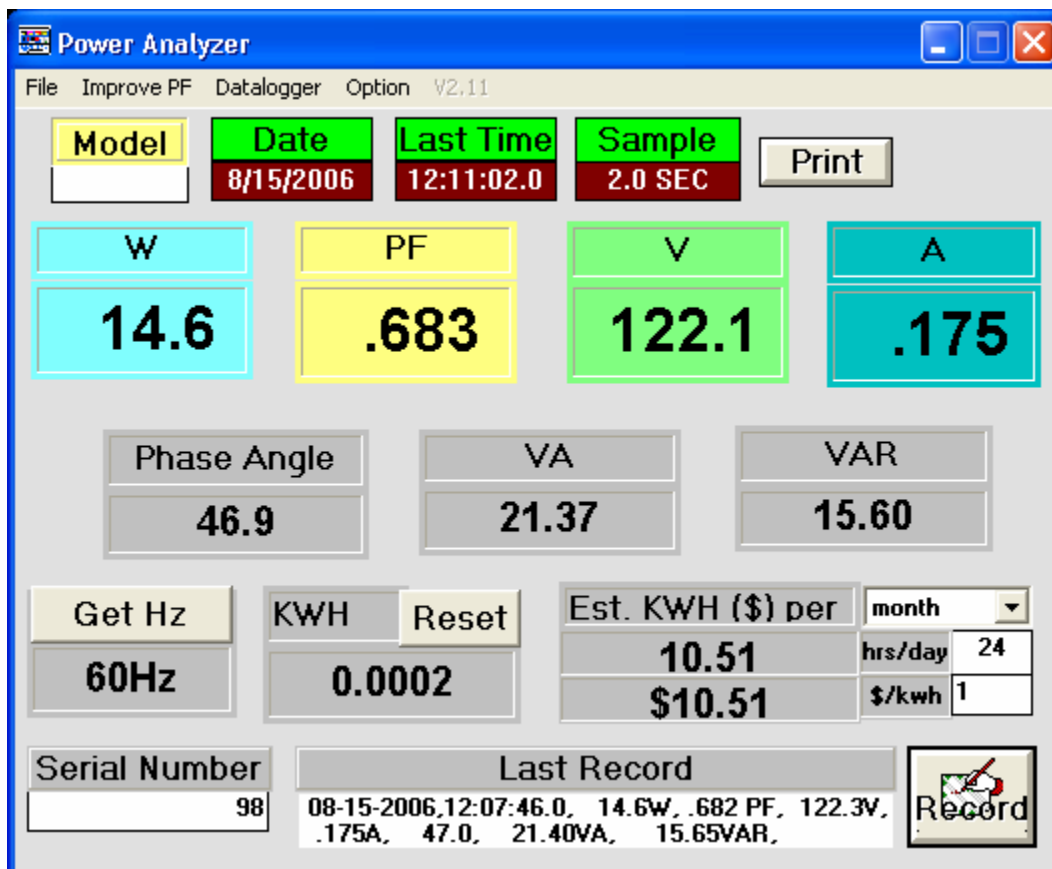# EXTECH INSTRUMENTS

Software Manual

Data Acquisition
and Datalogging Software

For Model 380801 and 380803
Power Analyzers

Introduction

Congratulations on your purchase of the Extech Power Analyzer Model 380801 / 380803. Both models can be connected to a PC for real-time data transfer (data acquisition) but the 380803 is unique in that it includes a built-in data logger where over a thousand readings can be stored for later transfer to PC. Instructions for basic use of the Power Analyzers are provided in a separate User Guide, this manual covers the PC interface aspect of the Power Analyzers exclusively.

Requirements

- Hardware Requirements: 486 PC or better with available Serial port for connection to the Power Analyzer and CD-ROM drive for installing the supplied software
- Meter to PC interface cable (DB-9 cable supplied)
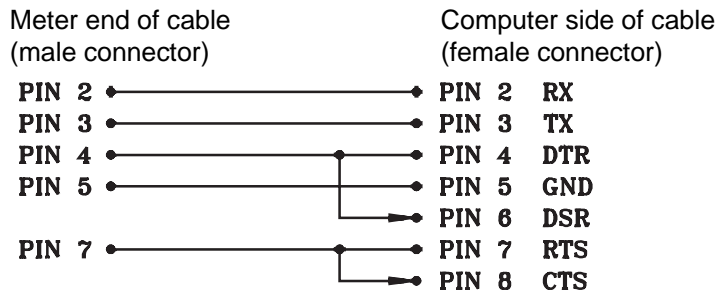- Operating System Compatibility: Windows® 95/98/NT/2000/XP

Hardware setup

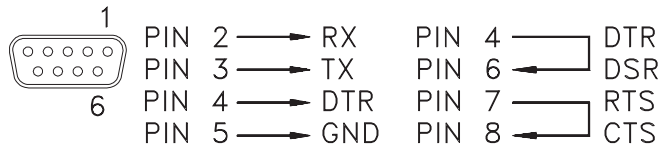### Connecting the Power Analyzer to the PC
Use the supplied 9-pin (DB-9) cable to connect the power analyzer to the PC COM port.

Cable Wiring Diagram
Note that in order to ignore hardware handshake, the RS-232 wiring should be configured as shown in the following diagram. The RTS must be pulled low (between -10 and -12V).

Meter end of cable
(male connector)

Computer side of cable
(female connector)

```
PIN 2 ●————————————————● PIN 2   RX
PIN 3 ●————————————————● PIN 3   TX
PIN 4 ●——————————●        PIN 4   DTR
PIN 5 ●————————————————● PIN 5   GND
                  └————→ PIN 6   DSR
PIN 7 ●——————————●        PIN 7   RTS
                  └————→ PIN 8   CTS
```

The supplied RS-232 9-pin cable is wired as in the diagram below:

```
  1
 ┌─────────┐
 │ ○○○○○ │   PIN 2 ———→ RX     PIN 4 ———┐ DTR
 │  ○○○○  │   PIN 3 ———→ TX     PIN 6 ←——┘ DSR
 └─────────┘   PIN 4 ———→ DTR    PIN 7 ———┐ RTS
  6           PIN 5 ———→ GND    PIN 8 ←——┘ CTS
```

Default RS-232 Communications Settings
Baud Rate: 9600; Stop bit: 1; Data bits: 8; Parity: None

NOTE: Software developers must ensure that DTR provides 10V (or higher) and RTS provides -10V (or lower). Voltage (10V, -10V) from DTR and RTS is used to generate the RS-232 signal. DTR is usually enabled (10V) but RTS must be disabled in order to provide -10V. To accomplish this in BASIC, add RS in the OPEN command:

OPEN "COM1: 9600, N, 8, 1, CS, DS, CD, RS" as #1

Data Acquisition (Models 380801 and 380803)

Data Acquisition is a utility that allows the PC to capture readings in real-time as Power Analyzer measurements are taken. To get started, install and launch the supplied Windows™ Application Program and connect the Power Analyzer to the PC via the supplied interface cable. Software installation instructions are printed on the program CD label.

Main Software Window

When the Power Analyzer program is launched, the Main Software window (see sample diagram) appears and the software searches for a connected Model 380801 or 380803 Power Analyzer. The '*No Comm*' alert will display in red next to the PRINT button if *a)* no instrument is connected to the PC or *b)* the wrong COM port is selected in the OPTION menu. When communication is successful, the main software window will display measurement values as shown.
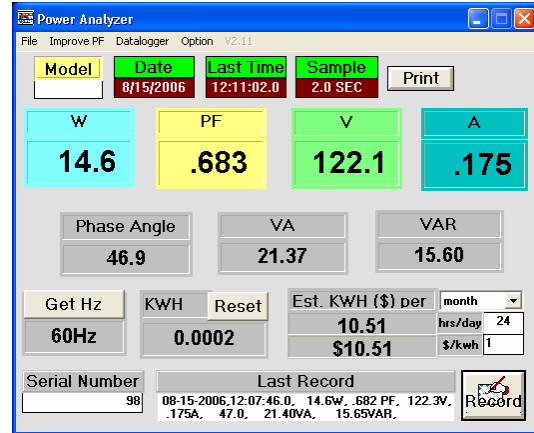
Main Software Window Display fields

Model: This is an optional user field where the Power Analyzer model number or other reference number can be entered.

Date / Last Time: The date and time are taken from the PC internal clock. '*Last Time'* refers to the time of day that the last reading was logged.

Sample: The Sample rate is the rate at which readings are logged. Set the sampling interval from 0.5 seconds to 32,767 seconds

Print: Print the current state of the Main Software window to local printer

Measurement Parameters: W (Watts), PF (Power Factor), V (Voltage), A (Amperage), Phase Angle, VA (Volt-Amps), and VAR (Reactive Power)

Get Hz: Display the frequency in Hz for the device under test currently connected to the Power Analyzer.

KWH: Kilo-Watt Hours (W' * Sampling time / 1000 / 3600)

Est. KWH per month (usage 24 hrs/day): Estimated Kilo-Watt Hours. Select per month, year, or day, and enter the daily usage (0-24 per day). Press RESET to recalculate the KWH.

Serial Number: Captured data is stored in serialized lists; the Serial Number field indicates the sequence number of the current data record. Note that users can enter a custom serial number to offset the list numbering if desired.

Last Record: Contents of the last data record.

Record Button: Appears only when Manual recording is selected. Each press of the RECORD button stores one reading into the currently opened file.

Main Software Window Menu

FILE MENU

Name: A file must be created before data acquisition can begin. Click on File and type a filename when prompted.

Start / End Recording: After a file name has been established, click on Start recording and then select AUTO or MANUAL recording. Auto Recording will continuously collect data until End recording is clicked. Manual recording captures one reading at a time (each time the RECORD button is pressed on the Main Software screen. Note that the RECORD button only appears after Manual recording is selected).

View File*: After data is collected, click on View File to see the ASCII data. The View File utility is explained in greater detail below and includes a sample diagram.

Plot Data from File:** Open an x-y graph representing the captured data. Data Plots are explained in greater detail below along with a sample diagram.

Printer Setup: Print utility allows user to print the captured data.

Exit: Close program.

*View File

Display the captured ASCII data in the view window as shown. Under the File menu, the user selects a saved file to view. The program will bring up one 'block' of data. The fields shown on the View File window are:
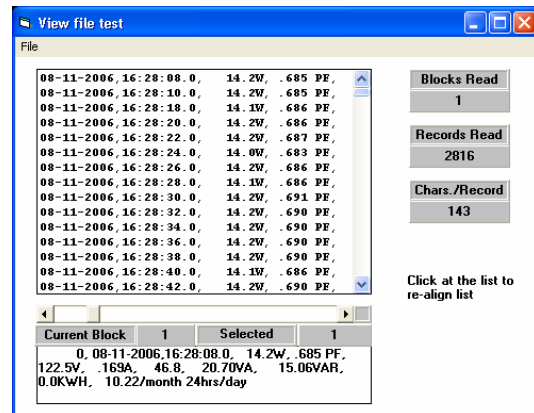

> **Blocks Read**: Number of data blocks read.
> **Records Read**: Number of records in the current file
> **Chars/Record**: The number of characters in one data record
> **Current Block**: The current block number.
> **Selected**: The current record number selected.

**Plot Data from File

Select *Plot Data from File* from the FILE menu in the Main Software screen to open an x-y graph representing the data from a saved data file.

> **File**: Select a data file to plot.
> **Select**: Select a measurement parameter W, V, A, PF, VA, etc. to plot. The parameter will be plotted on the graph as a continuous line (statistical analysis displays are shown as dotted lines as discussed below and as shown in the sample diagram).
> **Scale**: Set the Y-axis scale
> **X Label**: Select data sequence number or time as the X-axis
> **Title**: Customize the X-axis, Y-axis, and Graph titles
> **Grid**: Show horizontal and/or vertical grids
> **Zoom**: The zoom is limited to 3600 points

> **Statis** (Statistics): Displays the average value, standard deviation, and best fit as a dotted line on the graph (see diagram). Note that the statistics utility cannot analyze more than 3600 data points at any one time.
> **Clear**: Clear the graphic screen.
> **Print**: Prints the graph to a connected printer.
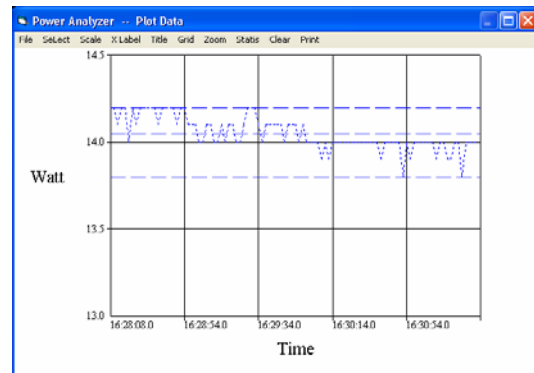
OPTION MENU
The Option menu on the main software screen provides the following options:

Sample Rate: Sample rate is the interval of time between logged readings. Select the desired interval time here or click on SAMPLE on the main software screen and enter the interval time (the Sample rate can be set from 0.5 seconds to 32,767 seconds)

COM: Select the PC COM Port number. If an incorrect COM Port number is selected, the meter will not communicate with the PC software

Baud Rate: Select the baud rate (9600, 4800, 2400 or 1200)

Language: Select Windows™ in English or Chinese

IMPROVE PF MENU
The Power Analyzer software can automatically calculate the value of capacitance required to improve the efficiency of the circuit under test:

1. Enter a target PF, A, VA, VAR, or Phase Angle value by typing in one of the boxes in the IMPROVED row
2. Press the UPDATE button
3. The capacitance required to meet the user target will appear in the CAP column in the right-most box of the IMPROVED row
4. Repeat the above steps to experiment with other targets
5. Note that this utility can only be used for AC circuits. If the power analyzer senses that the frequency is '0' an error message will display
6. Click PRINT to obtain a hard copy
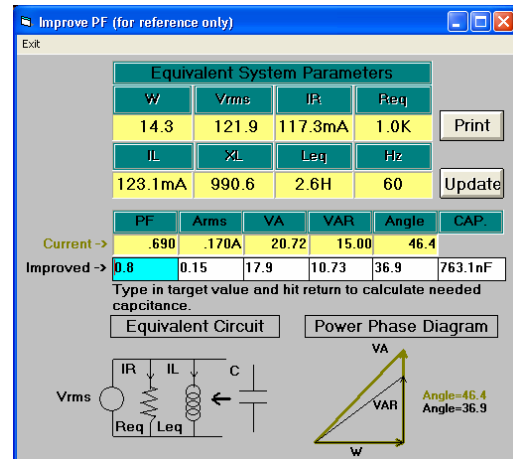
Warning: The Improve PF utility is valid only when the circuit under test is equivalent to a voltage source with resistance and inductance in parallel as shown in the Improve PF window diagram.

Datalogging Instructions (Model 380803 only)

Please read the previous sections of this Manual before continuing with the Datalogging section since many of the software features previously discussed in the Data Acquisition section apply to the Datalogging utility and will be discussed in this section.

Datalogging Overview

The Model 380803 Power Analyzer has a built-in memory bank that can store up to 1,012 reading sets (a set consists of a group of readings: V, A, PF, Phase, etc.). While datalogging, the Power Analyzer need not be connected to the PC; this punctuates the Power Analyzer's convenience in that it is not necessary to move a PC to the testing area. However, to configure the instrument before datalogging and when it comes time to download the readings, the Power Analyzer must be connected to the PC.

Configuring the Power Analyzer for a Datalogging session

The Power Analyzer must be configured using the supplied software and a PC before datalogging. As previously described, connect the Power Analyzer to the PC and launch the supplied Windows™ application program.

1. From the Main Software window's menu header, click on DATALOGGER. The Datalogger window will open (see sample diagram).

2. In the DATALOGGER SETUP section of the Datalogger window the following fields must be completed by the user. After changes are made press the ENTER key on the PC keyboard to update the datalogger:

- **ID**: For use when more than one Power Analyzer will be employed. Each Power Analyzer can have a unique ID number for easy identification and tracking; enter a number from 0 to 65535

- **Date and Time**: The datalogger has an internal timer but it does not have a real-time clock; therefore the user must manually enter a future date and time representing when the first reading will be taken. Start recording at the moment the programmed date and time arrives; the software will automatically attach a date and time stamp for all subsequent readings based on the date/time entered by the user and the sample rate. The date and time formats are MM-DD and HH:MM:SS. Press ENTER to complete the edit.

- **Sampling**: Set the datalogger sample rate (interval of time between recorded readings). Range is 0.4 seconds to 13106.8 seconds. Press ENTER to complete.

- **Recording Mode**: From the Recording Mode pull-down menu, select *Normal* (datalogger records normally at the pre-programmed sample interval), *Max* (datalogger records only the maximum value during each sampling interval), or *Min* (datalogger records only the minimum value during each sampling interval). Press ENTER to complete.

- **Power-on Baud Rate**: Select 9600, 4800, 2400, or 1200. Press ENTER to complete.

Note: Remember to press the ENTER key after making changes.

Logging Data to the Model 380803 Power Analyzer Memory

a. Manual Logging (one reading at a time)

1. To log one reading manually, momentarily press the Power Analyzer's REC button. One data set will be stored in internal memory; a data set consists of a Watt, PF or VA, V or KHz, and Amperage reading.
2. The data set's serial number will be displayed briefly in the PF/VA LCD at the moment the REC button is pressed.
3. A total of 1,012 data sets can be stored.
4. The stored readings are non-volatile meaning that, even after the Power Analyzer is turned OFF, the stored readings will be saved
5. When the memory is full, the PF/VA LCD will display 'FUL' when REC is pressed.

b. Automatic Logging (continuous recording)

1. To start recording, press and hold the REC button for 2 seconds. The PF or VA symbol on the PF/VA LCD will blink to indicate that the Power Analyzer's internal datalogger is recording.
2. To stop recording press and hold the REC button again for 2 seconds. The PF or VA symbol will stop blinking.
3. When the memory is full, the Power Analyzer automatically stops recording and the PF or VA symbol will stop blinking.

Clearing the Datalogger Memory

To erase the datalogger memory:

1. Press and hold the REC button while turning the Power Analyzer ON.
2. Release the buttons when the display switches on.
3. The PF LCD will display 'EPE' while the datalogger is erasing the memory. Wait until the PF LCD returns to normal operation before using the Power Analyzer (it may take several minutes depending on the number of readings to be erased).
4. As an alternative to the above steps, an advanced programmer could send an 'EEE' command to the datalogger through the RS-232 port.

Note: The action of erasing the datalogger memory does not actually erase the data. Only the header section of memory is erased to indicate the memory can be written over. The old data are actually retained until overwritten.

Downloading the Stored Data to the PC

1. As previously described, connect the Power Analyzer to the PC and launch the supplied Windows^{TM} application program.
2. From the Main Software window, select DATALOGGER from the menu header. The Datalogger software window will open.
3. Click the Read/Save button in the Datalogger window. Enter a file name when prompted and the program will retrieve and store the data in the named file.
4. The LOGGING INFORMATION section of the Datalogger window contains basic information about the data transferred from the datalogger to the PC file. See below:

   - **Write Counts**: For every download, the Write Counts field is incremented by one.
   - **Memory Size**: Size of the data block transferred to PC from the datalogger
   - **Memory**: The Memory field is a diagnostic tool. Refer to the 'Memory Diagnostic' section later in this Manual.
   - **Last Record**: Number of records transferred from the Datalogger to the PC. For example, if the number 44 appears in the Last Record field, there were 44 reading sets transferred. Reading number 44 was the *last record*.
   - **Status**: Status of datalogger ('idle' or 'recording').

Viewing and Printing the transferred Data File

After the data has been transferred from the
Datalogger to the PC:

1. Select VIEW FILE from the FILE menu in
   the Main Software window. The View File
   window will open (see sample diagram)
2. From the File menu in the View File
   window, open a saved data file to view.
3. The data will appear in list form as shown
   with date/time stamp.
4. The stored data file can also be opened in
   spreadsheet, database, word processing,
   and other programs as an ASCII text file.
5. The fields displayed in the View File window are:
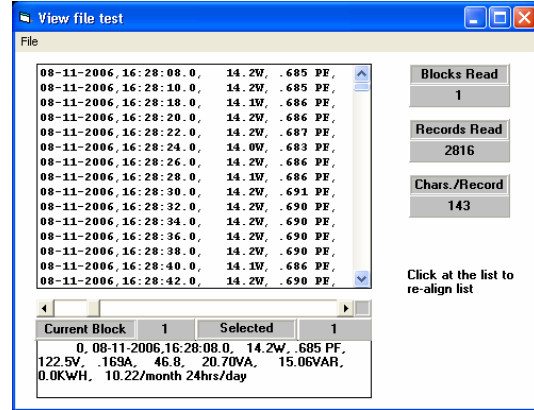
Blocks Read: Number of data blocks read. A data block is one entire collection of
readings transferred from the Power Analyzer's datalogger to the PC.
Records Read: Number of records in the current file
Chars/Record: The number of characters in one data record
Current Block: The current block number.
Selected: The current record number selected.
To print the data, select Print or Printer Setup from the View File's FILE menu

Plotting the Transferred Data File

Select *Plot Data from File* from the FILE menu in the Main Software screen to open an x-y graph
representing the data from the saved data file.

File: Select the saved file to plot.
Select: Select a measurement parameter W,
V, A, PF, VA, etc. to plot. The parameter will
be plotted on the graph as a continuous line
(statistical analysis displays are shown as
dotted lines as discussed below and as shown
in the sample diagram).
Scale: Set the Y-axis scale
X Label: Select data sequence or time as the
X-axis label
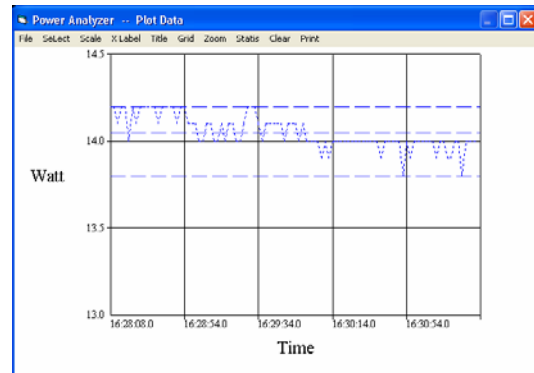**Title**: Customize the X-axis, Y-axis, and Graph
titles
Grid: Show horizontal and/or vertical grids
Zoom: Show readings in higher or lower detail
Statis (Statistics): Displays the average value, standard deviation, and best fit as a dotted
line on the graph (see diagram)
Clear: Clear the graphic screen
Print: Prints the graph to a connected printer

Data Verification Diagnostic

The Power Analyzer software program can confirm that the data transferred from the Power Analyzer's datalogger to the PC was not corrupted during the transfer process.

1. Download data from the Power Analyzer to the PC as previously described.
2. In the Datalogger software window, the MEMORY field informs the user as to the integrity of the data. If the field displays OK, the data integrity has been confirmed. Any other alert message such as 'none', '0', or 'FAIL' indicates an error.

History Diagnostic Test

1. Select DIAGNOSTIC from the Datalogger window, the Diagnostic window will display as shown.
2. Press the READ button to check for failures that may have occurred while writing to the datalogger memory.
3. For no errors, the Memory Status field will show 'OK', the Memory Write Failure Counts field will show '0', and the Last Write Failure Address field will show 'none'.
4. If any WRITE failure occurred, the Memory Status field will display 'FAIL', the Memory Write Failure Counts field will show the number of failures, and the Last Write Failure Address field will show the memory address for the failure.

Diagnostic Self-Test

1. Test the Datalogger's non-volatile memory by pressing the START button in the Diagnostic window and following the on-screen instructions (the Power Analyzer must be ON and communicating with the PC during the test).
2. The PF LCD will display 'EPS' indicating that the datalogger is testing. While testing, the W, V, and A functions continue to operate while the PF does not.
3. The power analyzer will not send data to its RS-232 port during the test.
4. When the test is complete the 'EPS' display will switch off and the power analyzer/datalogger will return to normal operation.

Checking the status of the Datalogger from the Main Software screen

1. As previously described, connect the Power Analyzer to the PC and launch the supplied Windows^{TM} application program.
2. Open the Datalogger window by clicking DATALOGGER from the Main Software window.
3. In the Datalogger window, Click the 'i' button.
4. The Datalogger window will reflect the current configuration of the datalogger with respect to Sampling rate, ID, Date, Time, Recording/Idle, Baud Rate, and Recording Mode.
5. To change the datalogger's configuration refer to the previous section entitled 'Configuring the Power Analyzer for a Datalogging session'

Appendix A: Information for Programmers and Software Developers

From the Main Software window, click the DATALOGGER header to open the Datalogger window. Use the Datalogger window as a reference for the information provided below.

COMMAND: Contact Extech Instruments technical support to obtain a copy of the protocol for Models 380801 / 380803. The protocol includes the command list for use with the COMMANDS field in the Datalogger window.

FILE: Select DATA DUMP from the File menu to retrieve all of the data stored in the datalogger. The data will be converted to ASCII format and saved in a text file.

ASCII Output to RS-232: The Datalogger can be configured to output data in ASCII format rather than coded format in order to accommodate a serial printer for example. In the Datalogger window, the MODE selection under 'ASCII out to RS-232' offers three options:

- **Disable**: Disable ASCII format data output.
- **One Shot Mode** (Manual): When the REC button is pressed once, one data record (W, A, V, PF + CR + LF) will output to the RS-232 port in ASCII format.
- **Continuous Mode** (Auto): With this option selected, the user must specify an output time interval. Once configured, the user must turn datalogger power off and on to enable this function. In this mode, the datalogger outputs data (W, A, V, PF + CR + LF) in ASCII format at the specified interval continuously.

Stopping the ASCII Output Stream
If the datalogger receives any character from the RS-232 port, or if the user presses and holds the REC button for 2 seconds to enable datalogging in AUTO MODE, the ASCII output stream will stop. To restart the output stream, turn power off and on again.

Using TERMINAL or TELIX programs for ASCII output
Windows TERMINAL and TELIX communication programs do not allow users to disable the RTS line as explained earlier in the 'Hardware Setup' section. However, users can rewire the RS-232 connection as shown below:

```
Power Analyzer Side          Computer Side
(Male)                       (Female)

PIN 2 •————————————————————• PIN 2  RX
PIN 3 •————————————————————• PIN 3  TX
PIN 4 •———————————————•      • PIN 4  DTR
   ┌─• PIN 5 •—————————│—————• PIN 5  GND
   │                   └—————• PIN 6  DSR
   └—• PIN 7 •———✕——————┐    • PIN 7  RTS
                        └————• PIN 8  CTS
```