'File' menu. The menu selections appearing on the bar will vary depending on the operation you are performing.

3. The Status Bar
The status bar (Figure 1-13) is found at the bottom of the WinScan™ window. The left area of the status bar describes actions of menu items as you use the arrow keys or mouse to navigate through menus. The right area of the status bar shows the current time.

1.4.2 Choosing Commands

When you want to perform an action in WinScan™ you must choose a command from one of the menus. Each menu groups commands by type, so, for instance, the File menu contains commands that deals with files, such as opening, closing, saving and printing. Some commands will perform an action immediately, but others will display a dialog box that allows you to specify exactly how something should be done.
Some menu options are not available at certain times; for instance, you cannot use the Paste command unless you have already cut or copied something. When menu options are not available they appear gray rather than black.

A. Choosing a Command Using the Mouse

Click the menu heading and then click the command option. Clicking anywhere in the screen, except on the Menu Bar, will close the menu without choosing a command

B. Choosing a Command Using the Pop-Up Menus

When you are in a graph view, WinScan™ has pop-up menus that provide you with quick access to menu options without having to use the menu bar. Click the right mouse button to display a pop-up menu..
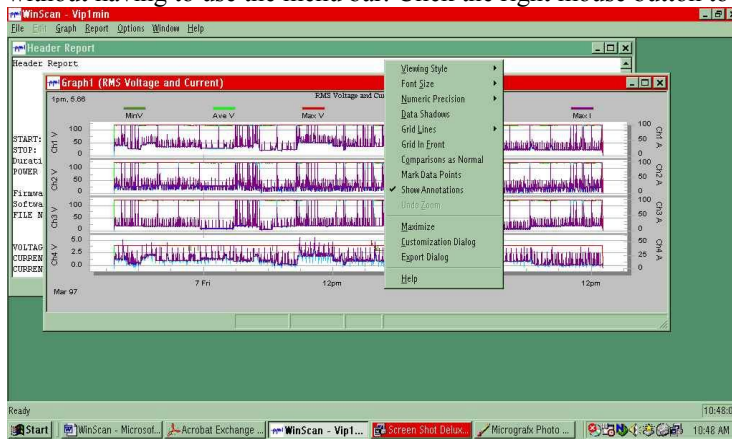

Figure: 1-14: Pop-up Menu

Figure: 1-15: Double click menu

Double clicking on the graph will also bring up some menu selections.

C. Choosing a Command Using the Keyboard

Each menu heading has one letter underlined. To choose a menu, press and hold the Alt key followed by the key for the underlined letter, then release both. For example, <ALT> and <F> opens the File menu. To choose a command, use the up and down arrow keys to move through the options in the menu, and then press the key for the underlined letter in the command name. Once you have opened a menu you can use the left and right arrow keys on the keyboard to move to the menus on either side of the currently opened menu.

1.4.3 Quitting WinScan™

When you have finished WinScan™, choose the "Exit" command from
the File menu to quit the application.

Section 2

2.1 The Basics

Once you have successfully installed WinScan™ onto you PC you are probably anxious to get started and do some useful analysis work with it. However, before you can do that, you need to become familiar with all the various features that WinScan™ has to offer so that you can use it effectively. And, that is the main intention of this section of the manual – to get you up and running with WinScan™ as quickly as possible so that you can receive the full benefit of your investment in this unique software package.

2.1.1 How WinScan™ Is Used

WinScan™ provides an interface between your and the scanner. With WinScan™ you can setup and control the scanner from your PC even if the scanner is at a remote site. You can playback the recorded data from the scanner to your PC where it will be converted into files and stored on the PC's hard disk drive. Once the conversion has occurred, the data is available to you for analysis in a variety of formats. As Figure 2-1 shows, the basic output from WinScan™ is called a Graph or Report.
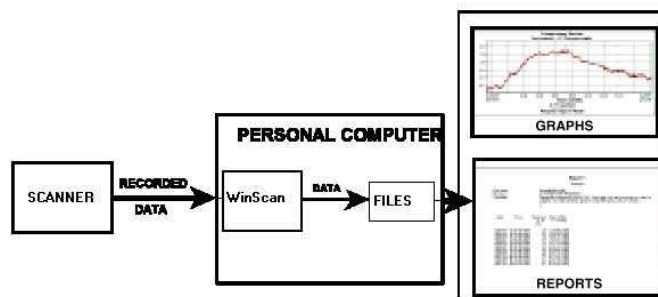

Figure 2-1: Block Diagram

2.2 Getting Familiar With WinScan™ – A Quick Run-Through

The remainder of this section is dedicated to getting you up and running with WinScan™ as quickly as possible. In order to accomplish that goal, we will present WinScan™'s features in the logical sequence that would occur once WinScan™ has been installed on your PC and you are ready to begin using it for the first time. Please understand, by the very nature of it's intended function, WinScan™ is a large and complex program, and it would be impossible to describe all it's features in detail at one time and in one section of this guide. So what we intend to do in this section is give you an overall view of WinScan™'s major features through the use of the example files that are supplied with the program.

The sequence of presenting this information follows the sequence in which the remaining sections of this user guide are presented. Once you have completed each of the exercises using the example file, you can refer to the companion section in this guide for further details. Also, using the examples will provide you with "hands on" experience in creating the types of information that is best suited for presenting the recorded data output from scanners for analysis. The normal sequence of events that would be followed once WinScan™ is installed on your PC is as follows:
1. Connecting the scanner.
2. Configuring the scanner.
3. Setting up WinScan™ to control the scanner.
4. Playing back the recorded data from the scanner.

5. Converting the played back data into files that you can access.
6. Using the powerful features of WinScan™ to develop and annotate graphs, views and reports of the project files for analysis.

Figure 2-2: Serial Cable

2.2.1 Connecting the Scanner

A. General

Designed into the Scanner is a Communications Port. The standard interface cable is an RS232 Serial type used to interface with a remote terminal or computer. The Communications Port allows you to access and manipulate the recorded information on the Scanner.

B. RS232 Serial Cable

The RS232 Serial Cable is configured and wired to conform to the industry standard RS232 connection.

Connect the round, black end of the cable to your Scanner and the rectangular (RS232) end of the cable to your computer serial port.   If you have a 9 pin serial port, use the adapter provided.

If the Scanner's channel 1 voltage leads are not connected to >80Vac, connect the AC adapter provided to the 25 pin D shell as shown in figure 2-2. Then plug the adapter into a 120VAC outlet.

You can now use WinScan™ to download and/or set up the unit to record.

Note: Before connecting with your Scanner via modem, you may need to adjust certain parameters in **PC SETUP.
See Chapter 4 for further information.**

C. Connecting to the Scanner

1. Click on File, Scanner Control

Figure 2-3: File menu

2. Click on **Scanner, Initialize**. Make sure that the scanner is connected to the port that is indicated on the screen. Also set the baud rate to 38400. WinScan will search and adjust for the correct rate for each scanner.
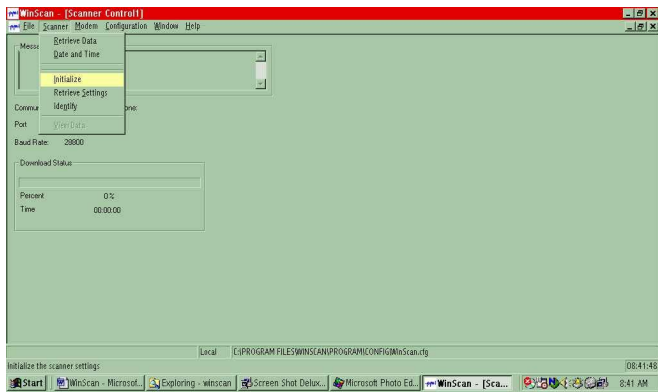

Figure 2-4: Scanner Control

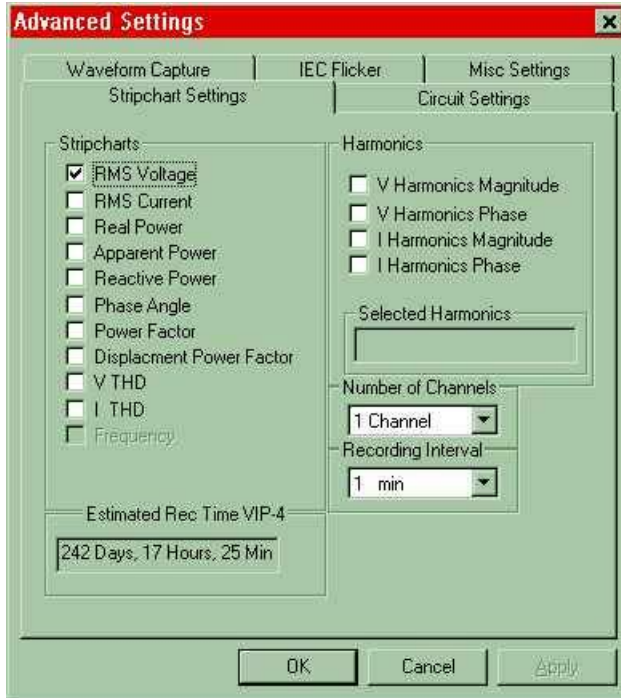3. Click on **Advanced Settings**.

Figure 2-5: Advanced Settings

4. Only check RMS voltage for stripchart, set number of channels to 1, and record interval to 1 min, click OK. These setting were chosen because they will work with all PMI units.
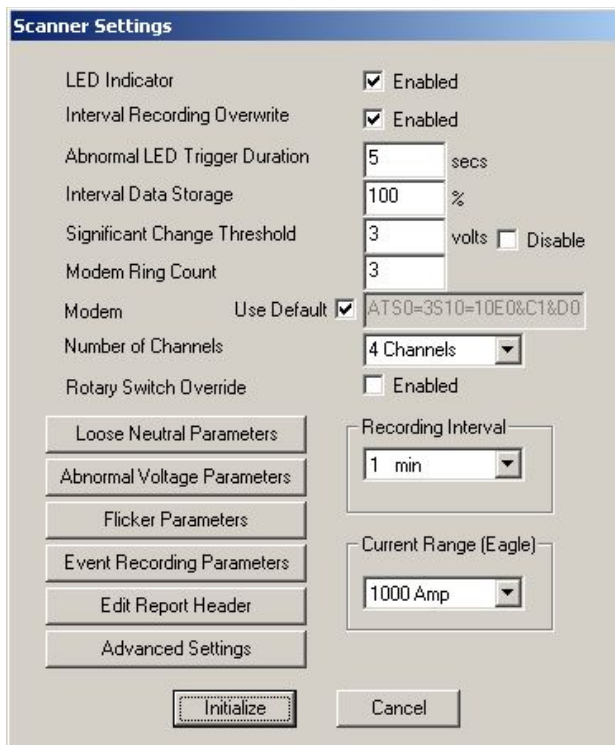

Figure 2-6: Scanner Settings

5. Click on , **Initialize**. The computer will then download the information to the unit. When it is complete. Take the unit and connect channel 1 to >80Vac, the unit will start counting down from 120 and then will start recording. Leave the unit over night to record.

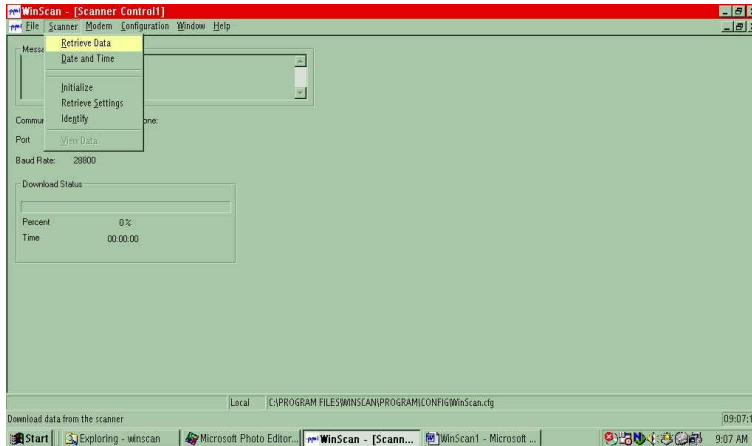6. In the morning connect the unit to the computer via the serial cable. Click on **Scanner, Retrieve Data**.
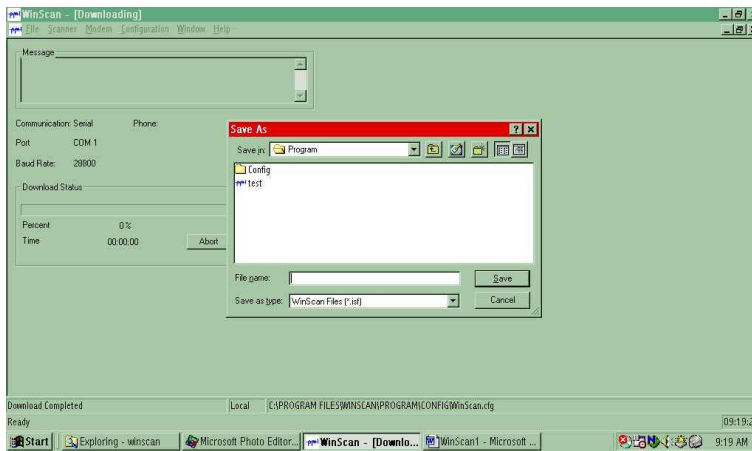
Figure 2-7: Scanner menu

Figure 2-8: Save As dialog

7. After downloading the computer will ask for a file name. Give it one and then click Save.

8. The computer will then ask if you wish to Reinitialize the scanner. Click **No**. NOTE: CLICKING **YES** ERASES ALL DATA AFTER NEXT COUNTDOWN.

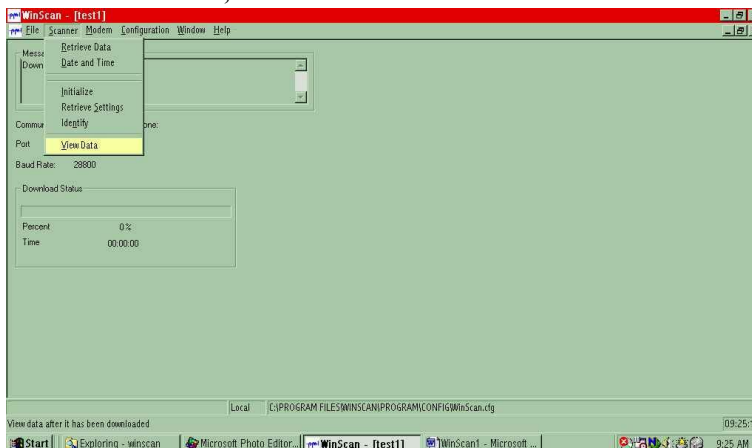9. Click on **Scanner, View Data**.

Figure 2-9: Reinitialize Scanner 0

Figure 2-10: Scanner Menu

Figure 2-11: Header Report

8.   The Header Report will appear giving you information on the recording.
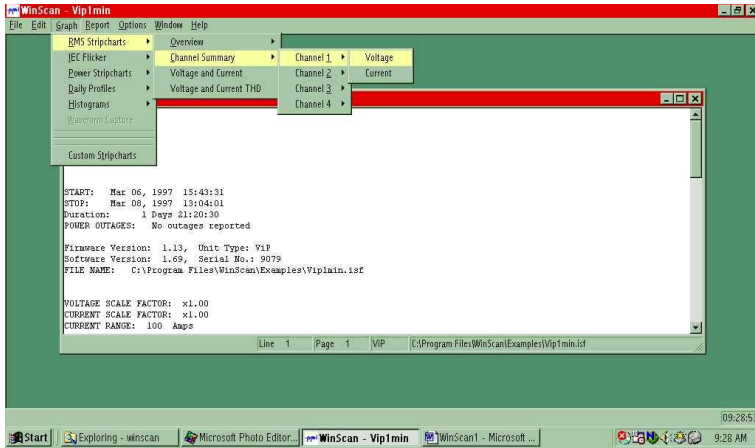

Fugure 2-12: RMS Strip Chart Menu
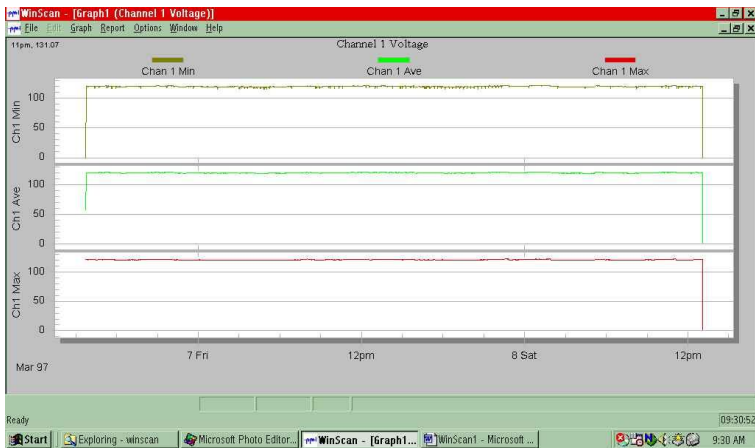
Fugure 2-13: Graph

11. Click on **Graph, RMS StripCharts, Channel Summary, Channel 1**, and **voltage**

Three graphs will appear. 1 is a minimum, 1 is a maximum, and 1 is an average. What these show are the 1-minute min, max, and avg of all cycles over each 1-minute period with a single cycle resolution.

12. To zoom, left click the mouse and drag a box across the area in question. . When you release the mouse it will zoom to the parameter you selected.
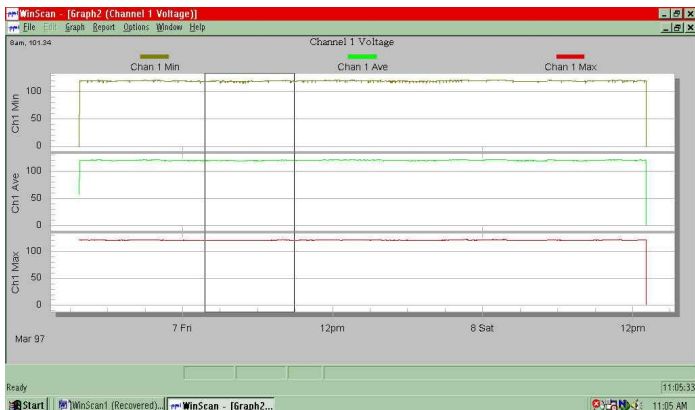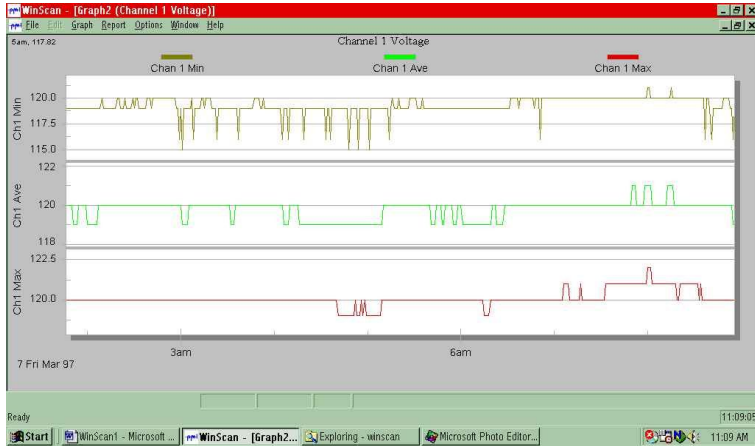
Figure 2-14: Zoom

Figure 2-15: Zoom Finished

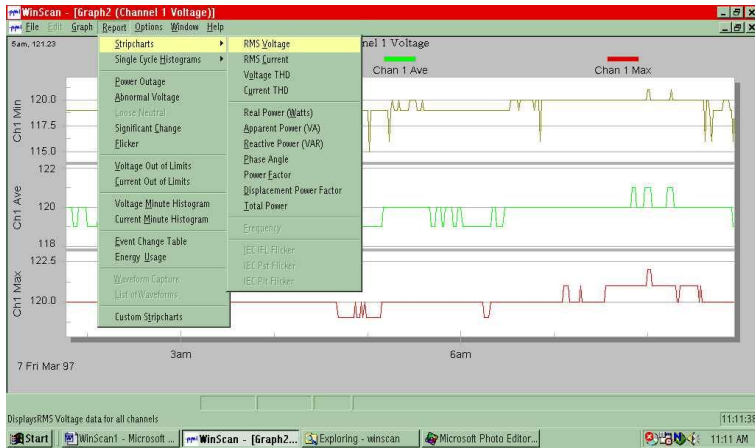*13.* To generate a report click on report, stripchart, rms Voltage.
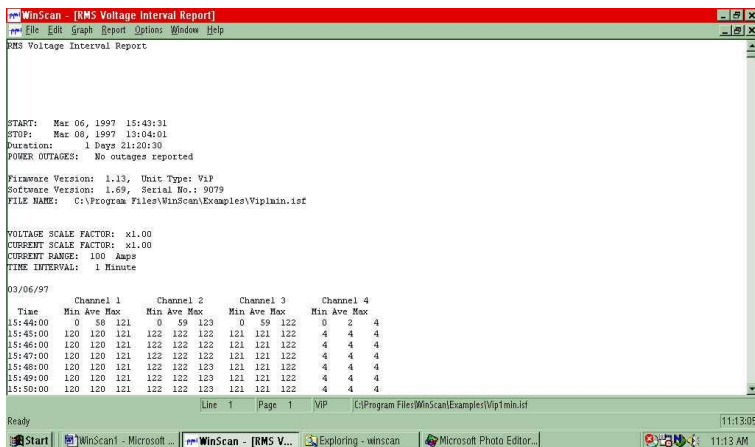

Figure 2-16: Report Menu

Figure 2-17: RMS Voltage Interval Report

This will give you the data in a tabular format showing the min, max and avg of all cycles during each 1-minute interval with a single cycle resolution.

Section 3

3.1 Connecting to the Scanner

3.1.1 Setting up the computer and Scanner

Before installing your Scanner in the field, initialize the unit so it will record data in the way that will be most useful to you. In order to do this, the Scanner must be connected to the computer either by modem or serial cable. Once the computer and the Scanner are linked, you can set the parameters the Scanner will use in recording power levels. These parameters not only determine what will be recorded, but what the graphs and reports you create will show.

A. The Scanner Control menu bar

You can give directions to the Scanner and computer by using options from the SCANNER CONTROL menu bar. To reach this menu, select FILE from the WinScan™ main menu by clicking on it or by typing <ALT+F>. Then select SCANNER CONTROL by clicking on it, by using the arrow keys to highlight it and typing <ENTER>, or by typing <S>.

A window called **"Scanner Control"** will appear on the screen. This window monitors exchanges between your computer and Scanner. In addition to producing the window, WinScan™ will change the menu bar across the top of your screen. This "SCANNER CONTROL menu bar" contains these options: FILE, SCANNER, MODEM, CONFIGURATION, WINDOW, and HELP.

⇒ Selecting HELP leads to information on the WinScan™ program.

⇒ MODEM options are described in the next section, ***Connecting the Scanner to your computer***.

⇒ The remaining options, CONFIGURATION, FILE, WINDOW, and SCANNER, are discussed later in this chapter.

B. Connecting the Scanner to your computer

Since most of the operations described in this chapter require the computer to communicate with the Scanner, you must first connect the two units, either by modem (if your Scanner is equipped with a modem) or by serial cable.

1. By modem: The Modem menu

The MODEM menu is used to establish a remote connection between your computer and the Scanner. To reach this menu, select FILE from the main menu. Then choose SCANNER CONNECT by clicking on it or by typing <S>. To open the MODEM menu, click on MODEM or type <ALT+M>. The menu contains three options: SELECT PHONE NUMBER, CONNECT, and DISCONNECT.

> Note: Before connecting with your Scanner via modem, you may need to adjust certain parameters in PC SETUP.
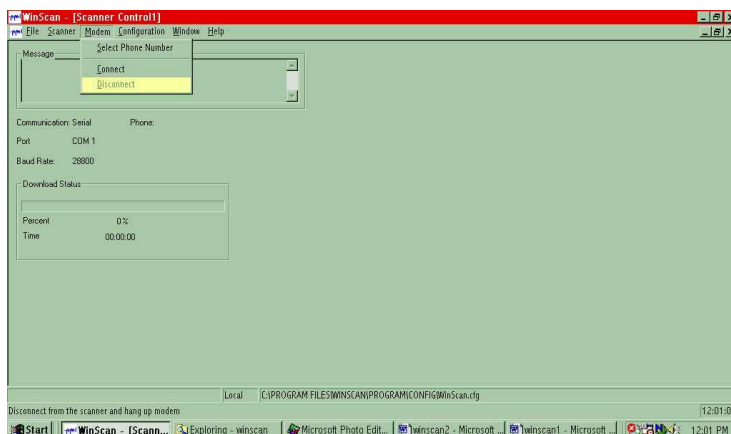

Figure 3-1: Modem Menu

The steps involved in connecting remotely with your Scanner are:

1. Enter phone numbers into a permanent directory.
2. Select a phone number from the directory and send the number to the **"Scanner Control"** window.
3. Choose CONNECT from the MODEM menu.
4. **DISCONNECT** (hang up) the modem.

This process requires the following options from the MODEM menu:

FIGURE 3-2: PHONE LIST
NEW PHONE NUMBER
Enter phone numbers into a permanent directory by choosing SELECT PHONE NUMBER from the MODEM menu. Select New Number by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>**, or by typing **<N>**. A dialog box will appear. Enter a name for the Scanner or the Scanner's location and the phone number by clicking on then typing in the corresponding text boxes. You do not need to enter dashes or parentheses. (For example, you may type "5405553434" instead of "(540) 555-3434.") When the information has been entered, click **[OK]** or type **<ENTER>** to save the new number. To close the dialog box without saving the new number, click **[CANCEL]**.
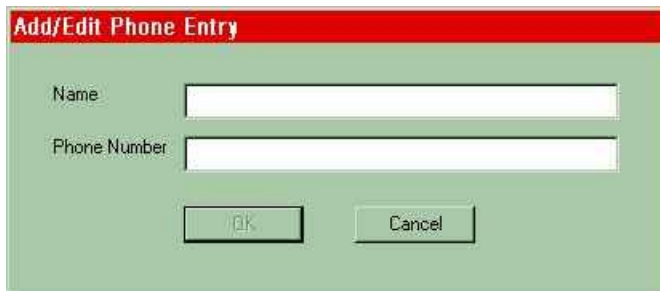
FIGURE 3-3: PHONE ENTRY DIALOG

SELECT PHONE NUMBER
To use a phone number in your directory, choose SELECT PHONE NUMBER from the MODEM menu by clicking on it, by typing **<ENTER>** when the option is highlighted, or by typing **<S>**. In the **"Phone List**,**"** click the gray box to the left of the number you wish to call. Then click **[OK]** or type **<ENTER>**. This will send the number to the **"Scanner Connect"** window on your screen. To leave the phone list without sending a number to **"Scanner Connect**,**"** click **[CANCEL]**.

FIGURE 3-4: PHONE LIST DIALOG
CONNECT
To connect with your Scanner, check whether the phone number you selected appears in the **"Scanner Connect"** window. If the number is in place, select **CONNECT** from the **MODEM** menu by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>**, or by typing **<C>**. WinScan™ will then call and connect with your Scanner via modem.
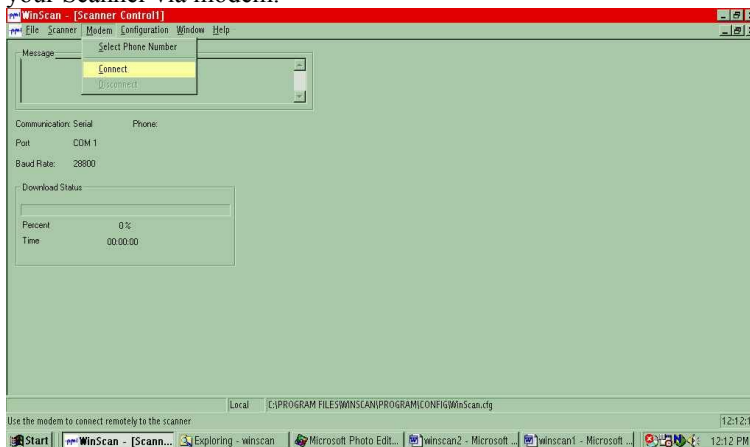
FIGURE 3-5: MODEM CONNECT
DISCONNECT
To hang up the modem following a connection with the Scanner, select **DISCONNECT** from the **MODEM** menu by clicking on it, by highlighting the option using the arrow keys and typing **<ENTER>**, or by typing **<D>**. The connection will be ended.

2. By serial cable
Attach one end of the serial cable to the serial port on the Scanner. The port is located on the topside of the unit. Plug the other end of the cable into a communications port in the back of your computer. Unless you have changed the **Com Port** setting in **PC SETUP**, use the Com 1 port for the serial cable. If you have changed the setting, plug the cable into the Com port you selected.

Figure 3-6: Serial Cable

The Scanner must be powered to download or receive information. There are two ways to do this:

1. Plug one end of the power adapter into the mating jack on the DB-25 connector (the end of the serial cable nearest the computer). Plug the other end into an electrical receptacle.
2. Apply 120 VAC to the Scanner's Channel 1 leads. Channel 1 leads are the black boots. If the Scanner is still connected to a voltage line it was monitoring, that power will work as well.

When the serial cable is in place, the Scanner is powered, and WinScan™ is up and running on your computer, you are connected to the Scanner. Be aware that any Scanner-related options you use will be transmitted directly to the Scanner.

To end the cable connection with the Scanner, **Exit** WinScan™, disconnect the Scanner's power, and unplug the serial cable from the Scanner and computer.

Scanner must be connected to the computer by modem, serial cable or Blue Tooth Wireless connection (Eagle Series Only)`.

Section 4

4.1 Configuration Menu

The Configuration menu

This menu allows you to set parameters which control the operation of your computer and Scanner. To access the CONFIGURATION menu, select FILE from the main menu. Then choose SCANNER CONTROL by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>**, or by typing **<S>**. Then select CONFIGURATION by clicking on it or by typing **<ALT+C>**. You will see a pull-down menu containing two options:

⇒ **PC SETUP** is used to configure your computer.

⇒ **SCANNER SETUP** is used to store settings that can later be sent to the Scanner.

PC SETUP

Select **PC SETUP** from the CONFIGURATION menu by clicking on it, by typing **<ENTER>** when the option is highlighted, or by typing **<P>**. WinScan™ will produce a dialog box entitled **"Change PC Configuration."** It contains options that affect the way your computer works with WinScan™ and the Scanner. They are:

Local

These two settings control the serial cable link between your computer and the Scanner.

- "Serial Port" refers to the port in the back of your computer where the 25-pin end of the cable is plugged in. The default setting is Com 1. To change the setting, click on the down arrow to the right of the box and select the new setting from the list that appears.

- "Baud Rate" is the rate at which electronic information is exchanged. 4800 is the default setting. To change the setting, click on the down arrow to the right of the box and select the new setting from the list that appears.

Modem

These two settings affect remote link-ups between your computer and Scanner.

- "Serial Port" refers to the port in the back of your computer where the modem is connected. The default setting is Com 2. To change the setting, click on the down arrow to the right of the box and select the new setting from the list that appears.

- "Baud Rate" is the rate at which electronic information is exchanged. WinScan™ will automatically set the proper rate if you leave this setting on its default: Auto. To change the setting, click on the down arrow to the right of the box and select the new setting from the list that appears.
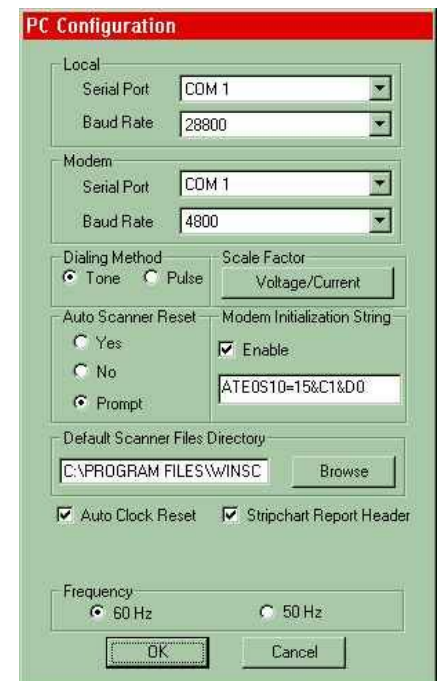
Figure 4-1: "Change PC Configuration"

By Blue Tooth Wireless Connection

The WinScan program port selection communications link must be changed to properly connect the PC with the Eagle Scanner via Blue Tooth. The user must determine which port on his PC is the Blue Tooth connection by checking in the Device Manager / Ports listing in the Windows operating system.

Once the Blue Tooth port is identified, the setting must be changed in the WinScan program. Open the program and click through the following:
File / Scanner Control / Configuration / PC Setup.
Under "local port" change the port setting to match the one on your PC that used the Blue Tooth, and raise the baud rate to the maximum setting. Once the setting changes are made, click OK.

To connect via Blue Tooth, start WinScan and proceed to initialize the scanner. The Blue Tooth program will search for all available Blue Tooth equipped devices in range and list them on the screen. Select the proper scanner by serial number and proceed to initialize or download the scanner.

Dialing Method

Select either "Pulse" or "Tone" to match the type of phone line your computer modem will use. The default setting is Tone.

Auto Scanner Reset

If set on "Yes," your Scanner will automatically reset (that is, be re-initialized) after the data have been retrieved. The default setting, Prompt, is safer: it ensures that WinScan™ will not re-initialize the Scanner (and erase the stored data) without first asking your permission.

Scale Factor

These two boxes allow you to enter a scaling factor for voltage and current reports. The scale factor has no effect on the data being recorded—it affects only the display. Recorded data will be multiplied by the scale factor and displayed on a correspondingly scaled stripchart. This feature can be used to display the recorded voltage or current referenced to the primary-side line of a potential transformer. Default settings are 1. To make a change, click on the box and enter the new number.

Auto Clock Reset

When checked, this feature automatically sets the Scanner's internal clock to the computer's time and date when the Scanner is initialized. If you do not check this box, use the Sᴄᴀɴɴᴇʀ option Dᴀᴛᴇ ᴀɴᴅ Tɪᴍᴇ to choose the time and date the Scanner will use. The default setting—checked (on)—is recommended.

Auto Data Save

This option, when checked, instructs your computer to automatically save downloaded Scanner data to a disk file. When you begin a download, you will be asked to enter a file name. WinScan™ will then save the file, and you can access it later using the Lᴏᴀᴅ option from the Fɪʟᴇ menu. The default setting—checked (on)—is recommended.

Stripchart Report Header

If this box is checked (the default setting), each report you create using WinScan™ will begin with four lines of information entered under the **Edit Report Header** option in the Iɴɪᴛɪᴀʟɪᴢᴇ step. See **Edit Report Header**. The setting in this option is applied at the time a file is downloaded—it has no effect on existing files.

⇒ For a complete table of PC configuration default settings, see *Appendix 1*.

Once you have set all the options to your satisfaction, click **[OK]** or type **<Eɴᴛᴇʀ>**. This sends your settings to WinScan™ and returns you to the Sᴄᴀɴɴᴇʀ Cᴏɴᴛʀᴏʟ menu. To close the **"Change PC Configuration"** window without saving changes, click **[Cᴀɴᴄᴇʟ]**.

Sᴄᴀɴɴᴇʀ Sᴇᴛᴜᴘ

Select Sᴄᴀɴɴᴇʀ Sᴇᴛᴜᴘ from the Cᴏɴꜰɪɢᴜʀᴀᴛɪᴏɴ menu by clicking on it, by using the arrow keys to highlight it and typing <Eɴᴛᴇʀ>, or by typing <S>. WinScan™ will produce a dialog box entitled **"Change Scanner Configuration."**

This dialog box is used to store default settings in your computer—not to send settings to the Scanner. The settings entered in this box are saved, and when you open the **"Scanner Settings"** box from the Sᴄᴀɴɴᴇʀ menu, the saved settings appear as the default values. If you make changes in the **"Scanner Settings"** box, those changes can be sent to the Scanner but they will not change the default settings saved in **"Change Scanner Configuration."** For a diagram of this process, see **Figure 5**.

So:

⇒ To change the default settings, use the option **SCANNER SETUP** in the **CONFIGURATION** menu. This stores the settings but <u>does not</u> send them to the Scanner. Instructions for this appear below in **Changing Default Settings**.

⇒ To send settings to the Scanner, use the option **INITIALIZE** in the **SCANNER** menu. This takes the stored settings, allows you to adjust them, and then sends the settings to the Scanner. Instructions for this can be found in **INITIALIZE**.
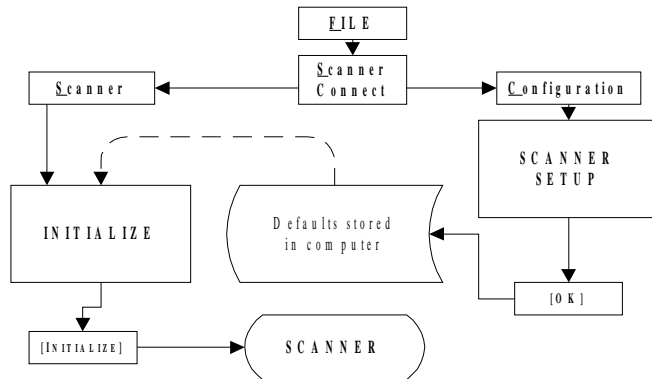

Figure 4-2: Scanner initialization process

Changing default settings

If you want to change the default settings that will be stored in the computer, make your changes in the box **"Change Scanner Configuration."** To open this box, select **SCANNER SETUP** from the **CONFIGURATION** menu as described above.

An explanation of the parameters can be found in **INITIALIZE**. When you have made your changes to **"Change Scanner Configuration,"** click on **[OK]** or type **<ENTER>**. This will store your changes and make them the new default values. To close the window without saving changes, click on **[CANCEL].**

SAVE CONFIGURATION

Under the Configuration menu is a selection for save configuration. To save the current configuration as a file select save configuration. A window will appear allowing you to save the configuration. Name the file and click ok.

LOAD CONFIGURATION

Under the configuration menu is a selection that will allow you to load a previously saved configuration into memory. To do this select "Load Configuration", select the file you wish to load, and click "OK".

A table of Scanner factory settings appears in *Appendix 1*. To restore settings to their original values, enter the factory settings in the boxes in **"Change Scanner Configuration"** and click on **[OK]** or type **<ENTER>**.

LED Indicator

This setting has no effect on the Scanner.

Interval Recording Overwrite

This option allows the Scanner to write over the oldest information in its memory when the memory fills up. If this option is not checked (not enabled), the Scanner will stop recording when its memory is full. Factory setting is <u>checked (enabled)</u>.

Abnormal LED Trigger Duration

With this option, you can change the duration of abnormal voltage required for the incident to be recorded. Factory setting is <u>5 seconds</u>, meaning that an abnormal voltage must last 5 consecutive seconds before it will appear in an **ABNORMAL VOLTAGE REPORT**. (Some Scanners have is no LED)
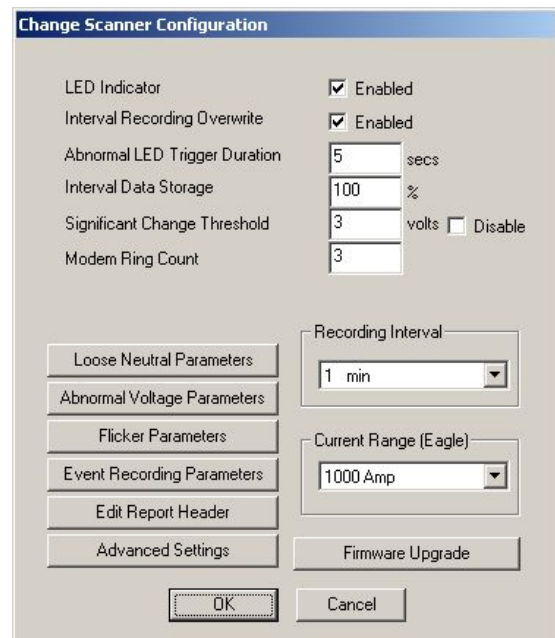

Figure 4-3: Scanner Configuration Dialog

Interval Data Storage

Interval data refers to data recorded for each interval in the recording period. For example, if the recording interval is 1 second and the recording period is 1 hour, the Scanner will save average, maximum and minimum measurements for 3,600 intervals. (See **Recording Interval** in this section.) Most of the Scanner's interval memory is reserved for this stripchart data. The percentage in this field equals the **Interval Recording Overwrite** is enabled) or turning off (when **Interval Recording Overwrite** is not enabled). Factory setting is 100 percent.

Significant Change Threshold

This setting determines the change in voltage needed before the Scanner records a significant change. Factory setting is 3 volts. The permitted range is 1-8 volts.

Modem Ring Count

This is the number of rings the Scanner will wait before answering a call. If a Scanner is located in a substation with a phone line also used for voice communications, you may want to set the ring count higher. That would allow a person the chance to answer the phone before the Scanner modem picks up. Factory setting is 3 rings.

Rotary Switch Override

If checked, this feature prevents a user from changing Scanner settings manually from the faceplate keypad, or rotary switches on the IV Scanners. Factory setting is not checked (not enabled). For more information see the Scanner Manual.

Recording Interval

This setting determines the averaging period for the data collected by the Scanner as well as the timeline WinScan™ uses to create graphs and reports of the data. The factory setting of 1 minute can be changed by using the scroll box. Clicking on the down arrow to the right of this box produces a list of the possible settings. Move up or down the list by clicking on the up and down arrows. To select a setting, click on it. The choices offered are: 1-5 seconds, 10 seconds, 15 seconds, 30 seconds, 1-5 minutes, 10 minutes, 15 minutes, 30 minutes, and 1-4 hours.

Current Range

For the Eagle product only. Allows you to set the current range of flexible CTs to 100, 1000, or 5000A.

Each of the seven **"Scanner Settings"** screen buttons leads to a separate dialog box.

Loose Neutral Parameters

Trigger Duration= number of seconds that the condition has to be present for it to be considered a loose neutral.

Range= Number of volts above or below nominal voltage that the condition would need to be reached to be considered a loose neutral. (i.e.- nominal =120VAC and a range of 12 vac, either L1 or L2 would need to be outside of the 108 to 132 vac range to meet the condition)

Difference= The number of volts that the between channel 1 and channel 2 need to be in order for the condition to be considered a loose neutral. (i.e.- L1 would need to be 136 or 104 vac if L2 was 120vac to meet the condition of a loose neutral)
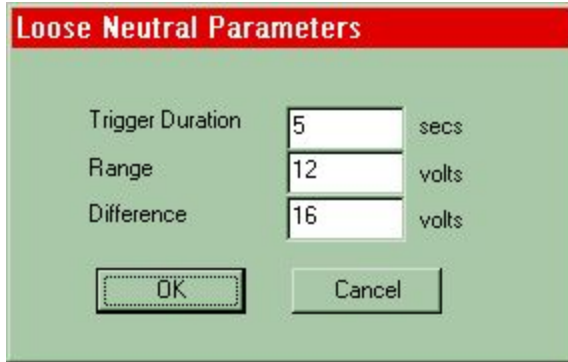
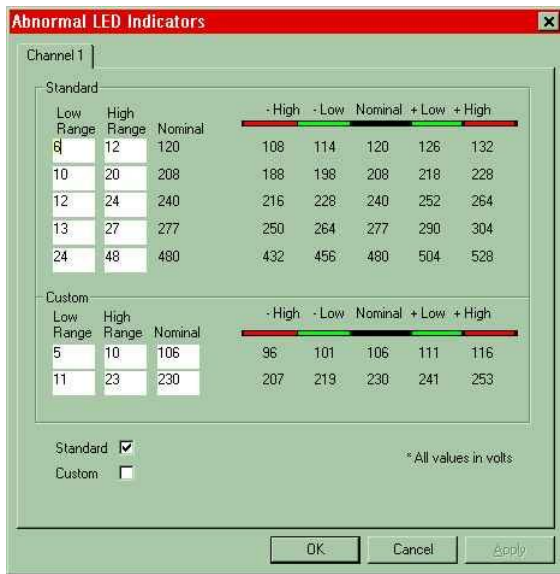**Figure 4-4: Loose Neutral Parameters Dialog**

Figure 4-5: Abnormal LED Indicators Dialog

[ABNORMAL VOLTAGE PARAMETERS]

This window displays a chart of low and high abnormal voltage ranges. There are four pages of charts—one for each recording channel in use. To switch from channel to channel, click on the numbered tab at the top of the charts.

For each channel/page, there are two charts: "Standard Settings" and "Custom Settings." The standard chart lists five nominal voltages (120, 208, 240, 277, and 480). To the left of the nominal voltages are columns marked "low range" and "high range." These numbers determine the values in the five columns to the right of the nominals. For example, for the nominal 120, the default low-range setting is 6 and the default high-range setting is 12. In this case, a low-range abnormal voltage event will be recorded if the voltage is below 114 or above 126. (That is, 120 volts plus or minus 6, the low-range setting.) A high-range abnormal voltage event will be recorded if the voltage drops below 108 or peaks above 132. (Again, 120 volts plus or minus 12, the high-range setting.)

The custom scale works much the same way, except you are permitted to change the two nominal voltages.

If you want the Scanner to use only the settings in the standard chart, check "Standard" at the bottom of the page. If you want the Scanner to use only the settings in the custom chart, check "Custom." If you want the Scanner to use both charts, check both boxes. When you are done working on all three pages, click **[OK]** or type **<ENTER>**. This will store your changes and return you to the **"Scanner Settings"** box. To exit the **"Abnormal Voltage Parameters"** charts without saving your changes, click **[CANCEL]**.

The Scanner will record the date and time of voltages which lie outside the ranges you have defined. Once the data have been retrieved, you can prepare an **Abnormal Voltage Report** using WinScan™.

Figure 4-6: Flicker Parameters

[Flicker Parameters]

The **"Flicker Parameters"** table contains three columns. For each time span in the first column ("Period"), you may set the percentage of variation ("Tolerance") and the minimum number of cycles ("Limit"). A flicker event occurs when the voltage varies from the nominal by more than the tolerance for more cycles than the limit within the given period. For example, using the factory settings for a 10-second period, a flicker event would be recorded when five or more variations of more than 1 percent occur within 10 seconds.

Enter changes in the appropriate boxes. When you are finished, click **[OK]** or type **<Enter>** to return to **"Scanner Settings."** Click on **[Cancel]** to return to **"Scanner Settings"** without saving your changes.

The Scanner will record events that meet or exceed your settings. Once the data have been collected and downloaded, you can prepare a **Flicker Report**.

Figure 4-7: Event Recording Parameters

[Event Recording Parameters]

The **"Event Recording Parameters"** table contains three columns for each of the four recording channels. "Nominal Voltage" is the voltage against which all events are measured. Factory setting is <u>120 volts</u>. "Threshold Bands" are the variations in voltage—repeated above and below the nominal—needed to signal a voltage event. Factory setting is <u>6 volts</u>, meaning that a voltage of less than 114, less than 108, less than 102, etc., or greater than 126, greater than 132, greater than 136, etc., may be considered the start of an event. "Minimum Event Time" is the number of consecutive cycles that must elapse before a new event of the same slope can be triggered. Factory setting is <u>10 cycles</u>.

Enter any changes in the appropriate boxes. When you are finished, click **[OK]** or type **<Enter>**. Click on **[Cancel]** to return to **"Scanner Settings"** without recording your changes.

The Scanner will record events that meet or exceed your settings. Once the data have been collected and downloaded, you can prepare an **Event Change Table**. See **Event Reports**.

Figure 4-8: Report Header Dialog

[Edit Report Header]

This box allows you to edit or enter information (name, address of recording site, phone, etc.—up to four lines) that will be included at the beginning of WinScan™ reports. (See *Loading a data file*) If you do not want the header to be included when you download Scanner data, go to **PC Setup** and un-check **Stripchart Report Header** box.

Click on the line where you wish to type or use **<Tab>** to move between the lines. When you are finished, click **[OK]** or type **<Enter>**. To return to **"Scanner Settings"** without saving your changes, click **[Cancel]**.
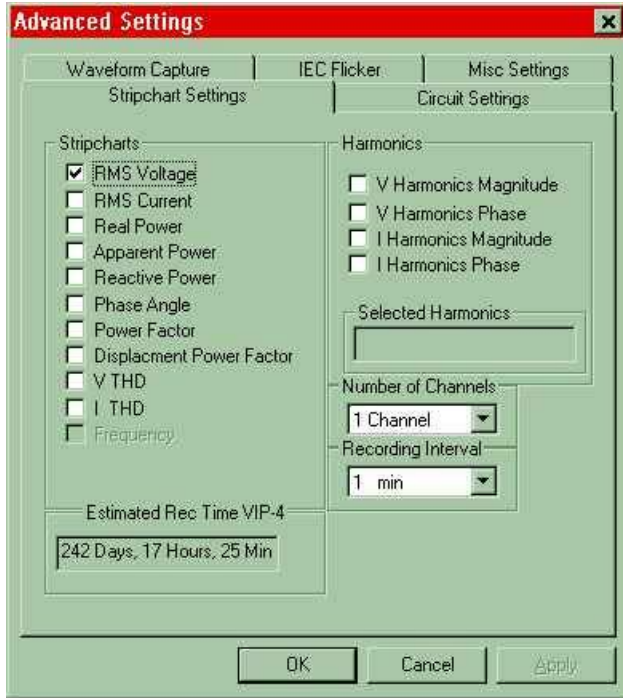
Figure 4-9 Advanced Settings Dialog

[Advanced Settings]

Check the boxes that you wish to acquire graphs of. If you want harmonics, you can select between phase and magnitude. Be sure to enter in the number of the harmonic you wish to record (up to the 51st)

Select the number of channels you need to record. If you are doing a three-phase recording you would select 3 or 4 channels (depending if you were recording neutral and ground.)

[Firmware Upgrade]

Select this only if you are upgrading the revision of the unit you are connected. This will erase all data on the unit, so insure that you have downloaded prior to upgrading.

Figure 4-10: Firmware Upgrade Dialog

The software will search for the appropriate file to download to the unit.

Once you have made all your selections, you can initialize the scanner to make the changes effective.

Figure 4-11: Erase Data Dialog

INITIALIZE

The **INITIALIZE** option is used to send settings to the Scanner. For information on how to change the default settings used here, see **SCANNER SETUP**. Use **INITIALIZE** only if you want to send settings to the Scanner.

This menu has the same selections as the "Scanner Setup". Refer to that section of the manual for detailed information.

Select **INITIALIZE** from the **SCANNER** menu by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>,** or by typing **<I>**. A dialog box entitled **"Scanner Settings"** will appear containing a number of settings you may wish to adjust. The numbers and settings are those saved by WinScan™ after they were entered in **"Change Scanner Configuration"** using the **SCANNER SETUP** option.

Figure 4-12: Warning

⇒ A complete table of Scanner factory settings appears in *Appendix 1*.

⇒ Information on WinScan™ reports and graphs and how Scanner settings affect them can be found in *Appendix 3*.

Initializing the Scanner

When all the settings are properly adjusted, click the **[INITIALIZE]** box at the bottom of the list to send them to the Scanner. (Again, the Scanner must be connected to the computer, either by modem or serial cable.) The settings will be stored by the Scanner until it begins recording.

If you wish to leave the **"Scanner Settings"** box without sending the settings to the Scanner, click on **[CANCEL]**. The box will be closed and any changes you made to the settings will not be saved.

The Scanner Control—File menu

Select this menu by clicking on the word **FILE** or by typing **<ALT+F>**. In the pull-down menu, you will see three options: **CLOSE**, **SAVE AS**, and **EXIT**.
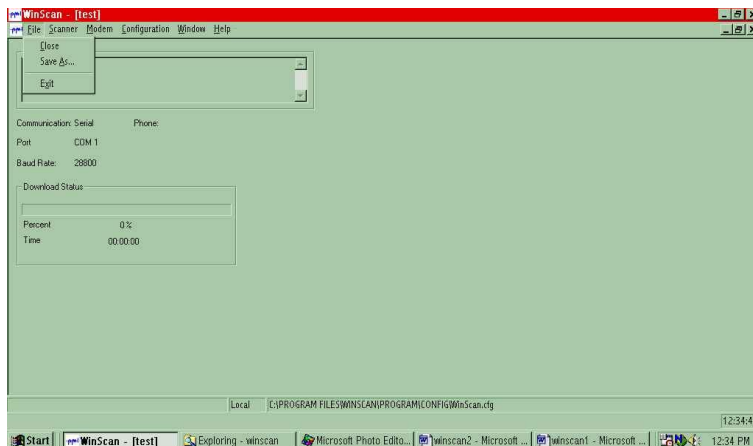

Figure 4-13: Scanner Control Menu

- **CLOSE**: Closes the current file and returns you to the main menu. To select this option, type **<C>** when the pull-down menu is visible.

- **SAVE AS**: Either saves a file that has not previously been saved (a new file) or saves an existing file under a different name or on a different drive. To select this option, type **<A>** when the pull-down menu is visible.

- **EXIT**: Closes WinScan™ and returns to your computer's desktop. Select this option by typing **<X>** when the pull-down menu is visible.

Section 5

5.1 Controlling the Scanner

5.1.1 The Scanner menu

The SCANNER menu is used to transfer data to and from the Scanner. However, the options in this menu won't work unless the Scanner is connected to your computer. Before performing operations in the SCANNER menu, see *Connecting the Scanner to your computer*. Once the connection has been established, the operations are identical regardless of whether the connection is via serial cable or via modem.
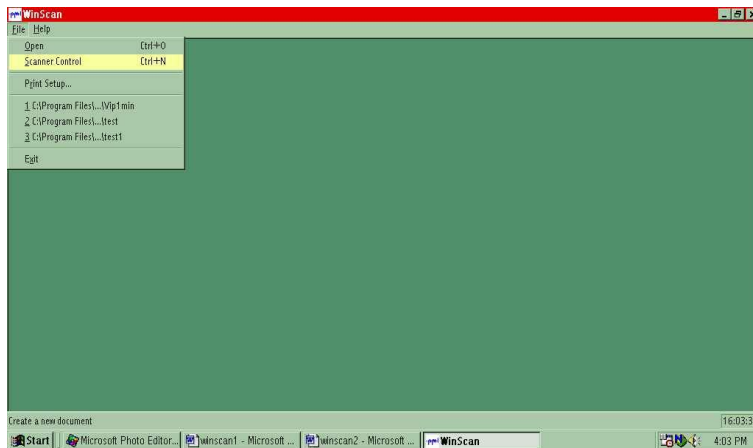

Figure 5-1: Scanner Control Selection

To reach the SCANNER menu from the main menu, select FILE by clicking on it or by typing **<ALT+F>**. Then select SCANNER CONTROL by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>**, or by typing **<S>**. Finally, select the SCANNER menu by clicking on it or by typing **<ALT+S>**.
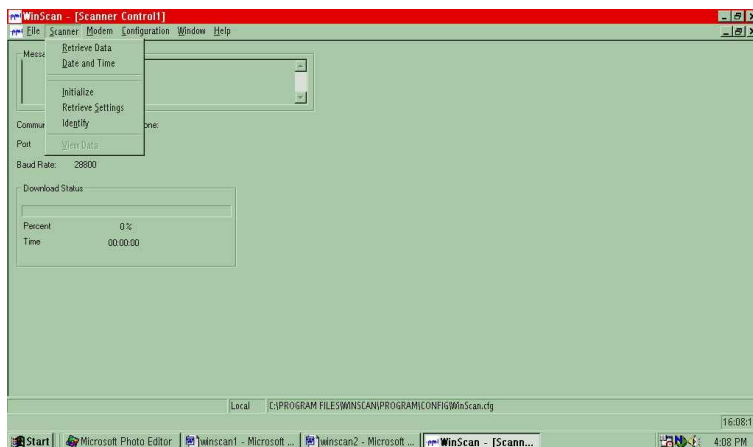
Figure 5-2: Scanner Menu

The pull-down menu contains six options: RETRIEVE DATA, DATE AND TIME, INITIALIZE, RETRIEVE SETTINGS, IDENTIFY, VIEW DATA. These options are discussed below in that order with the exception of INITIALIZE, which is handled last.

A. Retrieve Data

This option transfers the Scanner's collected data to your computer. It is described in detail in Chapter 6 **Retrieving data from the Scanner**.

B. Date and Time

This option allows you to set the Scanner's clock and calendar to match those of your computer, or to specify another time and date to be sent to the Scanner. This process is important because the Scanner will record data based on the time you set—not based on any external time source. If the clock is incorrect, the timeline on your WinScan™ graphs and reports will also be incorrect.

Select this option from the SCANNER menu by clicking on it, by using the arrow keys to highlight the option and typing <ENTER>, or by typing <T>. A dialog box will appear. If you want the Scanner to use the clock and calendar settings from your computer, click on the circle marked "Use PC Date/Time." If you want to enter the date and time, fill in the two boxes on the right under the word "Scanner" and click on the circle marked "Use modified Scanner Date/Time." When you have completed your choice, click on **[OK]** or type <ENTER>.

The Scanner will set its internal clock to the time you have provided and continue to keep time using its internal battery until it is connected to a voltage line. Once connected, the Scanner powers its clock and other functions from the line voltage.

> **NOTE**: If the "Auto Clock Reset" option in the **"Change PC Configuration"** dialog box is checked (the defaults setting), the Scanner will automatically use the computer's time and date following initialization.

C. Initializing the Scanner

When all the settings are properly adjusted, click the **[INITIALIZE]** box at the bottom of the list to send them to the Scanner. (Again, the Scanner must be connected to the computer, either by modem or serial cable.) The settings will be stored by the Scanner until it begins recording.

If you wish to leave the **"Scanner Settings"** box without sending the settings to the Scanner, click on **[CANCEL]**. The box will be closed and any changes you made to the settings will not be saved.

D. Retrieve Settings

This option reads the Scanner's settings. From the SCANNER menu, select RETRIEVE SETTINGS by clicking on it, by using the arrow keys to highlight it and typing <ENTER>, or by typing <S>. The settings will be shown on-screen in a box called **"Scanner Settings"**—exactly like the one that appears when you select INITIALIZE (see below). You can make changes to the settings and re-initialize the Scanner by clicking on **[INITIALIZE]**. The process for changing settings is described below.

E. Identify

This option identifies the Scanner and displays hardware information. From the SCANNER menu, select IDENTIFY by clicking on it or by using the arrow keys to highlight it and typing <ENTER>. The information will be shown on-screen in a box called **"Identify Scanner."**

Section 6

6.1 Retrieving data from the Scanner

After your Scanner has finished collecting data, you need to download the data in order to analyze it on your computer. This process can be accomplished either over phone lines (if your Scanner and computer have modems) or via a serial cable. As the data are downloaded, your computer will save it in a file that can later be opened and analyzed.

6.1.1 Downloading data

The first step in downloading Scanner data is to connect your computer and Scanner as explained in *Connecting the Scanner to your computer*. Before continuing on to the next step, make sure your computer and Scanner are correctly linked and that the Scanner is powered.

A. Retrieve Data

The menu option **RETRIEVE DATA** is found in the **SCANNER** menu. To reach this option from the main menu, select **FILE** by clicking on it or by typing **<ALT+F>**. Then select **SCANNER CONTROL** from the pull-down menu by clicking on it, by using the arrow keys to highlight it and typing **<ENTER>**, or by typing **<ALT+S>**. Select **SCANNER** from the new menu bar by clicking on it or by typing **<ALT+S>**.
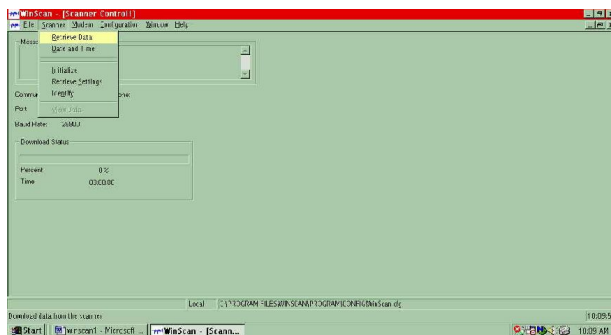

Figure 6-1: Scanner Retrieve Data Selection

As soon as you select **RETRIEVE DATA** from the pull-down menu, your computer will begin the download process. Before selecting **RETRIEVE DATA**, check again to make sure the connection between your computer and the Scanner is intact. If everything is in order, select the option by clicking on it or by typing **<ENTER>**.

A dialog box called **"Save As"** will appear. Enter a new filename and the select the directory where you would like the file to be saved, then click **[SAVE]** or type **<ENTER>** to start downloading. If you decide not to download data, click **[CANCEL]**.

Figure 6-2: "Save As" dialog box

As the download proceeds, you can monitor the progress in the box at the bottom of the **"Scanner Connect"** window. The process may take some time, especially if your modem runs at a slow baud rate or the data file is lengthy. Do not be alarmed if it takes up to 30 minutes to retrieve large files. Wait for confirmation that the download is complete before breaking the Scanner-computer connection. You now have a data file ready for analysis using the features discussed in the next chapter.

Working with Scanner data

Once you have retrieved data from the Scanner, you can use the WinScan™ software to make charts and graphs that help you evaluate the data. To work with data, you must first open or "load" a file. Then by using the menu options
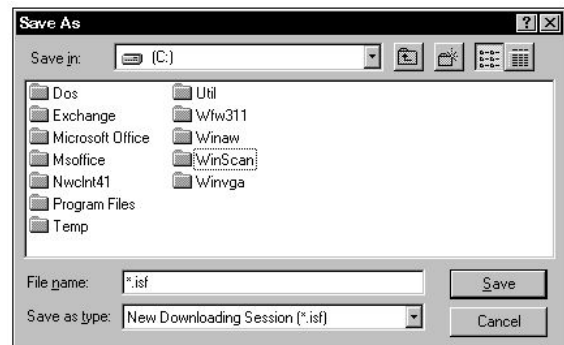
in WinScan™, you can create graphs and reports. You can view graphs and reports on your computer screen or print them. Reports can also be exported to a spreadsheet program to make it easier to evaluate the data. WinScan™ allows you to customize the appearance of graphs by zooming, changing colors, and altering other elements.

Section 7

7.1 Graphs

7.1.1 Print Setup

Before working with data files, be sure your printer is set up to print the graphs or reports you create. WinScan™ will automatically use the printer you normally use. To select a different printer or to change a printing specification, use the **Print Setup** option from the **File** menu. To access this option, select **File** from the main menu by clicking on the word or by typing **<Alt+F>**. From the pull-down menu, select **Print Setup** by clicking on the word, by using the arrow keys to highlight the option and typing **<Enter>**, or by typing **<Alt+R>**.

A dialog box entitled **"Print Setup"** will appear. You can select a printer from a list of available printers by clicking on the arrow to the right of the box marked "Name." Use a similar process—point and click—to change the paper size or source. Choose the paper orientation—either "Portrait" (recommended for reports) or "Landscape" (recommended for graphs)—by clicking on the appropriate circle. To adjust other properties (which may vary from printer to printer), click on **[Properties]** and make the necessary changes in the resulting dialog box.

Click on **[OK]** or type **<Enter>** to save the changes you made. To close the window without saving the changes, click on **[Cancel]**.

> **Note**: You can also access the **Print Setup** option <u>after</u> creating a report. With the report open, select **File** from the menu bar by clicking on it or by typing **<Alt+F>**. Then select **Print Setup**. You <u>cannot</u> use **Print Setup** after creating a graph.

7.1.2 Loading a data file

From the WinScan™ main menu bar, select **File** by clicking on it or by typing **<Alt+F>**. Then select **Load** by clicking on it, by highlighting it and typing **<Enter>**, or by typing **<L>**. In the dialog box that appears, use the cursor to highlight the directory and/or the file you would like to work with, then click on **[Open]** or type **<Enter>**.

When a file is successfully loaded, WinScan™ will display a **"Header Report"** which contains basic information about the data in the file. This summary may include the name and address of your company and some facts about the recording session: the beginning and ending times, the duration, and the number of power outages experienced. The header report also gives the version numbers of the hardware (Scanner) and software, the name of the data file, and some of the parameters used by the Scanner, including voltage and current scale factors, current range and recording interval.
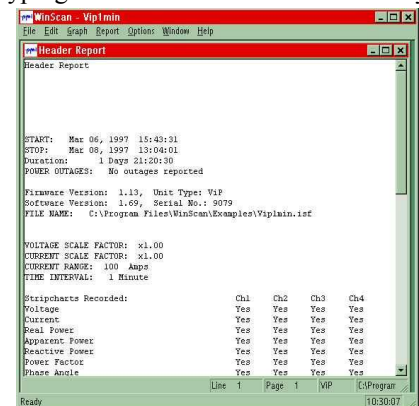

Figure 7-1: Header Report

7.1.3 The Graph/Report menu bar

When a file is loaded, WinScan™ (in addition to producing the header report) changes the menu bar across the top of the screen. The new choices: **File**, **Edit, Graph**, **Report**, **Options, Window**, and **Help**.

⇒ Selecting **Help** will display information on WinScan™.

⇒ The other options are discussed below in the order they appear on the menu bar.

A. The Graph/Report—File menu

The **File** menu offers two choices: **Close** and **Exit**.

- **Close** closes the data file and returns you to the WinScan™ main menu.

- **Exit** halts the program and returns you to your computer's desktop.

After a report has been created, the **FILE** menu will contain additional choices:

- **PRINT** leads to a dialog box that allows you to print the report.

- **PRINT SETUP** is explained earlier in this chapter.

- **EXPORT REPORT** is explained later in this chapter in **Exporting report data to a spreadsheet**.

Note: These additional choices <u>do not</u> appear after a graph has been created. To print a graph, see **Customizing and printing graphs**.

B. The Graph menu

Graphs may include the average, minimum and/or maximum voltage, current or other measurements as recorded on one, all or several channels. Graphs may be studied either on the screen or in printed form.

⇒ For a list of all the graphs WinScan™ can create, see *Appendix 2*.

⇒ For explanations of various graphs and reports, see *Appendix 3*.

Access the **GRAPH** menu by clicking on it or by typing **<ALT+G>**. The resulting pull-down menu will offer six choices: **RMS STRIPCHARTS**, **IEC FLICKER, POWER STRIPCHARTS**, **DAILY PROFILES**, **HISTOGRAMS, AND WAVEFORM CAPTURE**. The first five choices are followed by an arrowhead to the right (▶).This means that selecting an option will result in another menu which "folds out" to the right of the option selected. To create one of these graphs, you will go through one or more of these foldout menus in order to inform WinScan™ exactly what style of graph you would like to see. Once a graph is open, another selection called Custom Stripcharts appears.

Figure 7-2: Graph Menu

⇒ For more on using pull-down and foldout menus, see ***WinScan™ menus***.

1. RMS Stripcharts

The graphs produced using this option show root-mean-square (RMS) values for voltage, current or both over the duration of the data recording. Graphs can be created for all channels or for one channel using average, maximum and/or minimum RMS values.

To create this type of graph, load a data file according to the instructions above. Click on **GRAPH** in the menu bar or type **<ALT+G>**. Select **RMS STRIPCHARTS** from the **GRAPH** menu by pointing to it with the cursor or by using the arrow key to highlight it and typing either **<ENTER>** or **<RIGHT ARROW>**. In the resulting foldout menu, you will see three more options: **OVERVIEW, CHANNEL SUMMARY, VOLTAGE AND CURRENT, VOLTAGE AND CURRENT THD**.

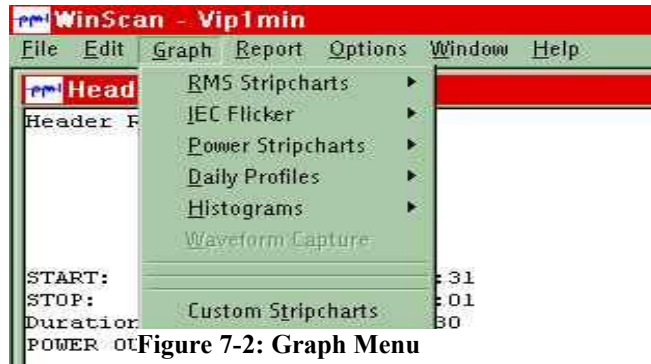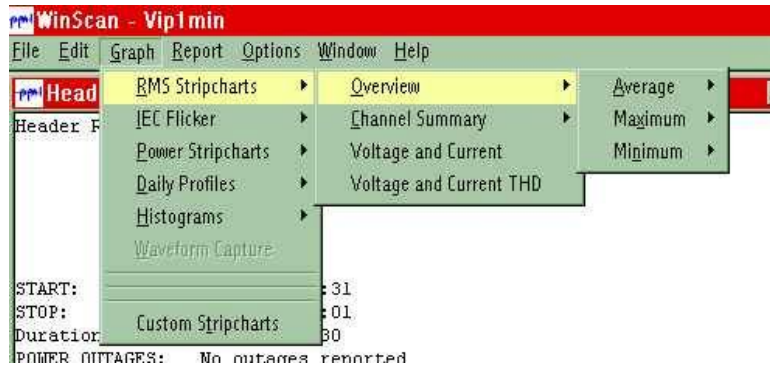**Figure 7-3: RMS Stripcharts Menu**

a. Overview

Selecting **OVERVIEW** leads to another foldout menu containing: **AVERAGE**, **MAXIMUM**, and **MINIMUM**. And selecting one of these leads to a final choice: **VOLTAGE** or **CURRENT**. Different combinations of these choices will produce

a graph showing the average, maximum or minimum RMS levels of either voltage or current over the duration of the recording. For example, choosing OVERVIEW, then AVERAGE, then VOLTAGE will produce a graph titled **"Average RMS Voltage."** This graph will show average RMS values (the average for each recording interval) on each of the four recording channels over the duration of the recording.

The OVERVIEW option yields six different graphs: **"Average RMS Voltage**,**" "Maximum RMS Voltage**,**" "Minimum RMS Voltage**,**" "Average RMS Current**,**" "Maximum RMS Current**,**"** and **"Minimum RMS Current**.**"** Each graph can be altered or printed using the features described in **Customizing and Printing Graphs**.

The maximum and minimum data points represent the highest or lowest single-cycle reading within each recording interval. Therefore, the plot line connecting one maximum point to the next does not signify a gradual or continuous motion between the two readings; rather, the line is shown in order to make the graph easier to read.

b. Channel Summary

This option allows you to create a graph showing the average, maximum and minimum voltage or current for a selected channel over the duration of the recording. Selecting CHANNEL SUMMARY leads to another foldout menu of four options: CHANNEL **1**, **2**, **3**, and **4**. Selecting a channel leads to a final choice: VOLTAGE or CURRENT. If you choose CHANNEL SUMMARY, then CHANNEL **1**, then CURRENT, for example, you will make a graph entitled **"Channel 1 RMS Current."**

The CHANNEL SUMMARY option yields eight different graphs, each showing the RMS voltage or current for channel 1, 2, 3 or 4. These graphs can be altered or printed using the features described in **Customizing and printing graphs**.

c. Voltage and Current

This option creates a graph of the data for all four channels including the average, maximum and minimum voltage and current for each channel over the duration of the recording. Once this "master graph" (called **"RMS Voltage and Current"**) appears, you can eliminate lines and/or adjust the scales used in the graph.

From the **RMS STRIPCHARTS** pull-down menu, select **Voltage and Current** by clicking on it or by using the arrow keys to highlight it and typing **<ENTER>**. A graph **"RMS Voltage and Current"** will appear on the screen.

Along with producing the graph, WinScan™ will provide a new menu choice in the menu bar across the top of the screen: under **options,** SELECT PLOTS. This option can be used while the graph is on your screen to remove the plots that are not needed in your analysis. This option is described in the next section.

This graph can be printed using the EXPORT feature described in **Customizing and Printing Graphs**. It may be altered using features described in the same section.

d. Voltage and Current THD

This option creates a graph of the data for all four channels including the average, maximum and minimum voltage and current for each channel over the duration of the recording. Once this "master graph" (called **"Voltage and Current THD"**) appears, you can eliminate lines and/or adjust the scales used in the graph.

From the **RMS STRIPCHARTS** pull-down menu, select **Voltage and Current THD** by clicking on it or by using the arrow keys to highlight it and typing **<ENTER>**. A graph **"Voltage and Current THD"** will appear on the screen.

Along with producing the graph, WinScan™ will provide a new menu choice in the menu bar across the top of the screen: under **options,** SELECT PLOTS. This option can be used while the graph is on your screen to remove the plots that are not needed in your analysis. This option is described in the next section.

This graph can be printed using the EXPORT feature described in **Customizing and Printing Graphs**. It may be altered using features described in the same section.
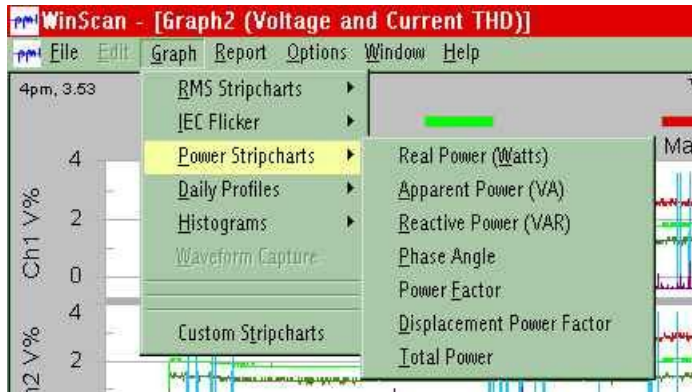
2. Power Stripcharts

Figure 7-4: Power Stripcharts Menu

The graphs produced in this section show the level of a given quantity over the duration of the recording. There will be one graph for each channel with recorded data. WinScan™ will show, for each channel, the average, maximum, and minimum levels of a selected quality over the recording timeline. Once the graph is displayed, you may select plots to remove from the display. Each of these graphs can be altered using the features described in **Customizing and printing graphs**.

To create a power stripchart, load a data file according to the instructions earlier in this chapter. Click on **GRAPH** in the menu bar or type **<ALT+G>**. Then select **POWER STRIPCHARTS** by pointing to it with the cursor or by using the arrow keys to highlight it and typing either **<ENTER>** or **<RIGHT ARROW>**. You will see another menu box with five options: **REAL POWER (WATTS)**, **APPARENT POWER (VA)**, **REACTIVE POWER (VAR)**, **PHASE ANGLE**, and **POWER FACTOR**. Select the quantity you would like WinScan™ to graph by clicking on the word or by highlighting it and typing **<ENTER>**.

> WinScan™ will then produce a graph showing the average, minimum and maximum levels of the quantity you have selected over the duration of the Scanner recording period. When the graph is produced, WinScan™ will also add a new choice to the menu bar: **SELECT PLOTS**. This option can be used to remove certain plots from the graph. For more information, see the preceding section—**SELECT PLOTS**.
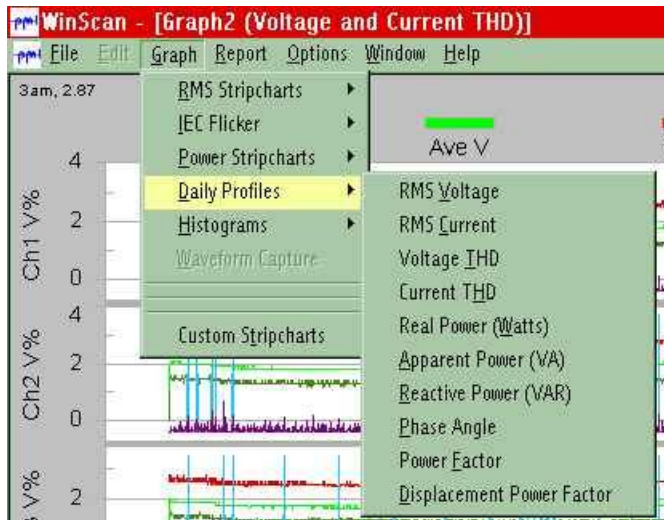
3. Daily Profiles

Figure 7-5: Daily Profiles Menu

Daily profile graphs are most useful when working with data gathered by the Scanner over a period of several days or weeks. These graphs show trends in the level of a given quantity over the course of an average day. Each of these graphs can be altered using the features described in **Customizing and printing graphs**.

To create a daily profile graph, load a data file according to the instructions earlier in this chapter. Click on **Graph** in the menu bar or type **<Alt+G>**. Then select **Daily Profiles** by clicking on it or by using the arrow keys to highlight it and typing **<Enter>** or **<Right Arrow>**. WinScan™ will show you a menu of the eight factors that can be charted in daily profile graphs. They are: **RMS Voltage**, **RMS Current**, **Real Power (Watts)**, **Apparent Power (VA)**, **Reactive Power (VAR)**, **Phase Angle**, **Power Factor**, and **Displacement Power Factor**. Select one by clicking on it or by using the arrow keys to highlight it and typing **<Enter>**. WinScan™ then produces a graph showing the average levels of the selected measurement plotted over a 24-hour timeline.
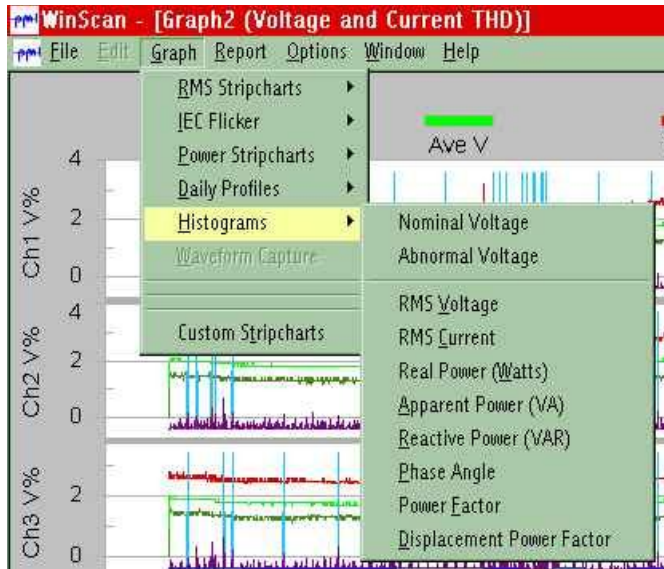
3. Histograms

Figure 7-6: Histogram Menu

A histogram shows the frequency of occurrence of certain readings. Such a graph does not show *when* a reading was taken, just how often it occurred. These graphs make it easy to see the most common readings as well as the range of all readings taken during the recording period. Each of these graphs can be altered using the features described in the next section, Customizing and printing graphs.

To create a histogram graph, load a data file according to the instructions earlier in this chapter. Click on **Graph** in the menu bar or type <Alt+G>. Then select Histograms by pointing to it with the cursor or by using the arrow keys to highlight it and typing either <Enter> or <Right Arrow>. From the fold-out menu, choose the type of histogram you would like to create by clicking or by highlighting your choice and typing <Enter>. The choices are: Nominal Voltage, Abnormal Voltage, RMS Voltage, RMS Current, Real Power (Watts), Apparent Power (VA), Reactive Power (VAR), Phase Angle, Power Factor, and Displacement Power Factor. WinScan™ then produces a histogram for each recording channel, with the selected quantity scaled across the horizontal axis. The number of minutes (for Nominal or Abnormal Voltage histogram graphs) or cycles (all other histogram graphs) during which a level was recorded appears on the vertical axis.
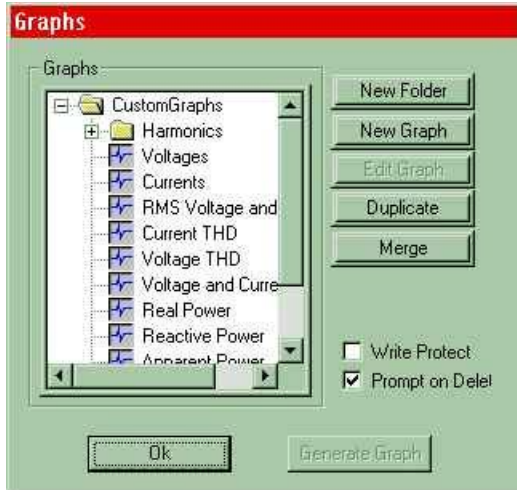
3. Custom Stripcharts

Figure 7-7: Custom Stripcharts Menu

This option allows you to graph several quantities simultaneously. To create a custom stripchart, first load a data file according to the instructions earlier in this chapter. Click on **Graph** in the menu bar or type **<Alt+G>**. Select **Custom Stripcharts** from the **Graph** menu by clicking on it or by using the arrow keys to highlight it and typing **<Enter>**.

A dialog box entitled **"Custom Graphs"** will appear. The box contains a list of eight different measurements which can be graphed: **Voltage**, **Current**, **Real Power**, **VA Power**, **VAR Power**, **Power Factor**, displacement power factor (**DPF**), and **Phase Angle**. Each measurement is followed by boxes marked **Max**, **Min**, and **Avg**. Select the graphs you would like to create by clicking on the proper boxes. Clicking on box to the left of the measurement marks all three boxes that follow the name. Alternately, you may click on **Max**, **Min**, or **Avg** individually. On the right side of the dialog box, click on the channel for which you would like the graphs to be created.

When you have made your selections, click on **[OK]** or type **<Enter>**. WinScan™ will then graph all the quantities you have selected on up to four stripcharts. Each stripchart will use up to two scales on the vertical axes of the graph. All types of data selected for one measurement—i.e., maximum, minimum, and/or average—will appear on the same strip. WinScan™ graphs the data in the order of the list of measurements, so the selected quantity appearing highest on the list will be scaled on the left vertical axis of the top stripchart, the second-highest will be scaled on the right axis of the top stripchart, and so on. To leave the dialog box without creating any graphs, click on **[Cancel]**.

C. Options Menu

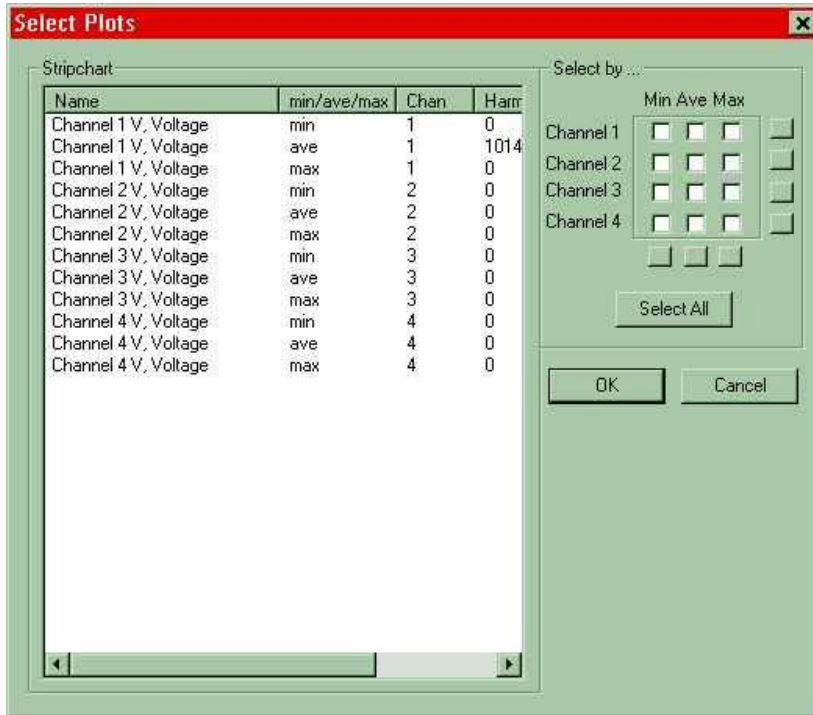Once a graph has been opened you then have access to the options menu.
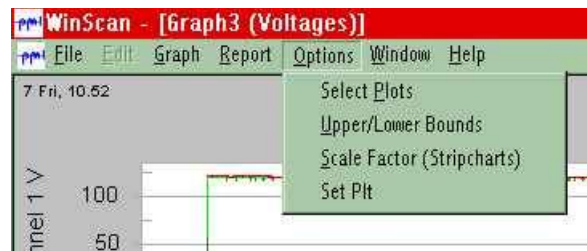
1. Select Plots

Once you have created an RMS stripchart using **Voltage and Current**, you can remove plots from graph. To do this, the graph must be in the active window. (If you are not sure whether the graph window is active, click anywhere on the graph. This will make the window active.) From the menu bar, choose SELECT PLOTS by clicking on it or by typing <ALT+P>. A dialog box called **Select Plots"** will appear.

The box contains columns that correspond to each line plotted on the graph. When you first open **"Select Plots,"** each small box within the box will **Figure 7-8: Options Menu** contain a check mark, meaning all lines are included in the master graph.

To remove lines from the master graph, un-check the corresponding boxes

by clicking on them. Alternately, you may use <TAB> to move from box to box and <SPACE BAR> to toggle between checked and un-checked. To un-check all the boxes, click on **[CLEAR SELECTIONS]**. To check all the boxes, click on **[MARK SELECTIONS]**. When you are finished, click on **[OK]** or type <ENTER>. A new graph will appear showing only the data you requested.

The SELECT PLOTS feature also applies to POWER STRIPCHART graphs—see below.

Figure 7-9: Select Plots Dialog

11. Customizing and printing graphs

WinScan™ allows you to change the appearance of the graphs you create. You can zoom in on a certain area of the graph for a more detailed view. By using the customization menu, you can change the colors, styles, and other elements of WinScan™ graphs. Printing a graph or exporting it to another file or application is also possible by way of this menu—see EXPORT DIALOG below.

Zooming: To zoom in on a specific area of the graph, move the pointer to the area you would like to enlarge. Press and hold down the left mouse button. As you drag the mouse, a box will appear on the screen. When the box encloses the area you wish to enlarge, release the mouse button. The area you boxed in will then be enlarged to the same size as the previous graph. To enlarge an area of the new graph even further, repeat the process. To return to the original graph, see UNDO ZOOM in the **Customize** menu below.
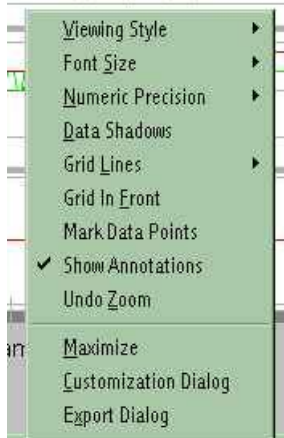
Figure 7-10: Customize Menu

The **Customize** menu can be accessed by clicking the <u>right</u> mouse button while the pointer is located anywhere on a graph. The options are:

VIEWING STYLE: Color, Monochrome, or Monochrome & Symbols. Shows graph in color, black and white, or in black and white with different shapes denoting different lines in the graph. Default is <u>Color</u>. However, Monochrome or Monochrome & Symbols is recommended when printing on a black and white printer.

FONT SIZE: Large, Medium, or Small. Default is <u>Medium</u>.

NUMERIC PRECISION: No Decimals, 1 Decimal, 2 Decimals, or 3 Decimals. Alters number of digits after the decimal point in the **Pointer Locator** (see below). Default is <u>2 Decimals</u>.

DATA SHADOWS: Shows a shadow behind graph lines for a three-dimensional effect. Default is <u>checked</u>; however, the black shadow is not visible against the default black background.

GRID LINES: Both Y and X Axes, Y Axis, X Axis, or No Grid. Shows dotted grid lines on the horizontal (X) axis, the vertical (Y) axis, both, or neither. Default is <u>Y Axis</u>.

GRID IN FRONT: When checked, prints grid lines over plot lines instead of behind them. Default is <u>not checked</u>.

MARK DATA POINTS: When checked, a small node is added to plot lines where they cross the marked points on the horizontal axis. Default is <u>not checked</u>.

SHOW ANNOTATIONS: This option does not apply to WinScan™.

UNDO ZOOM: Returns to the original graph after the zoom feature (see above) has been used. If you have zoomed more than once on the graph, UNDO ZOOM still returns you to the original graph—not the previous graph. You can also "undo zoom" by typing **<Z>** while the cursor is on the graph.

MAXIMIZE: Enlarges graph to fill the entire screen. To return to the original-size graph, hit **<ESCAPE>** or click on the bar at the top of the screen.

CUSTOMIZATION DIALOG: You can also reach this box directly from the graph itself—while pointing anywhere on the graph, type **<SPACE BAR>** or click the left mouse button twice, quickly. This dialog box presents most of the above features in one place, as well as controls for colors, graph style, and fonts. Use the mouse to select the items you want to change. Clicking on **[APPLY]** implements the changes without closing the dialog box. Clicking on **[ORIGINAL]** returns all settings to their original values. **[OK]** closes the box and implements the changes you selected. **[CANCEL]** closes the box but ignores any changes.

The final option in the **CUSTOMIZE** menu allows you to **print** a graph.

EXPORT DIALOG: (You can access this option by double clicking on the graph or from the customization menu). Clicking on the Export button will bring up the export dialog.

This box allows you to send the graph to a printer or to another file. Select the export destination by clicking on the corresponding box; you can export to the computer clipboard, to another file, or to a printer. Specify the destination in the text box. You may also specify the size you would like the document to be when it arrives at its destination. To do this, select the units of

Figure 7-11: Voltage Customization

measure (millimeters, inches, or points) by clicking the correct box with the mouse. Then type the measurements in the two boxes separated by a slash (/). The first box will be the width of the exported graph, and the second
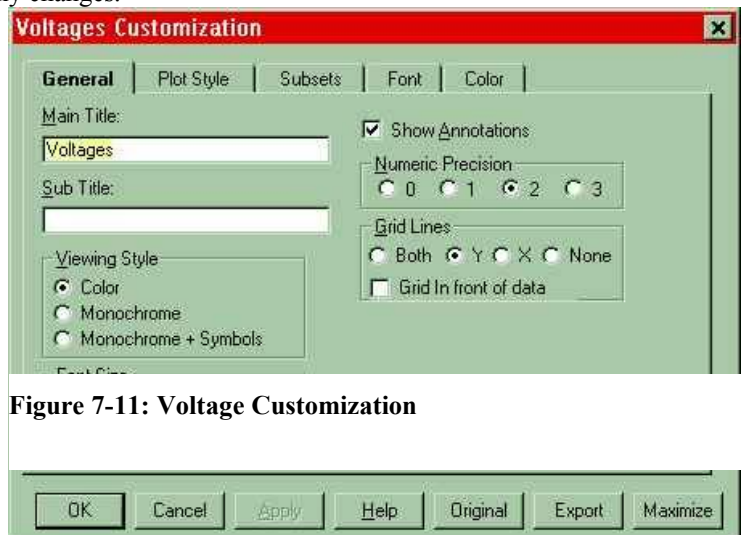
box the height. To export the graph, click on **[EXPORT]** or hit **<ENTER>**. Click on **[CANCEL]** to leave the dialog box without exporting the file. See **PRINT SETUP**, for information on setting up your printer.

Pointer Locator: When the pointer is anywhere within the area of the graph (that is, above the X axis and to the right of the Y axis), a locator appears in the upper left corner of the graph. The locator tells you the coordinates of the pointer based on the scales used in the graph.
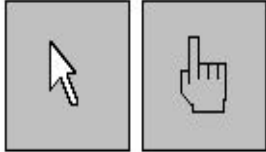
Figure 7-12: Exporting Voltages

Figure 7-13: The arrow pointer and the "pointing hand"

The pointer locator can be also used to read data at certain points along the plot lines. Move the pointer to the point on the line which you would like to read and watch for the arrow pointer to turn into a "pointing hand," with one finger pointing up—see picture at left. When the pointer is in the shape of a hand, the numbers in the corner of the screen represent the exact data from the graph itself—not just the pointer location. The hand appears only when you are pointing at a data point. You can make the data points visible by selecting **MARK DATA POINTS** in the **CUSTOMIZE** menu.

D. Waveform Capture

Many of PMI scanners have waveform capture capabilities. To view a captured waveform perform the following:
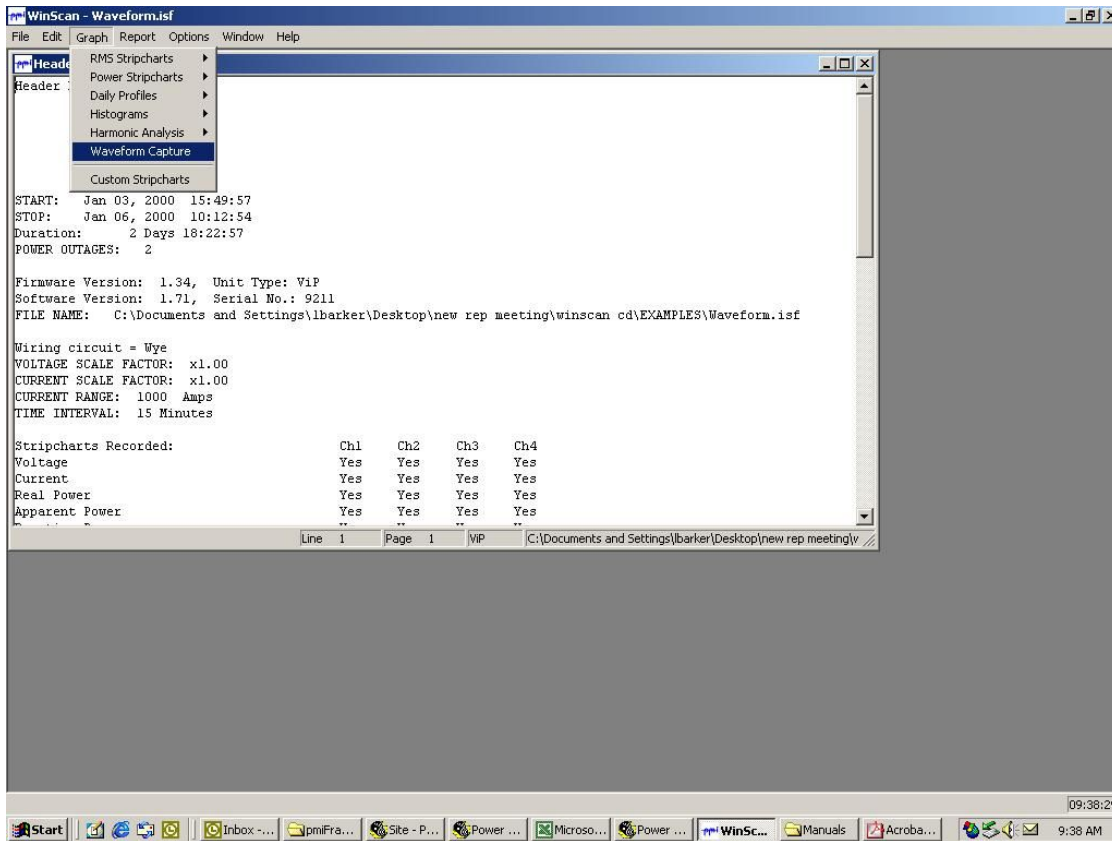
    A. Click Graph
    B. Click Waveform Capture

Figure 4: Graph Menu

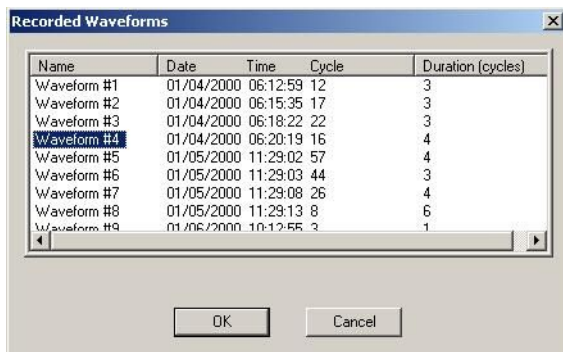   C. Select waveform to view
        D. Click OK

Figure 5: Waveform Selection

        E. The waveform should be shown.
        F. To zoom into a particular area simply left click and drag the cursor around the area you would like to view and release.
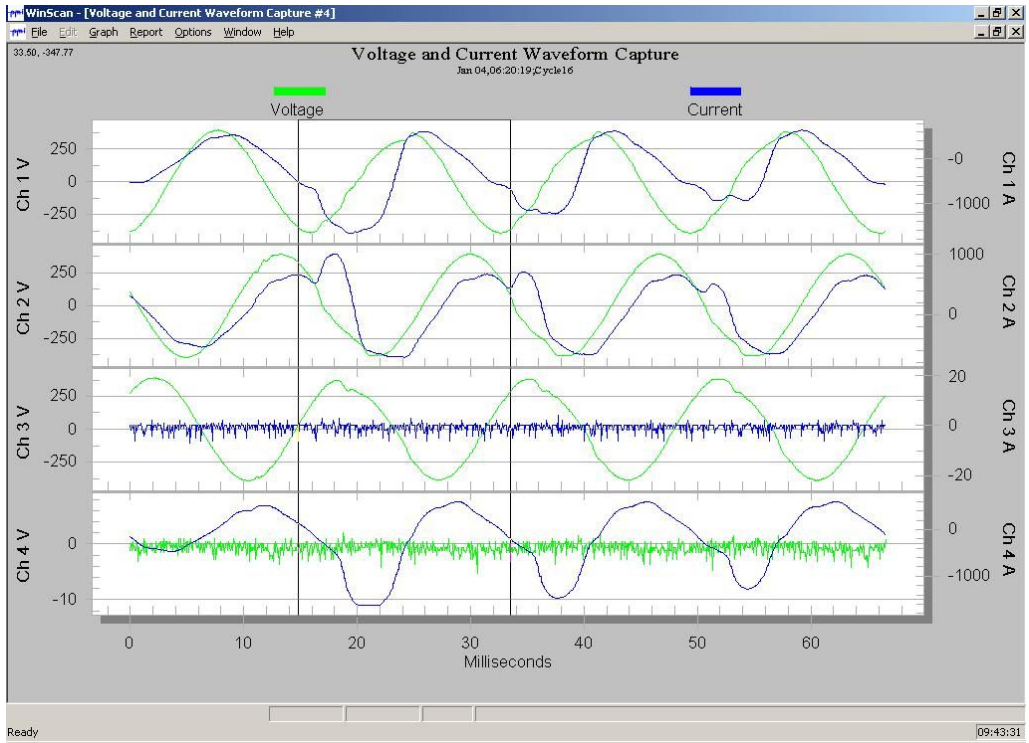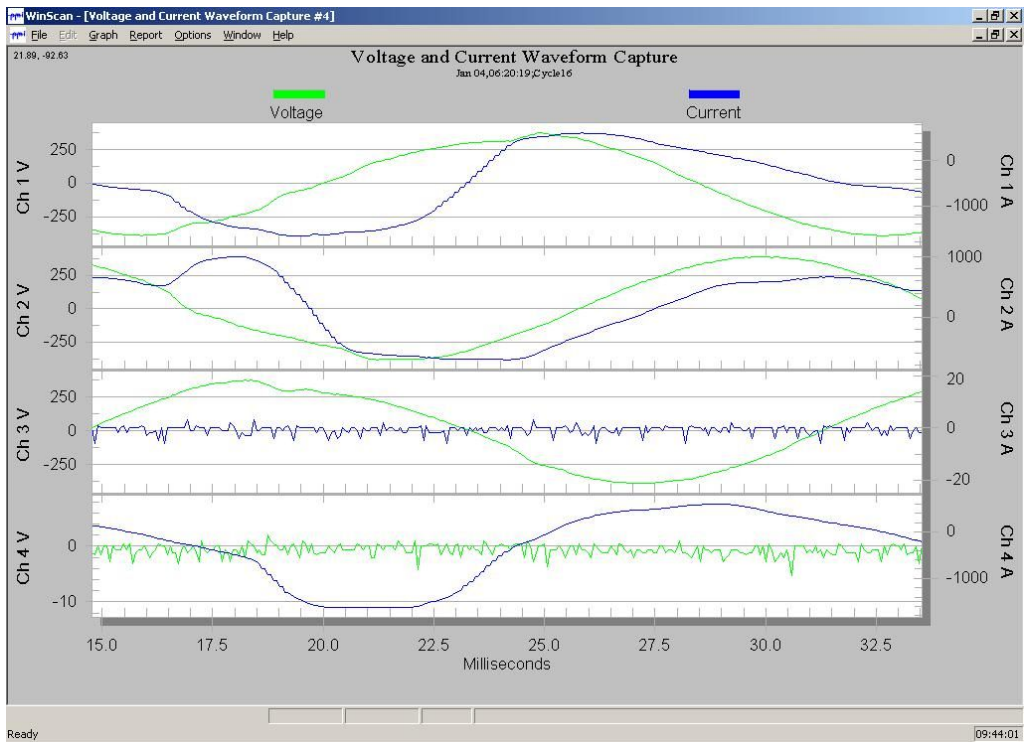
Figure 6: Waveform Capture

Figure 7: Waveform Capture zoomed in

E. Harmonic Bar graphs

Users that have PMI units that are capable of storing waveforms can now display harmonic bar graphs using the software. The WinScan software will perform a harmonic analysis off the first full cycle displayed in the zoom. If less than one cycle is in the view, WinScan will perform the harmonic analysis off the first full cycle from the start of the zoomed area. To create a harmonic bar graph simply perform the following:

    A.   Click on Graph
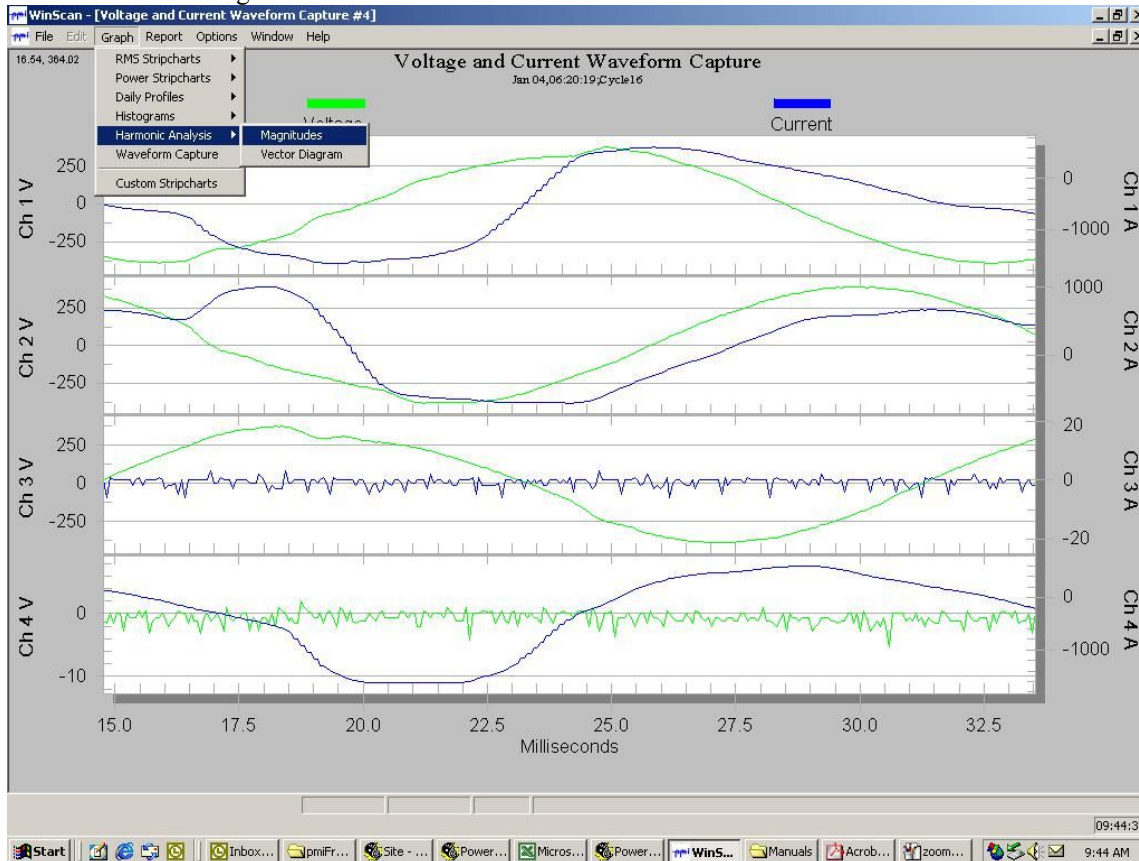   B.   Click on Harmonic Analysis
    C.   Click on Magnitudes

Figure 8: Harmonic Analysis Menu

Figure 9: Harmonic Bar Graph

D. To set graph options click on Options, Harmonic Analysis.

Figure 10: Options Menu

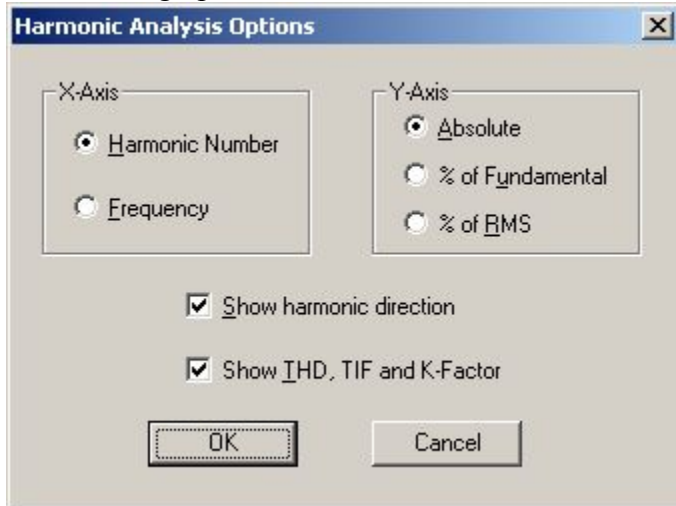E. Here you can set what parameters you would like displayed as well as how you would like the graph formatted.

Figure 11: Harmonic Analysis Options

1. Under the X-Axis you may display as a harmonic number or frequency (i.e.- 2nd harmonic = 2 x fundamental frequency = 120Hz in North America).
2. Y-Axis can be displayed as an absolute value (Amps, KW, or Volts) or as a percent of fundamental or RMS.
3. You can also display the harmonic Direction. (Above the line the harmonic is generated from the source, below the line from the load).
4. You may also show THD (total harmonic distortion), TIF (Telephone Interference Factor), as well as K- Factor.

F. Vector Diagrams

Users that have a scanner capable of capturing waveforms can now create Vector Diagrams for each harmonic frequency. All angles are taken with reference to channel 1 voltage input.

To create a vector Diagram simply:
    A. Click on Graph
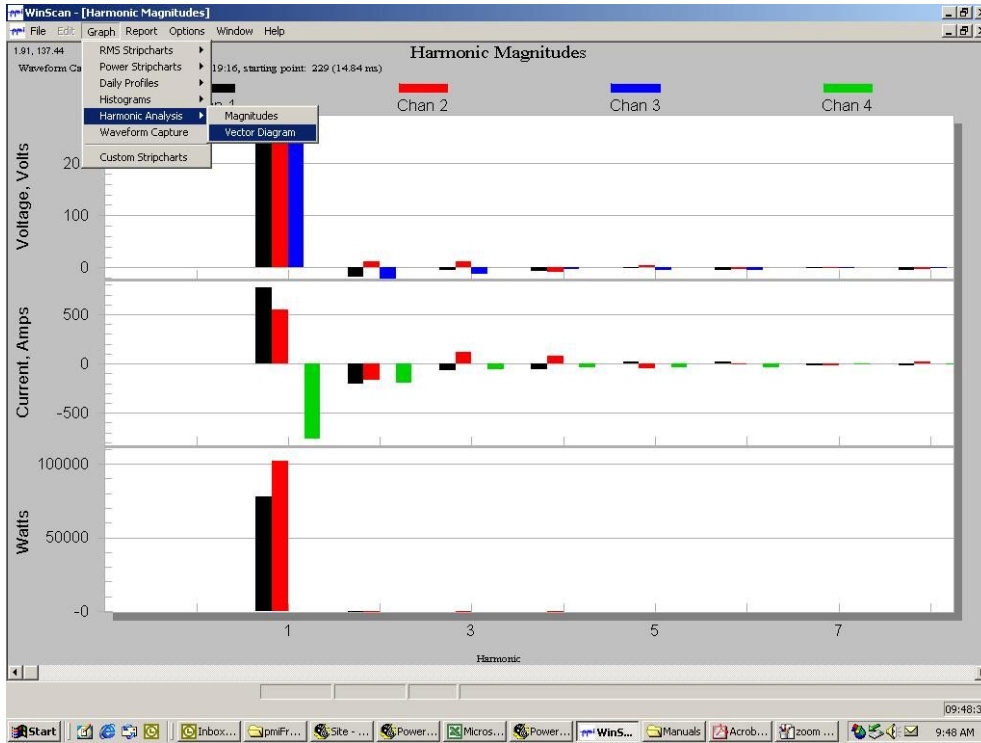   B. Click on Harmonic Analysis
    C. Click on Vector Diagram

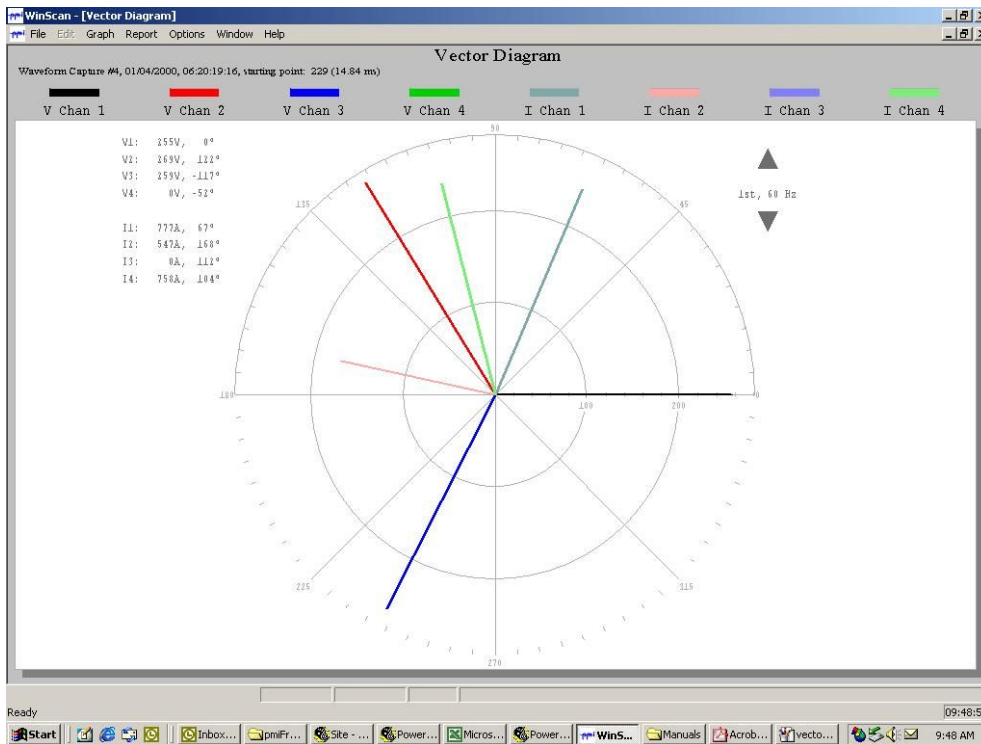**Figure 12: Harmonic Analysis Menu**

Figure 13: Vector Diagram

D. You may also view the vector diagram for each harmonic by clicking on the up and down arrows on the vector diagram.
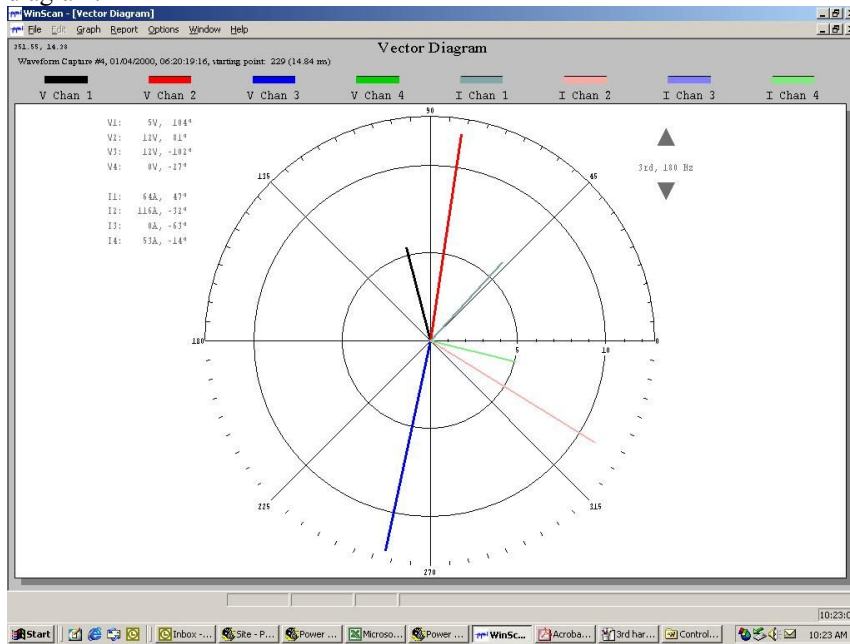
Figure 14: 3rd Harmonic Vector Diagram

G. Harmonic Analysis Report
You can now generate a harmonic analysis report if your scanner is capable of waveform capture. This report will provide you with a listing of all harmonics, even harmonics, odd harmonics, triplen harmonics, THD, as well as K-Factor, and TIF.

To generate a harmonic analysis report simply:
    A.   Zoom on the waveform you would like to generate the report from.
    B.   Click on Report
    C.   Click on Harmonic Analysis

Figure 15: Harmonic Analysis Report

H. Custom Strip Charts

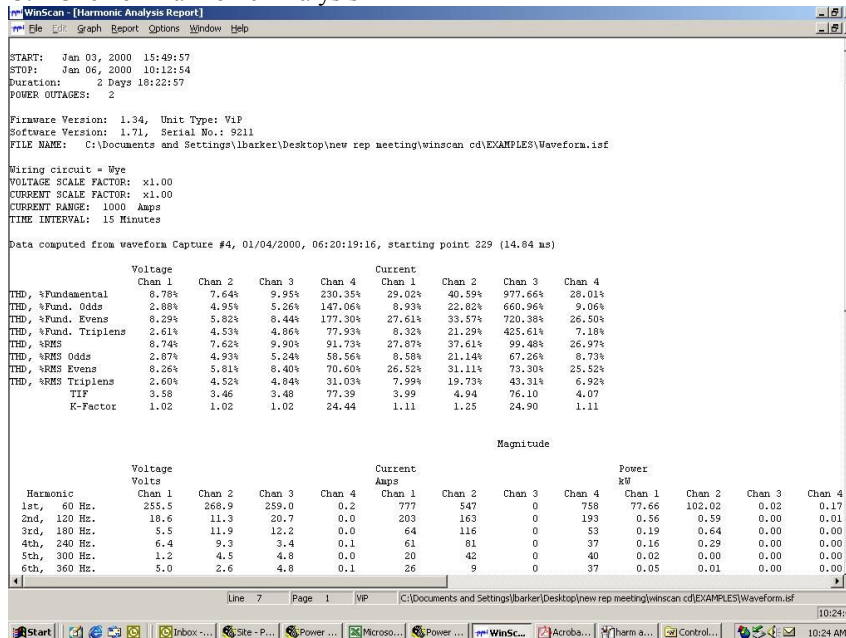Although WinScan provides you with numerous strip charts in the default configuration, sometimes a user may want a particular format that they can use to view the recorded data. For instance some utilities prefer to view only maximum currents and minimum voltages on the same screen.

Users can create custom strip charts that they can use over and over again on any file created. Creating a custom strip chart will create a template that will enable you to view information in the format you would like.

To create a Custom Strip Chart simply:
      A. Click on Graph
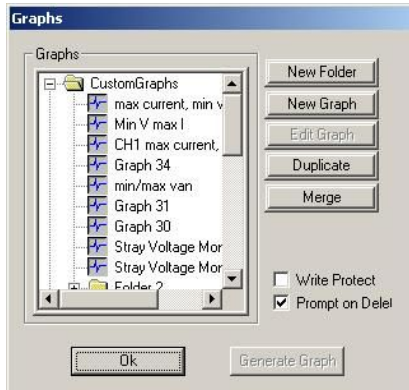   B. Click on Custom Strip Charts

Figure 16: Custom Graphs

      C. You can now create a new folder to store the charts in, or create a new Graph. For this example let's select New Graph.
      D. Type in the name of the Graph (example Max Amps, Min Volts)
      E. Type in the Subtitle
      F. Click on New Axis
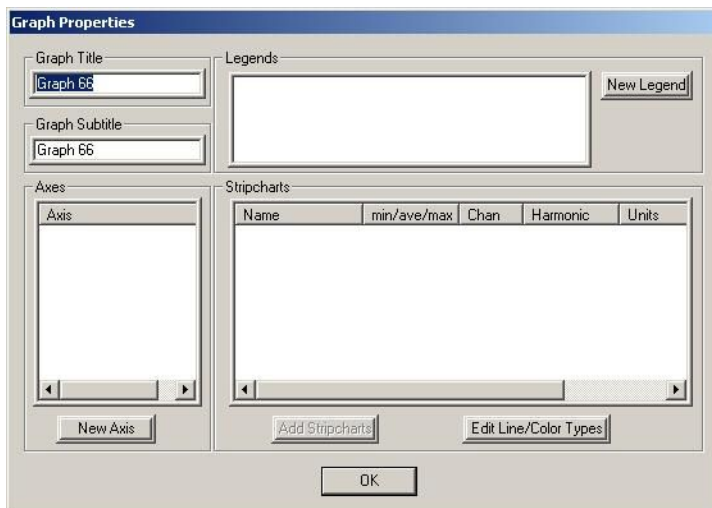
Figure 17: Graph Properties
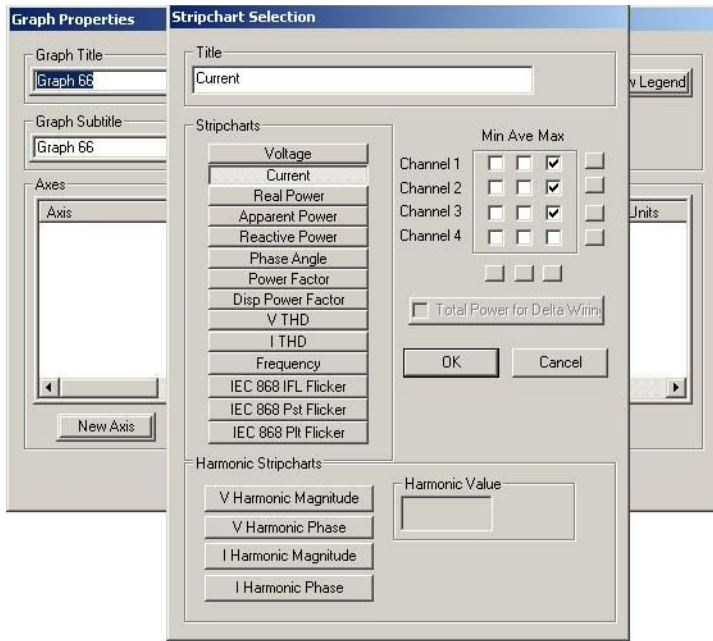
Figure 18: Strip Chart Selection

      G.   Select the strip charts you want on the graph. For this example I will select channel 1,2,3 Maximum Currents.

      H.   Click ok

      I.   To create a view that has only one engineering unit on a top graph and one on the bottom, simply create a second axis that is empty. Click on new axis and click ok.
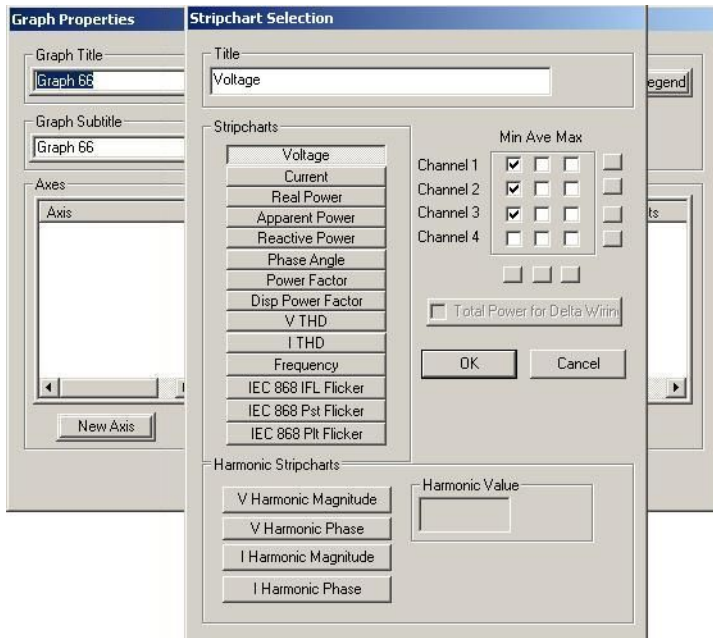
Figure 19: Strip chart selection

      J.   For this example I will add a third axis for voltage minimums for channel 1,2,3.

      K.   Click ok.

      L.   If you wish you could add legends, change the names and colors by clicking on New Legend.
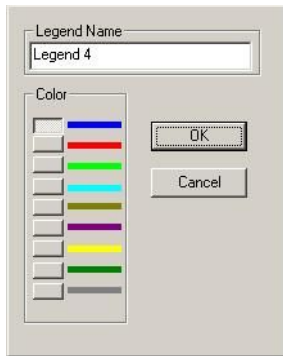
Figure 20: Legend dialog box

        M. You can also change the colors of the traces by double clicking on the trace color.

        N. Click ok and the graph is saved. To generate graph, click on Generate Graph.
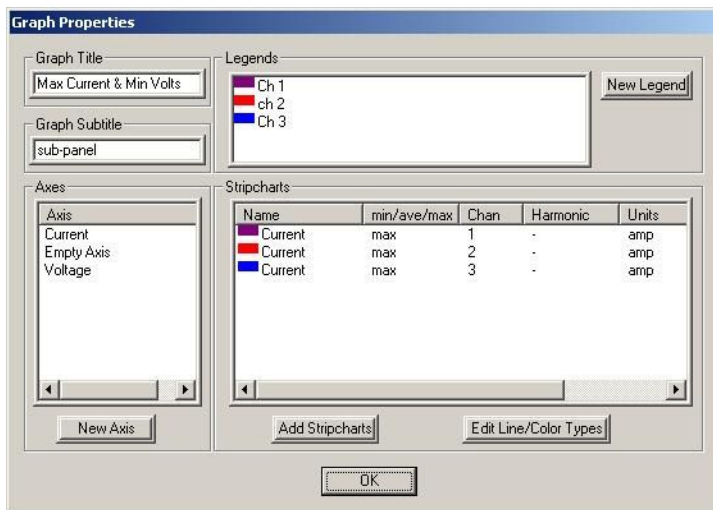
Figure 21: Graph Properties

        O. To use this graph on a different data file simply open the file and click on Graph, Custom Strip Charts, Select the template you had just created, and click on Generate graph.
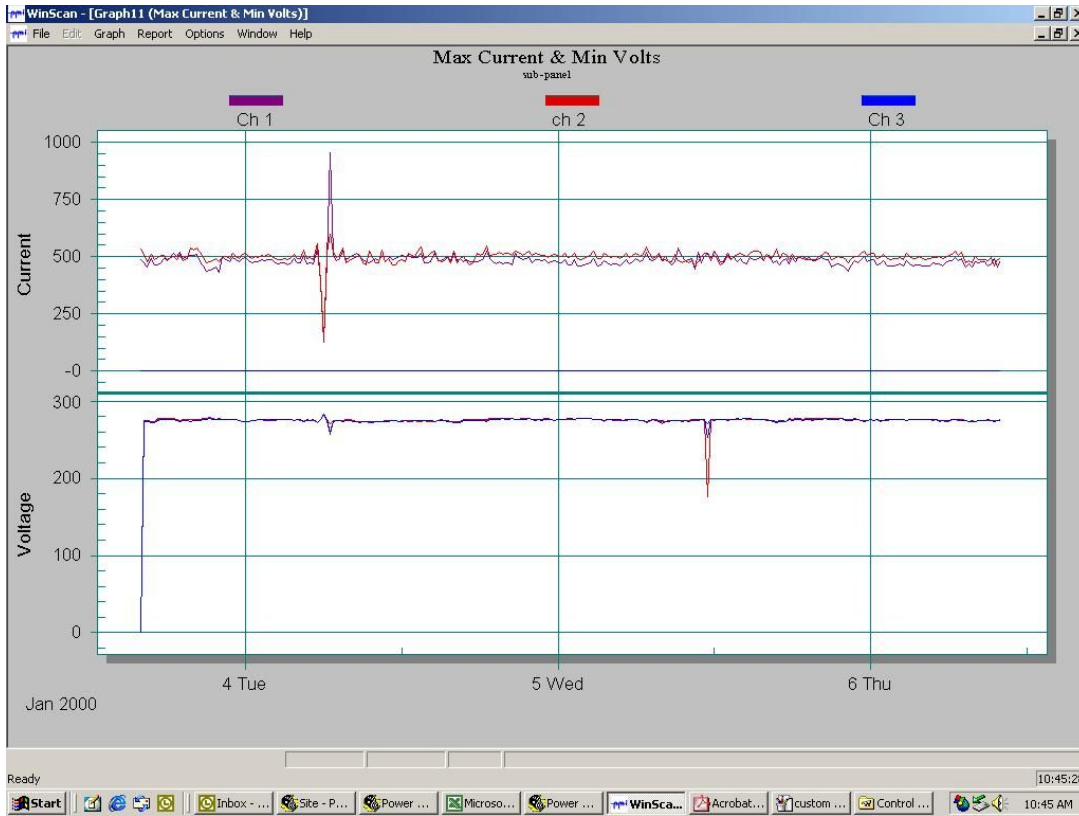
Figure 22: Finished Custom Graph

P.   You may also generate a Report from a Custom Strip Chart by clicking on Report, Custom Strip Chart, select the chart you want the report formatted, and click on Generate Report.
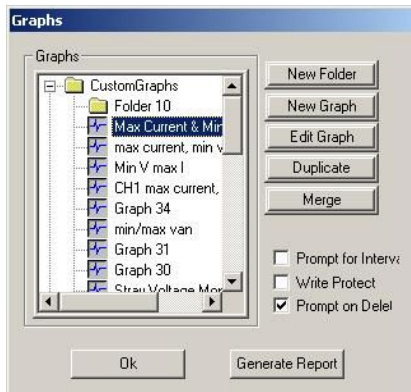
Figure 23: Custom Graphs Report Dialog
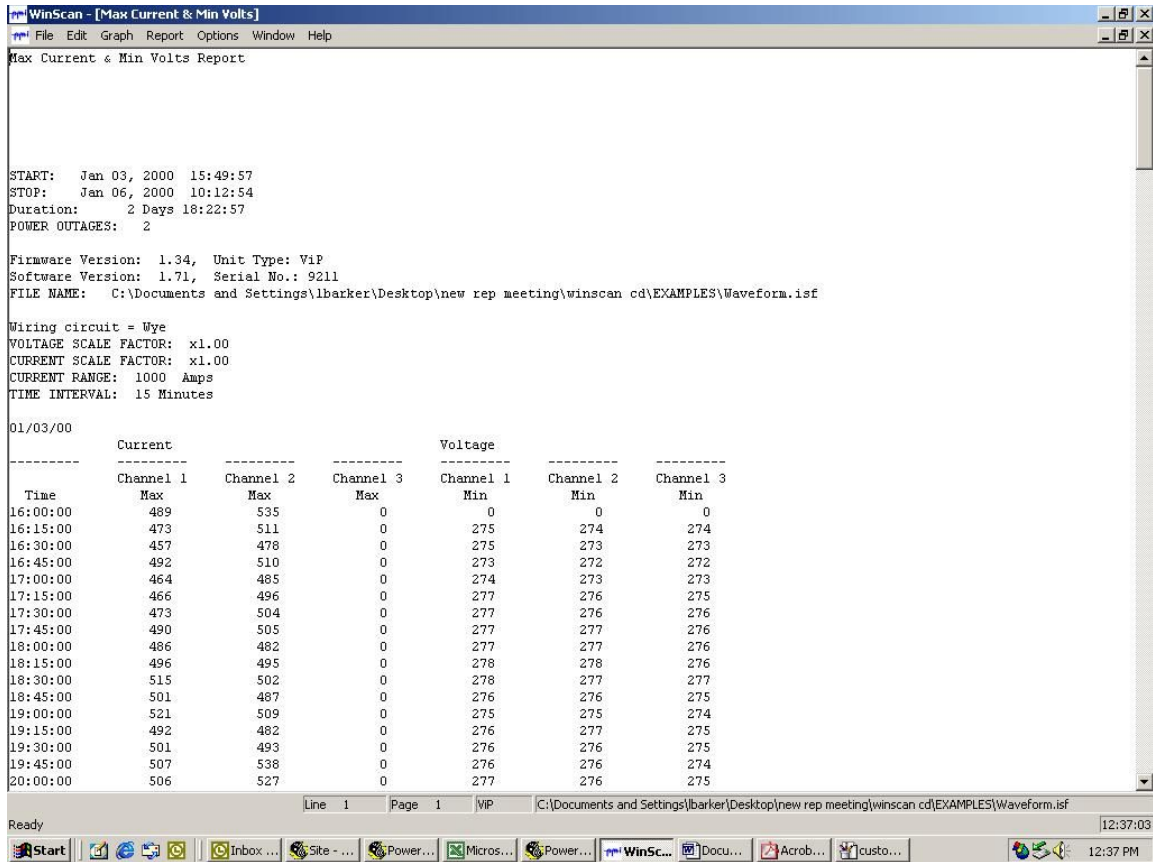
Figure 24: Custom Report

Section 8

8.1 Reports

8.1.1 The Report menu

WinScan™ can generate numerical tables from Scanner data. By using the **REPORT** menu, you can produce tables showing interval-by-interval readouts of Scanner data or single-cycle histograms that show the frequency of a certain reading. You can also create reports on certain events, such as a power outage or abnormal voltage reading, which may have occurred while the Scanner was recording.

Once you have created a report, you can print it or export it to a spreadsheet program for further analysis.

WinScan™ reports begin with the information from the **"Header Report"**. You may move up and down a report by clicking on the scroll arrows in the upper and lower right-hand corners of the report window. You cannot type in the report window. See **EDIT TEXT**, to edit the report header or add notes to the report.

Figure 8-1: Report Menu

⇒ For a list of all the reports WinScan™ can create, see *Appendix 2*,

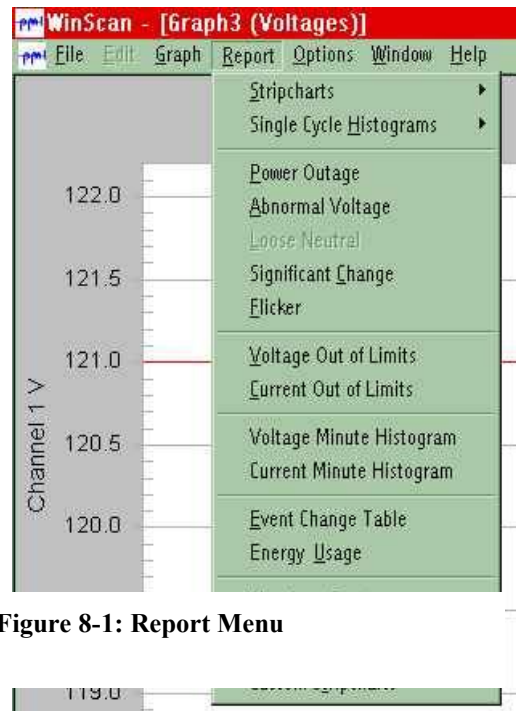⇒ For explanations of various graphs and reports, see *Appendix 3*.

A. Interval Reports (STRIPCHARTS)

An interval report is a listing of certain data recorded by the Scanner, presented interval-by-interval—a numerical stripchart. For example, if the Scanner's recording interval was set at one second, an interval report will list data second-by-second.

To create an interval report, first load a data file according to the instructions earlier in this chapter. Then select **REPORT** from the menu bar by clicking on it or by typing **<ALT+R>**. From the pull-down menu, select **STRIPCHARTS** by pointing to it with the cursor or by using the arrow key to highlight it and typing either **<RIGHT ARROW>** or **<ENTER>**. A new fold-out menu lists the seven types of data with which WinScan™ can create an interval report: **RMS VOLTAGE**, **RMS CURRENT**, **REAL POWER (WATTS)**, **APPARENT POWER (VA)**, **REACTIVE POWER (VAR)**, **PHASE ANGLE** and **POWER FACTOR**. Select the measurement to be used in the interval report by clicking on the word or by using the arrow keys to highlight your choice and typing **<ENTER>**. WinScan™ will then produce the report you requested.

Once you have created an interval report, you can print it or export the data for further analysis. See **Printing reports** and **Exporting report data to a spreadsheet**.

B. Single-Cycle Histograms

Cycle histogram reports show the number of cycles during which a certain value was recorded. Histograms can help you see both the range of the values recorded and the values most commonly recorded.

To create a single-cycle histogram, first load a data file according to the instructions earlier in this chapter. Then select **REPORT** from the menu bar by clicking on it or by typing **<ALT+R>**. From the pull-down menu, select **SINGLE-CYCLE HISTOGRAMS** by pointing to it with the cursor or by using the arrow keys to highlight it and typing either **<RIGHT ARROW>** or **<ENTER>**. The next fold-out menu is a list of the eight types of data with which WinScan™ can create a histogram: **RMS VOLTAGE**, **RMS CURRENT**, **REAL POWER (WATTS)**, **APPARENT POWER (VA)**, **REACTIVE POWER (VAR)**, **PHASE ANGLE**, **POWER FACTOR,** and **DISPLACEMENT POWER FACTOR**. Select a quantity by clicking on the word or by using the arrow keys to highlight your choice and typing **<ENTER>**. WinScan™ will then produce the report you requested.

WinScan™ can also create *minute* histograms—rather than *cycle* histograms—of voltage and current over the recording period. See **Voltage Minute Histogram** or **Current Minute Histogram**.

Once you have created a histogram, you can print it or export the data for further analysis. See **Printing reports** and **Exporting report data to a spreadsheet**.

C. Event Reports

Most of the remaining items in the **Reports** menu generate lists of unusual occurrences during the recording period rather than compiling data from the entire report period.

Event reports can be created for the following data:
- **Power Outage**
- **Abnormal Voltage**
- **Significant Change**
- **Flicker**
- **Voltage Out of Limits**
- **Current Out of Limits**
- **Event Change Table**

The remaining options—**Voltage Minute Histogram** and **Current Minute Histogram**—create reports that show the frequency of occurrence of average voltage or current levels.

To generate any of these reports, first load a data file according to the instructions earlier in this chapter. Then select **Report** from the menu bar by clicking on it or by typing **<Alt+R>**. Then click on your choice, or use the arrow keys to highlight your selection and type **<Enter>**. For almost all the choices, this will lead directly to the report you selected.

However, selecting **Voltage Out of Limits** or **Current Out Of Limits** will bring up a dialog box titled **"Out of Limits Thresholds."** Define the acceptable range of voltage or current by typing in values in the boxes marked "Upper Limit" and "Lower Limit." To search for minimum and maximum values in each interval that are outside the range you have set, click on **[Min/Max Values]**. To search for average values outside the range, click on **[Average Values]**. WinScan™ will create a list of readings that meet your criteria.

Edit Text

When you create a report, WinScan™ adds a new choice to the menu bar at the top of the screen: **Edit** will appear to the right of **File**. Select **Edit** by clicking on it or by typing **<Alt-E>**. The option that appears is **Report Header**.

- **Report Header** allows you to enter four lines of up to 40 characters each that will be added to the beginning of the active report. Select this option from the **Edit** menu by clicking on it or by using the arrow keys to highlight it and typing **<Enter>**. Use **<Tab>** to move between the lines in the resulting dialog box. Click on **[OK]** or type **<Enter>** when you have finished typing the header information. Click **[Cancel]** to exit the dialog box without entering your revisions.

Printing reports

To print a report, it in the active window. (If you are not sure whether the report is in the active window, click on any part of the report. This will make that window active.) Next, select **File** from the menu bar, either by clicking on the word or by typing **<Alt+F>**. From this menu, select **Print** by clicking on it, by typing **<P>**, or by highlighting the option using the arrow keys and typing **<Enter>**. A dialog box entitled **"Print"** will appear. Choose the appropriate printer, pages to be printed, and number of copies, then click **[Print]** or type **<Enter>**.

You may change the printer options prior to printing a report by selecting **Print Setup** from the **File** menu. See **Print Setup**.

Exporting report data to a spreadsheet

You may wish to export report data to a spreadsheet program for further analysis. To begin this process, the report must be open and in the active window. (If you are not sure whether the report is in the active window, click on any part of the report. This will make the window active.) Next, select **File** from the menu bar, either by clicking on the word or by typing **<Alt+F>**. From this menu, select **Export Report** by clicking on the word, by typing **<A>**, or by highlighting the option using the arrow keys and typing **<Enter>**.

A dialog box entitled **"Save As"** will appear. Specify the location in which you would like the exported data to be saved. The line marked "Save As Type:" should read "Spreadsheet (*txt.)" If it does not, use the scroll box to find that option. When the destination, a new file name, and file type are in place, export the data by clicking **[OK]**.

The data will be exported as a text file (bearing a ".txt" extension), with the data fields comma-delimited. Follow the instructions in your spreadsheet application for importing data of this kind.

8.2 The Window menu

Use the **WINDOW** option to arrange the windows on your computer screen. To access the **WINDOW** menu, click on the word or type **<ALT+W>**.

- **CASCADE** stacks the open windows like a deck of cards. To select this option, click on the word or type **<C>**.
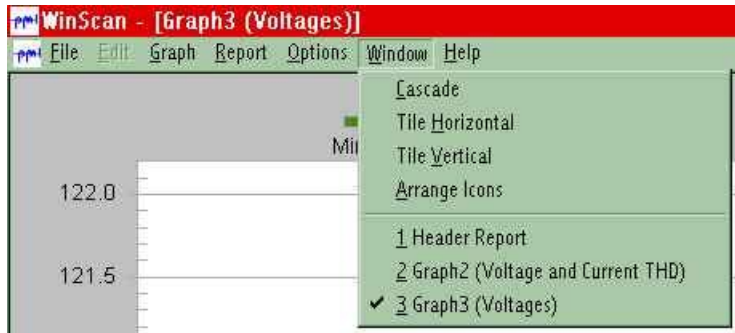

Figure 8-2: Window Menu

The two tile features can be used for side-by-side comparisons of two or more charts and/or graphs:

- **TILE HORIZONTAL** arranges two or three windows in horizontal strips across the screen, with the contents of each window visible. To select this option, click on it or type **<H>**.

- **TILE VERTICAL** arranges two or three windows side-by-side, with the contents of each visible. To select this option, click on it or type **<V>**.

- **ARRANGE ICONS** puts in neat order (at the bottom of the screen) the small boxes representing minimized windows. To select this option, click on it or type **<A>**.

- Typing the **NUMBER** before the title of a certain window brings that window to the front and makes it the active window. To select a window listed here, click on the name or type the number of the window. The listing includes only visible and minimized windows still on the WinScan™ desktop—not windows that have been closed.

Other ways to adjust the appearance of windows and the WinScan™ desktop include:

- Change the size of a window by dragging the corners of the box in any direction.

- A window may be moved manually by clicking on the top bar and then dragging it to the desired location.

- To minimize a window, click on the small box that contains a dash (-), located in the upper right-hand corner of the window.

- To maximize a window, click on the box containing a small square, located in the upper right-hand corner of the window.

- To close a window, click on the box with an "X", located in the upper right-hand corner of the window.

Note: Closing a WinScan™ graph or report by clicking on the "X" erases that graph or report; in order to view it again, you must re-select the same options and have the graph re-drawn. If you want to hide a graph or report in order to view it later without having to re-draw it, minimize the graph or report box rather than closing it. Closing all the graphs, reports, and the **"Header Report"** closes the data file and returns you to the main menu.

Section 9

9.1 Trouble shooting

Problem: *The Scanner and computer are not communicating.*

Possible causes and solutions:

1. The Scanner is not properly powered. During the downloading process, the Scanner must be powered in one of two ways:

a) The wall transformer power adapter plugged into the DB-25 plug on the serial cable, or

b) using the line voltage while the Scanner is still installed. To use this option, the voltage on Channel 1 must be greater than 80 volts. Alternately, apply 120 VAC from another source to the Channel 1 input lines (the black-booted clips).

2. The download cable is not connected to a serial port.

a) A serial port is usually either a 25-pin or 9-pin male connector on the back of your computer. If the ports are labeled, they will read COM1, COM2, COM3, and COM4 (unless or course there are fewer than four). A parallel port (LPT1, for example) will not work for downloading Scanner data. If you are not sure which port is a serial port, consult your computer manual.

rial port you are using is not the same one chosen in the **PC SETUP** stage.

sure the software is set for the correct serial port, or that you have plugged the serial cable into the serial port selected in the software. elect a serial port or check which one you selected, see **PC SETUP**. Try changing the selected com port to each possible setting (COM1, or 4) and then attempting the download again. Or, try plugging the serial port into each of the COM ports at the back of your computer.

al port on your computer is a 9-pin male and the download cable is a 25-pin male, an adapter is needed. A faulty adapter can hamper uter communications. The problems could include:

ay not be a serial adapter, or

everal pins wired differently than WinScan™ was expecting.

A 12-volt adapter was included with your Scanner™. However, if that adapter has been lost, a suitable replacement can be purchased at Radio Shack (catalog number 26-209) or another electronics store.

5. The **Baud Rate** ("Local") in the **PC SETUP** dialog box is not set correctly.

a) Try setting the rate lower than 4800 baud, and then try again to download.

Problem: *The Scanner was set up to record for several weeks, but the reports only show data for the last few days.*

Possible causes and solutions:

The amount of data overflowed the storage capability of the Scanner. The only data affected by this sort of memory overwriting are stripchart data; other reports and graphs—histograms, daily profiles, incident reports, and so on—will include data from the entire recording period.

The reason for the overwriting is this: interval settings determine how many stripchart data points are taken during a given period. And the more frequently data points are saved in the Scanner's memory, the more quickly that memory will fill up. The interval setting can be altered in **SCANNER SETUP** or from the Scanner keypad. The Scanner records three data points (average, maximum and minimum) for each interval. The chart below shows the Scanner's recording capacity based on the interval setting and available memory. Recording durations for interval settings not listed can be calculated by multiplying or dividing the listed settings.

If you want the Scanner to shut down when the memory is filled rather than write over the oldest stripchart data, un-check the **Interval Recording Overwrite** box in the **INITIALIZE** dialog box before initializing the Scanner.

	512K	1,024K	1,536K	2,048K
1 second	55.2 min.	1.84 hours	2.76 hours	3.68 hours
5 seconds	4.6 hours	9.2 hours	13.8 hours	18.4 hours
1 minute	2.3 days	4.6 days	6.9 days	9.2 days
2 minutes	4.6 days	9.2 days	13.8 days	18.4 days
5 minutes	11.5 days	23 days	34.5 days	46 days

10 minutes	23 days	46 days	69 days	92 days
15 minutes	34.5 days	69 days	103.5 days	138 days
1 hour	138 days	276 days	414 days	552 days

Appendix 1: PC and Scanner configuration factory settings

PC SETUP

OPTION	FACTORY SETTING
Local: Serial Port	Com 1
Local: Baud Rate	4800
Modem: Serial Port	Com 2
Modem: Baud Rate	Auto
Dialing Method	Tone
Auto Scanner Reset	Prompt
Scale Factor: Voltage	1
Scale Factor: Current	1
Auto Clock Reset	On
Auto Data Save	On
Stripchart Report Header	Checked

SCANNER SETUP/INITIALIZE

OPTION	FACTORY SETTINGS
LED Indicator	Checked
Interval Recording Overwrite	Checked
Ab. LED Trigger Duration	5 seconds
Interval Data Storage	100 percent
Significant Change Threshold	3 volts
Modem Ring Count	3 rings
Number of Channels	4
Rotary Switch Override	Not Checked
Recording Interval	1 minute

EVENT RECORDING PARAMETERS

Nominal Voltage	120 volts
Threshold Bands	6 volts
Minimum Event Time	10 cycles

Default settings are identical for all four channels.

ANSI/IEEE STANDARD 141

Period	Tolerance (%)	Limit
10 seconds	1	5
1 minute	1.5	10
15 minutes	2	10
30 minutes	2.5	10
1 hour	3	10
4 hours	3.5	10
8 hours	4	10
12 hours	5	10
24 hours	6	10

Default settings are identical for all four channels.

ABNORMAL LED INDICATORS

Nominal	Low Range	High Range
Standard: 120	6	12
Standard: 208	10	20
Standard: 240	12	24
Standard: 277	13	27
Standard: 480	24	48
Custom: 106	5	10
Custom: 203	11	23

Default settings are identical for all four channels.

Appendix 2: Graphs and reports available in WinScan™

Possible graphs

Menu choices in SMALL CAPS, graph titles in "Quotations."

GRAPHS
RMS STRIPCHARTS
OVERVIEW
AVERAGE
VOLTAGE …………………………..."Average RMS Voltage"
CURRENT …………………………..."Average RMS Current"
MAXIMUM
VOLTAGE …………………………..."Maximum RMS Voltage"
CURRENT …………………………..."Maximum RMS Current"
MINIMUM
VOLTAGE …………………………..."Minimum RMS Voltage"
CURRENT …………………………..."Minimum RMS Current"
CHANNEL SUMMARY
CHANNEL 1
VOLTAGE …………………………."Channel 1 RMS Voltage"
CURRENT …………………………."Channel 1 RMS Current"
CHANNEL 2
VOLTAGE …………………………."Channel 2 RMS Voltage"
CURRENT …………………………."Channel 2 RMS Current"
CHANNEL 3
VOLTAGE …………………………."Channel 3 RMS Voltage"
CURRENT ………………………… "Channel 3 RMS Current"
CHANNEL 4
VOLTAGE …………………………."Channel 4 RMS Voltage"
CURRENT …………………………."Channel 4 RMS Current"
VOLTAGE AND CURRENT…………."RMS Voltage and Current"
VOLTAGE AND CURRENT THD……."RMS Voltage and Current THD"

POWER STRIPCHARTS
REAL POWER "Real Power"
APPARENT POWER………………….…"Apparent Power"
REACTIVE POWER………………… "Reactive Power"
PHASE ANGLE …………………….…"Phase Angle"
POWER FACTOR"Power Factor"

DAILY PROFILES
RMS VOLTAGE"RMS Voltage Daily Profile"
RMS CURRENT"RMS Current Daily Profile"
VOLTAGE THD"Voltage THD"
CURRENT THD"Current THD"

REAL POWER.. "Real Power Daily Profile"
APPARENT POWER……………….…… "Apparent Power Daily Profile"
REACTIVE POWER ………………….…"Reactive Power Daily Profile"
PHASE ANGLE …………………….…"Phase Angle Daily Profile"
POWER FACTOR"Power Factor"
DISPLACEMENT POWER FACTOR…"DPF Daily Profile"

HISTOGRAMS
NOMINAL VOLTAGE ……….………"Nominal Voltage Minute Histogram"
ABNORMAL VOLTAGE "Abnormal Voltage Minute Histogram"
RMS VOLTAGE……………………….…."RMS Voltage Cycle Histogram"
RMS CURRENT……………………….…."RMS Current Cycle Histogram"
REAL POWER……………………….……"Real Power Cycle Histogram"
APPARENT POWER………………….……"Apparent Power Cycle Histogram"
REACTIVE POWER………………….……"Reactive Power Cycle Histogram"
PHASE ANGLE……………………….……"Phase Angle Cycle Histogram"
POWER FACTOR……………………….…"Power Factor Cycle Histogram"
DISPLACEMENT POWER FACTOR…"DPF Cycle Histogram"
WAVEFORM CAPTURE …….……… Allows viewing of the actual waveforms
CUSTOM STRIPCHARTS ……… .Dialog box permits up to 24 plots simultaneously.

Possible Reports
Menu choices in Sᴍᴀʟʟ Cᴀᴘs, report titles in "Quotations."

Rᴇᴘᴏʀᴛ
Sᴛʀɪᴘᴄʜᴀʀᴛs
RMS Vᴏʟᴛᴀɢᴇ...................................…"Voltage Interval Report"
RMS Cᴜʀʀᴇɴᴛ.................................…"RMS Current Interval Report"
Vᴏʟᴛᴀɢᴇ THD...............................…"Voltage THD Interval Report"
Cᴜʀʀᴇɴᴛ THD...............................…"Current THD Interval Report"
Rᴇᴀʟ Pᴏᴡᴇʀ...................................…"Real Power Interval Report"
Aᴘᴘᴀʀᴇɴᴛ Pᴏᴡᴇʀ...........................…"Apparent Power Interval Report"
Rᴇᴀᴄᴛɪᴠᴇ Pᴏᴡᴇʀ...........................…"Reactive Power Interval Report"
Pʜᴀsᴇ Aɴɢʟᴇ...................................…"Phase Angle Interval Report"
Pᴏᴡᴇʀ Fᴀᴄᴛᴏʀ..............................…"Power Factor Interval Report"
Dɪsᴘʟᴀᴄᴇᴍᴇɴᴛ Pᴏᴡᴇʀ Fᴀᴄᴛᴏʀ......"Displacement Power Factor Interval Report"
Total Pᴏᴡᴇʀ..................................…"Total Power Interval Report"

Sɪɴɢʟᴇ-Cʏᴄʟᴇ Hɪsᴛᴏɢʀᴀᴍs
RMS Vᴏʟᴛᴀɢᴇ………………….."RMS Voltage Cycle Histogram Report"
RMS Cᴜʀʀᴇɴᴛ………………….."Current Cycle Histogram Report"
Rᴇᴀʟ Pᴏᴡᴇʀ (Wᴀᴛᴛs)……………"Real Power Cycle Histogram Report"
Aᴘᴘᴀʀᴇɴᴛ Pᴏᴡᴇʀ…………………."Apparent Power Cycle Histogram Report"
Rᴇᴀᴄᴛɪᴠᴇ Pᴏᴡᴇʀ………………….."Reactive Power Cycle Histogram Report"
Pʜᴀsᴇ Aɴɢʟᴇ………………………"Phase Angle Cycle Histogram Report"
Pᴏᴡᴇʀ Fᴀᴄᴛᴏʀ……………………."Power Factor Cycle Histogram Report"
Dɪsᴘʟᴀᴄᴇᴍᴇɴᴛ Pᴏᴡᴇʀ FACTOR…"DPF Cycle Histogram Report"
Pᴏᴡᴇʀ Oᴜᴛᴀɢᴇ……………………."Power Outage Report"
Aʙɴᴏʀᴍᴀʟ Vᴏʟᴛᴀɢᴇ………………"Abnormal Voltage Report
Sɪɢɴɪғɪᴄᴀɴᴛ Cʜᴀɴɢᴇ………............…"Significant Change"
Fʟɪᴄᴋᴇʀ……………………………"Flicker Report"
Vᴏʟᴛᴀɢᴇ Oᴜᴛ ᴏғ LIMITS…………"Voltage Out of Limits Report"
Cᴜʀʀᴇɴᴛ Oᴜᴛ ᴏғ Lɪᴍɪᴛs………….."Current Out of Limits Report"
Vᴏʟᴛᴀɢᴇ Mɪɴᴜᴛᴇ Hɪsᴛᴏɢʀᴀᴍ……"RMS Voltage Minute Histogram Report"
Cᴜʀʀᴇɴᴛ Mɪɴᴜᴛᴇ Hɪsᴛᴏɢʀᴀᴍ……"RMS Current Minute Histogram Report"
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Wᴀᴠᴇғᴏʀᴍ Cᴀᴘᴛᴜʀᴇ……."Waveform Capture report"
Lɪsᴛ Oғ Wᴀᴠᴇғᴏʀᴍs…….."List of Waveform Report"
Cᴜsᴛᴏᴍ Sᴛʀɪᴘᴄʜᴀʀᴛs……."Custom Stripcharts"

Appendix 3: Understanding graphs and reports

(G)—Graph; (R)—Report; (B)—Both

Underlined words are defined elsewhere in this appendix.

ABNORMAL VOLTAGE: (B) States or shows the date and time of any voltage readings outside the "normal" range defined during the Scanner initialization process. The graph version of this report, a <u>histogram</u>, shows a bar graph of the number of minutes the <u>RMS</u> voltage averaged a specific abnormal level. When the Scanner is first installed, it will sample the average voltage on each channel. The nominal in the chart closest to the sampled voltage will become the nominal used by the Scanner to decide which voltages are abnormal. It is these abnormal voltages that will be recorded. The abnormal voltage event must last more cycles than the number you entered for the **Abnormal LED Trigger Duration**.

APPARENT POWER (VA): (B) The product of <u>RMS</u> voltage and RMS current. Since power equals volts times amps, multiplying the RMS voltage by the RMS current gives a quality whose units are watts However, since the volt-amp product doesn't always represent consumed power, this quantity is called "volt-amps" (VA). This represents the power that is "apparently" being consumed, given the RMS voltage and current values. However, the real or true power consumed is always less than or, at most, equal to the apparent power due to reactive loads. When the <u>phase angle</u> is zero degrees, the apparent power is equal to <u>real power</u>. Transformers, generators, and other devices are rated in volt-amps, not watts.

DAILY PROFILE: (G) These graphs show trends over the course of a 24-hour day. The graphs show when levels are most likely to increase or decrease. To create a daily profile graph, the Scanner averages the levels taken at the same time of day (in 15-minute blocks) throughout the recording period and plots these averages over a 24-hour scale. For example, if over a three-day recording period the average readings from 6-6:15 a.m. are 110 volts the first day, 120 the second day, and 118 the third day, the daily profile graph will plot 116 volts as the 6 a.m. data point.

DISPLACEMENT POWER FACTOR: (B) See also <u>Power Factor</u>. Displacement power factor (DPF) represents the ratio of 60-Hz watts to volt-amps. It measures the same quantity that power factor does, but only includes 60 Hz voltage and current, and neglects the contribution of harmonics. If there are no harmonics present, the displacement power factor is equal to the true power factor. This quantity is computed as the cosine of the 60-Hz<u>phase angle</u>..

EVENT CHANGE TABLE: (R) One of the most complicated—and most useful—reports created by WinScan™. States the date and time of events during which the voltage deviated from the nominal voltage by more than the threshold bands for a period longer than the minimum event time. Nominal voltage, threshold bands, and minimum event time can all be set during the Scanner initialization process. Defaults for these terms and their meanings:

Nominal Voltage: Default is 120 volts. This setting is the expected normal operating voltage. Any voltage within the value of the threshold band (either less than or more than the nominal) is considered to be within the nominal voltage band.

Threshold Bands: Default is 6 volts. This setting defines the "bands" of voltage which range below the nominal down to 0 volts, and above the nominal to the highest voltage measurement. Bands are created by adding or subtracting the setting from the nominal; that is, with a nominal of 120 volts and a threshold setting of 6 volts, threshold bands are said to be: 114 volts, 108 volts, 102 volts, and so on, as well as 126 volts, 132 volts, 138 volts and so on. As voltage levels cross these "bands," the power level is said to have changed one threshold voltage.

Minimum Event Time: Default setting is 10. This is the minimum number of cycles that must elapse during an event before a new event can be triggered by further voltage variations of the same slope, i.e., two consecutive occurrences of sagging voltage. This setting prevents triggering multiple events during voltage surges or sags that cross multiple threshold bands.

⇒ Assume that the default settings have been used and the Scanner™ is recording. Here is how a change event happens and is recorded:

1. The beginning of an event comes when the voltage on any channel crosses a threshold level. Say the voltage drops out of the nominal band below 114 volts, the first threshold, then drops below the next threshold of 108 volts, and continues to drop to 107 volts—all within five cycles.

2. Since the sag "bottomed out" in less than the 10 cycles for which the minimum event time is set, only one event is recorded even though the voltage sagged across two voltage thresholds (114 and 108). Had the voltage reversed its course within the time limit—that is, surged after sagging—a new event would have been triggered.

3. After six more cycles (11 cycles after the start of the event), the voltage surges above the 108-volt threshold. This change of slope (that is, a surge following a sag or vice versa) coupled with the crossing of a threshold level has ended the first event.

4. The same factors that determined the first event had ended, though, have indicated the start of a second event: that is, a threshold band (namely, 108 volts) has been crossed. The Scanner, while recording the end of the first event, also begins to record information on this second event.

5. After 12 cycles, the voltage climbs back to 119 volts. Since this level is within the nominal voltage band, the second event comes to an end.

6. Since they occurred in succession and were linked to each other, the two events will be classified by WinScan™ into one "Super Event." They will still be reported separately, but will be grouped in the report under a common "Super Event" number. Super Events end when there are no active events on any of the recording channels. The next Super Event begins with the start of any event on any of the recording channels. All recording phases must be without events for one second before a new Super Event can begin.

   The **"Event Change Table Report"** produced by WinScan™ will show the date and time of the events, the channel on which each event occurred, and the number of cycles each event lasted. Whether the voltage sagged or surged is indicated by a minus (-) or plus (+) sign. WinScan™ also records the maximum and minimum voltage and current during the event. The columns "Current Prev" and "Current Post" display the current level one cycle before the event and one cycle after the event's conclusion.

FLICKER: (R) States the date and time of any flicker events as defined during the Scanner initialization process. A flicker event occurs when a voltage disturbance exceeds both the tolerance and the limit within the given time period. For instance, if the voltage varies by more than the tolerance, but does so fewer times than the limit, the disturbance will not be recorded as a flicker. The variations must exceed the tolerance at least as many times as the limit within the given period. The default settings, which can be adjusted in the Scanner initialization process, are from ANSI/IEEE Standard 141, and are listed in *Appendix 1*.

HISTOGRAM: (B) Histograms show the frequency of a certain reading—that is, the number of times a certain reading was recorded by the Scanner. Histogram reports will have the possible readings in numerical order in the left-hand column, followed by the number of times that reading occurred. Graphs will chart the possible readings on the horizontal (X) axis and the frequency on the vertical (Y) axis. Histograms can be *cycle*, meaning that the frequency number equals the number of cycles the reading occurred, or *minute* histograms, which show the number of minutes during which the average reading equaled a certain number. Histograms are useful for analyzing long-term data and in determining the most common value. However, histograms cannot tell you *when* a certain reading occurred.

PHASE ANGLE: (B) The amount by which two phases (two sine waves) are out of synchronization. Phase angle is defined as the amount of shift between the sine wave voltage and current waveforms. With a resistive load, the AC current sine wave varies exactly in step with the AC voltage waveform. When reactive loads such as motors and capacitors are added, the current waveform still varies with the voltage, but is shifted in time. The time shift is measured in degrees, with 360 degrees equal to one 60-Hz cycle (16.667 mS). One degree is about 46 microseconds. Ideally, there is no phase shift (zero degrees) and the voltage and current waveforms are perfectly in step. When the current is shifted past the voltage, the current is "lagging the voltage." If the current is shifted behind the voltage (earlier in time), the current is "leading the voltage."

POWER FACTOR: (B) The ratio of watts to volt-amps. This is a ratio representing the faction of volt-amps that are consumed as real power. This is the "true" power factor, which includes the effects of harmonics. The power factor is always less than or equal to 1. If the power factor is 1, all current is being drawn to produce real power that is doing actual work. If the power factor is zero, none of the current flow is being used to do work—no power is being consumed, but current is still being drawn. The power factor is termed "leading" or "lagging" depending on the direction of phase angle shift.

Power Outage: (R) States the date and time of any power outages recorded during the Scanner's operation. If no outages occurred, the report will state that none occurred. Power outages are sometimes classified using these categories.

Reactive Power (VAR): (B) Also known as "imaginary power." This quantity is computed as the volt-amps times the sine of the 60-Hz phase angle. Reactive or imaginary power appears to the power company as real, delivered power in terms of current flow and transformer loading, but is actually never consumed or used to do work. The dimensions of this quantity are those of power, but to avoid confusion the units are called reactive volt-amps, or VAR. Reactive loads, such as capacitors and motors, cause current to flow with a leading or lagging phase angle. This non-zero phase angle causes reactive power to flow. Power factor correction capacitors are also rated in VAR because they cause a fixed amount of reactive power to flow at a given line voltage.

Real Power (Watts): (B)Watts represent the rate of transfer of energy. This is the amount of energy consumed per unit of time. It is computed by multiplying the instantaneous values of voltage and current, since voltage multiplied by current equals power. Since an AC voltage source with a resistive load produces power that varies over the course of the 60-Hz cycle, power is normally averaged over a cycle. One horsepower is equal to 746 watts.

Root-mean-square (RMS): (B) Also known as "effective value." Root-mean-square voltage is the AC value that will provide the same heating or power effect as the equivalent DC value. Mathematically, RMS is the square root of the average of the peak voltage squared. For a sine wave, RMS is always 0.707 times the peak voltage or current. For a triangular wave, the RMS is 0.577 times the peak. The root-mean-square reflects the power value of the entire wave cycle, not just the peaks. RMS is used instead of an average value because the average value of a wave over a complete cycle is zero.

Significant Change: (R) A significant change report is intended to detect fast voltage variations, such as those resulting from large motors being turned on or off. This report shows the date and time at which the voltage level rose or fell by more than the threshold setting. The threshold is set during the Scanner initialization process, and the variations are noted cycle-by-cycle. When the Scanner begins recording, the nominal voltage is used as the standard voltage from which to measure changes. The most varied cycle in each second is compared with the standard. If the difference exceeds the threshold (the default threshold is 3 volts, but 1-9 V are possible settings) two things happen:

1. A significant change event and its time and date are recorded.

2. The voltage that caused the event to be recorded becomes the new voltage standard. If the voltage then returns to the nominal (the original standard), another event will be recorded and the nominal setting again becomes the standard by which feature events are measured.

Stripchart: (B) Some stripcharts are created by an inked pointer dragging on a moving strip of paper—think of lie detectors or seismographs. WinScan™ has dispensed with the pointer and paper in favor of computer-generated graphs and reports. Simply put, a stripchart shows a series of readings as they rise and fall over time. In WinScan™ graphs, a stripchart may show the minimum, maximum, and/or average levels of a measurement for each recording interval. The WinScan™ stripchart report, or interval report, numerically lists the same information, interval-by-interval.

Voltage Out of Limits or **Current Out of Limits:** (R) The out-of-limits thresholds in this report are defined after the data are gathered. When you select one of these items from the **Reports** menu, a dialog box appears asking you for the high and low levels which define out of limits. WinScan™ will produce a report listing the time and date of any readings beyond the values you select.

Warranty Clause

Power Monitors Inc. (PMI) warrants each new product manufactured and sold to be free from defects in material, workmanship, and construction, and that when used in accordance with this manual will perform to applicable specifications for a period of one year after shipment.

If examination by PMI discloses that the product has been defective, then our obligation is limited to repair or replacement, at our option, of the defective unit or its components. PMI is not responsible for products that have been subject to misuse, alteration, accident, or for repairs not performed by PMI.

The foregoing warranty constitutes PMI's sole liability, and is in lieu of any other warranty of merchantability or fitness. PMI shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

Equipment Return

If any PMI product requires repair or is defective, call PMI at (800) 296-4120 before shipping the unit to PMI. If the problem cannot be resolved over the phone, PMI will issue a return authorization number. For prompt service, all shipments to PMI must include:

1. Billing and shipping address for return of equipment.
2. The name and telephone number of whom to contact for further information.
3. A description of the problem or the work required.
4. A list of the enclosed items and serial numbers.
5. A return authorization number.
6. If possible, a copy of the original invoice.

Equipment returned to PMI must be shipped with freight charges prepaid. After repair, PMI will return equipment F.O.B. factory. If equipment is repaired under warranty obligation, freight charges (excluding air freight or premium services) will be refunded or credited to the customer's account. Return equipment to:

> **Power Monitors Inc.**
> **1661 Virginia Avenue**
> **Harrisonburg, Va. 22802 USA**
> **Attention: Repair Department**

Quick Guide to WinScan™

All instructions start from main menu unless otherwise noted.

Add phone number
1. **FILE**
2. **SCANNER CONTROL**
3. **MODEM**
4. **NEW PHONE NUMBER**
5. Enter number, digits only
6. **[OK]**
   •

Change scanner settings
1. **Connect to scanner**
2. **FILE**
3. **SCANNER CONTROL**
4. **SCANNER**
5. **INITIALIZE**
6. Make changes
7. **[INITIALIZE]**
8. Settings to scanner
   •

Change scanner defaults
1. **FILE**
2. **SCANNER CONTROL**
3. **CONFIGURATION**
4. **SCANNER SETUP**
5. Make changes
6. **[OK]**
7. Changes saved in WinScan™
   •

Clear scanner memory
1. **Connect to scanner**
2. **FILE**
3. **SCANNER CONTROL**
4. **SCANNER**
5. **CLEAR MEMORY**
   •

Close file
1. **FILE** (from any menu bar)
2. **CLOSE**

Connect to scanner: ***local***
1. Attach serial cable from scanner to computer com port selected in ***Setup Computer***
2. Supply power to scanner
   •

Connect to scanner: ***modem***
1. **FILE**
2. **SCANNER CONTROL**
3. **MODEM**
4. **SELECT PHONE NUMBER**
5. Choose number
6. **MODEM**

7. **CONNECT**
   •

Customize graph
1. Create graph (see ***Graph***)
2. Hit right mouse button with cursor on graph
3. Choose from menu
   •

Disconnect from scanner
1. **FILE**
2. **SCANNER CONTROL**
3. **MODEM**
4. **DISCONNECT**
   •

Exit WinScan™
1. **FILE** (from any menu bar)
2. **EXIT**

Export data to spreadsheet
1. Create report (see ***Report***)
2. **FILE**
3. **SAVE AS SPREADSHEET**
   •

Graph
1. **FILE**
2. **LOAD** (see ***Load***)
3. **GRAPH**
4. Choose type of graph
   •

Load file
1. **FILE**
2. **LOAD**
3. Select directory, file
4. **[OPEN]**
   •

Print graph
1. Create graph (see ***Graph***)
2. Hit right mouse button with cursor on graph
3. **EXPORT DIALOG**
4. Select "Printer" as destination
5. Make other changes if necessary
6. **[EXPORT]**
   •

Print report
1. Create report (see *Report*)
2. FILE
3. PRINT

•

Report
1. FILE
2. LOAD (see *Load*)
3. REPORT
4. Choose type of report

•

Retrieve scanner data
1. **Connect to scanner**
2. FILE
3. SCANNER CONTROL
4. RETRIEVE DATA
5. Enter directory, filename
6. **[SAVE]**

•

Setup computer
1. FILE
2. SCANNER CONTROL
3. CONFIGURATION
4. PC SETUP
5. Make changes
6. **[OK]**

•

Setup printer
1. FILE
2. PRINT SETUP
3. Make changes
4. **[OK]**

Can't find what you're looking for? Try these alternate terms to find the proper entry in the **Quick Guide**. If you still can't find the operation you need, consult the **Index**.

Alternate term	*Quick Guide term*
Call scanner	*Connect to scanner: modem*
Change graph appearance	*Customize graph*
Create graph	*Graph*
Create report	*Report*
Defaults—scanner	*Change scanner defaults*
Download scanner data	*Retrieve scanner data*
Erase scanner memory	*Clear scanner memory*
Hang up	*Disconnect from scanner*
Link computer and scanner	*Connect to scanner: local*
Open file	*Load file*
Printer options	*Setup printer*
Quit	*Exit WinScan™*
Send data to spreadsheet	*Export data to spreadsheet*
Send settings to scanner	*Change scanner settings*
Store phone number	*Add phone number*

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