

Chapter 4: Displaying Waveforms

Opening a Waveform File

NetPower Waveform provides the ability to open and display a selected waveform file. Once open, all of the information that NetPower Waveform displays applies to the selected file.

Important

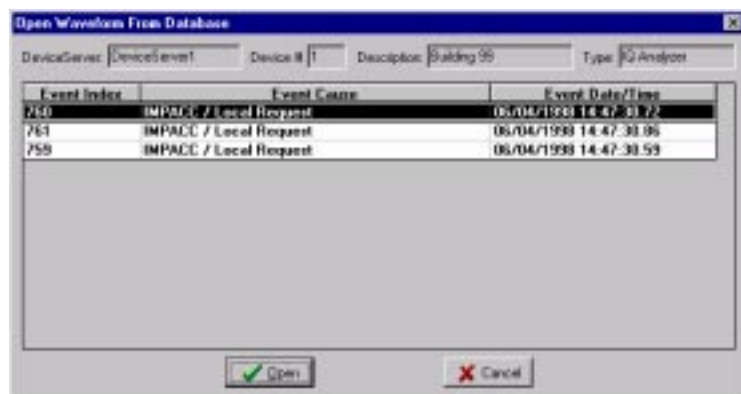
Before you can view a waveform file, you must upload the file from the device that captured it. For additional information, see *Chapter 3: Capturing and Uploading Waveforms*.

Opening a Waveform From the Database

To open a waveform from the database, do the following:

1. From the Device List tab on the NetPower Waveform main window, select the device for which you want to view waveforms.
2. Click the Open Waveform From Database icon.

The Open Waveform From Database dialog box displays.



The Open Waveform From Database dialog box lists the following information about each waveform:

Column	Description
Event Index	The index number assigned to the waveform data by the device.
Event Cause	The reason the device captured the waveform data.
Event Date/Time	The date and time of the waveform data capture.

3. Select a waveform.
4. Click Open.

The NetPower Waveform Display window and the Graph Tools palette display.



The graph is empty when it displays. Click the graph tools buttons to control what signals or combination of signals display.

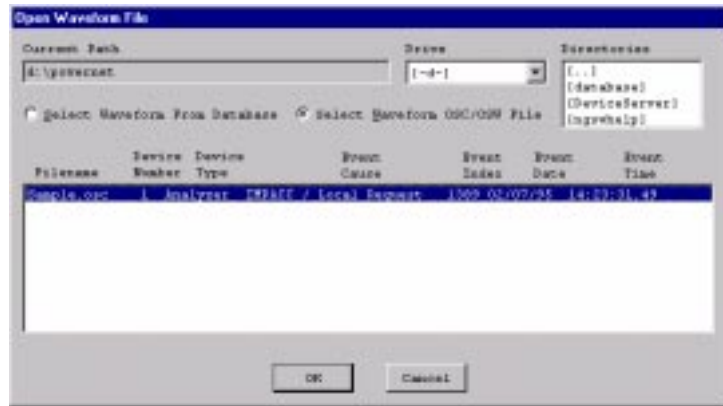
Note
To close the NetPower Waveform Display window, click the Close icon on the NetPower Waveform main window.

Opening a Waveform from a Local File

To open a waveform from a local file, do the following:

1. From the File menu, choose Open.

The Open Waveform File dialog box displays.



Note

If you have waveform data that you uploaded using IMPACC Series III, you can open and view it in NetPower Waveform.

The Open Waveform dialog box lists the following information about each file:

Column	Description
Filename	The name of the waveform file.
Device Number	The PowerNet Software number of the device that captured the data.
Device Type	The type of device: <ul style="list-style-type: none"> ◆ DT (Digitrip 910). ◆ Analyzer (IQ Analyzer). ◆ Optim (Digitrip Optim1050). ◆ MPCV (MPCV Network Protector).
Event Cause	The reason the device captured the waveform data.
Event Index	The index number assigned to the waveform data by the device.
Event Date	The date of the waveform data capture.
Event Time	The time of the waveform data capture.

2. To display a waveform from a local file, click Select Waveform OSC/OSW File.

- ◆ If the file you want to open is not listed, select the drive and directory where the file is located.

The waveform files located in the directory you selected display.

OR

To display a waveform from the waveform database, click Select Waveform From Database.

The DeviceServer Selection dialog box displays.



- ◆ Select the DeviceServer whose waveform database contains the waveform you want to view.
- ◆ Click OK

The dialog box closes, and the waveform files in the selected database display.

3. Select a waveform file.
4. Click OK.

The NetPower Waveform Display window and the Graph Tools palette display.



Note
 If you clicked Select Waveform OSC/OSW in the Open Waveform File dialog box, the tile bar on the NetPower Waveform Display window displays the file name, rather than the DeviceServer name.

The graph is empty when it displays. Click the graph tools buttons to control what signals or combination of signals display.

Note
 To close the NetPower Waveform Display window, click the Close icon on the NetPower Waveform main window.

Using Graph Tools

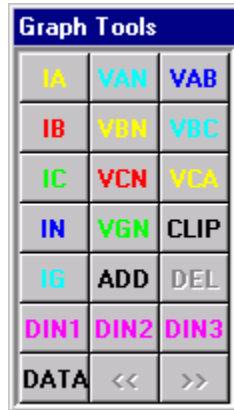
NetPower Waveform plots signals (currents, voltages, and digital inputs) on the NetPower Waveform Display window, which can display up to four signals at the same time. You control what signal or combination of signals display by using Graph Tools.

Graph Tools is a series of buttons within a tool palette that control what displays on the NetPower Waveform Display window.

Graph Tools Palette

The Graph Tools palette displays to the right of the NetPower Waveform Display window. It consists of 21 buttons that either represent a signal or control the graph.

Note
 The VAB, VBC, and VCA buttons in the Graph Tool are replaced with VAT, VBT, and VCT when you display a waveform from the MPCV Network Protector.



Note
 You can move Graph Tools to another location by clicking on the title bar and dragging the palette to a new location.

There are three types of signals you can display using Graph Tools:

- ◆ Currents
- ◆ Voltages
- ◆ Digital Inputs

Currents and voltages are analog signals, while digital inputs are digital signals.

Signal Buttons

The signal buttons on Graph Tools toggle the display of that graph. Click the button once to activate the display; click it a second time to deactivate the display.

Note
 If the device that captured the waveform data does not support a signal type, the corresponding signal button is grayed-out.

The following table describes each signal button and lists which devices support that signal type:

Signal Button	Description	Digitrip 910	Digitrip OPTIM	IQ Analyzer	MPCV
IA	Phase A current	✓	✓	✓	✓
IB	Phase B current	✓	✓	✓	✓
IC	Phase C current	✓	✓	✓	✓
IN	Neutral current		✓	✓	

Signal Button	Description	Digitrip 910	Digitrip OPTIM	IQ Analyzer	MPCV
IG	Ground current		✓	✓	
VAN	Phase A line to neutral voltage			✓	
VBN	Phase B line to neutral voltage			✓	
VCN	Phase C line to neutral voltage			✓	
VGN	Ground to neutral voltage			✓	
VAN	Phase A Network voltage (line to neutral)				✓
VBN	Phase B Network voltage (line to neutral)				✓
VCN	Phase C Network voltage (line to neutral)				✓
VAB	A-B line to line voltage			✓	
VBC	B-C line to line voltage			✓	
VCA	C-A line to line voltage			✓	
VAT	Phase A transformer voltage				✓
VBT	Phase B transformer voltage				✓
VCT	Phase C transformer voltage				✓
DIN1	State of digital input 1			✓	
DIN2	State of digital input 2			✓	
DIN3	State of digital input 3			✓	

Note

Network and Transformer Voltages are available only for the MPCV Network Protector.

Command Buttons

In addition to signal buttons, the Graph Tools palette contains the following command buttons:

Command	Description
CLIP	Copies the contents of the waveform graph window to the clipboard. For more information, see the section <i>Copying to the Clipboard</i> .
ADD	Adds another graph to the window. For more information, see the section <i>Using Multiple Graphs</i> .
DEL	Deletes the active graph from the window. For more information, see the section <i>Deleting the Active Graph</i> .
DATA	Displays the data associated with the waveform. For more information, see the section <i>Viewing Associated Data</i> .
<<	Scrolls to the previous waveform in a waveform continuation. Scrolls to the previous eight cycles in an MPCV waveform. For more information, see the section <i>Scrolling</i> .
>>	Scrolls to the next waveform in a waveform continuation. Scrolls to the next eight cycles in an MPCV waveform. For more information, see the section <i>Scrolling</i> .

Data Points and the Locator Bar

The locator bar, the vertical white line that moves left and right across the graph as you move the mouse, allows you to select a specific point on the signal.

The left and right arrow keys on the keyboard move the bar one point at a time. The [Home] key moves the locator bar to the beginning of the waveform, and the [End] key moves the locator bar to the end of the waveform.

Data for the point highlighted by the locator bar displays in the text area to the right of the graph. The following data displays:

- ◆ Scales of the graph (does not change with locator bar movement).
- ◆ Value (changes with locator bar movement).
- ◆ Time index (changes with locator bar movement).
- ◆ Date and Time of the start of the capture (does not change with locator bar movement).

Types of Graphs

As each device collects one or more forms of data, NetPower Waveform supports several types of graphs:

- ◆ Low Speed Sampled Data
- ◆ High Speed Sampled Data
- ◆ Fourier Amplitude Spectrum

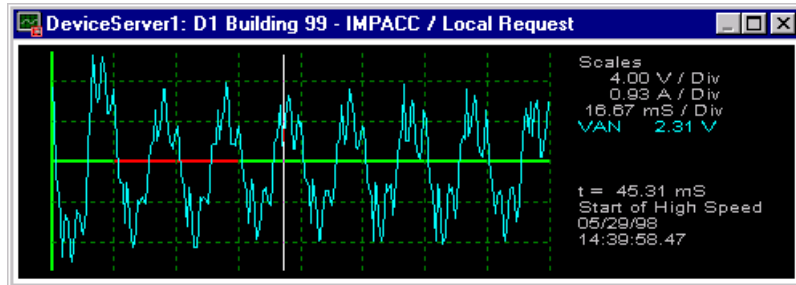
You can only view the graph types supported by the device that captured the data.

The following table lists the devices and the types of data each collect:

Device	Low Speed Sampled Data	High Speed Sampled Data	Fourier Data
Digitrip 910		✓	✓
Digitrip OPTIM		✓	✓
IQ Analyzer	✓	✓	✓
MPCV Network Protector		✓	✓

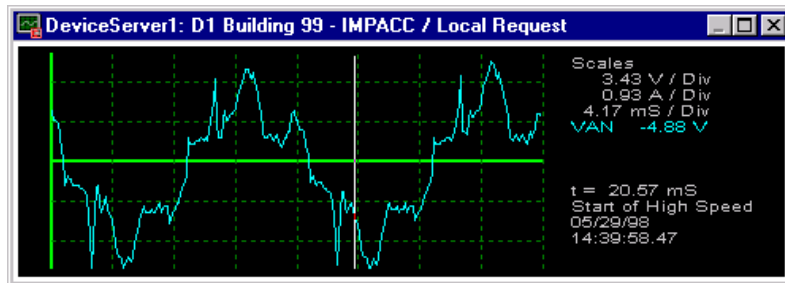
Low Speed Sampled Data

A low speed sampled data graph plots data collected at low speed. When high speed data is available for the waveform, the low speed sampled graph contains a red line marking the portion of the signal for which high speed data is available.



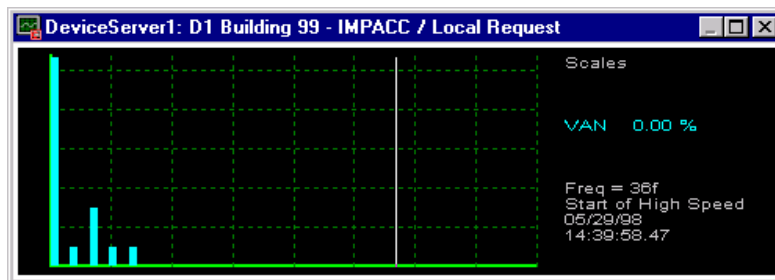
High Speed Sampled Data

A high speed sampled graph plots data collected at high speed, and contains four times more data for the specified cycle than a low speed sampled graph. For devices that also sample at low speed, this is an “exploded” version of the area marked by the red line on the low speed sampled data graph.



Fourier Amplitude Spectrum

The Fourier amplitude spectrum graph contains the Fourier data that was calculated for the waveform. This graph shows the harmonic content of the waveform.



Switching Between Graphs

The NetPower Waveform graph window initially contains the lowest speed graph type available for the device from which the data was captured. For an IQ Analyzer, the window contains a low speed sampled data graph, while for the Digitrip OPTIM, Digitrip 910, and MPCV Network Protector, the window contains a high speed sampled graph.

To switch to a different graph type, do the following:

1. Double-click anywhere on the NetPower Waveform Display window.
The graph type switches to the next available type, and NetPower Waveform re-plots any data plotted on the graph.
2. Double-click anywhere on the NetPower Waveform Display window to switch to the next graph type.

Displaying a Signal

NetPower Waveform plots signals (currents). The signal buttons on the Graph Tools palette allow you to display and remove signals from a graph.

To display a signal, do the following:

1. Open a waveform file.
2. Switch to the graph type desired.
3. Click the signal button in the Graph Tools palette that corresponds to the signal you want to plot.

The button depresses, and the signal is plotted onto the graph in the NetPower Waveform Display window.



4. To remove the signal from the graph, click the signal button a second time.

The signal is removed from the graph area of the NetPower Waveform Display window.

Note

Each signal is colored to help you identify it. These colors can be customized. For information, see the section *Customizing Colors*.

Displaying Multiple Signals

The number of signals you can display simultaneously on a graph is determined by the graph type you use, and the type of signal you display. The following table indicates the number of signals you can display on each graph type:

Graph Type	Max. Analog Signals	Max. Digital Signals	Max. Total Signals
Low Speed Sampled Data	3	1	4
High Speed Sampled Data	3	0	3
Fourier Amplitude Spectrum	1	0	1

Note

Currents and voltages are analog signals, and digital inputs are digital signals.

To display multiple signals, do the following:

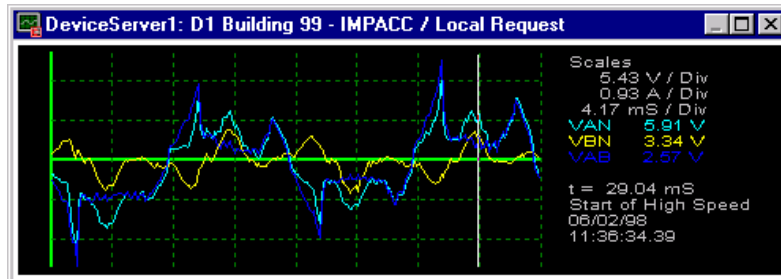
1. Open a waveform file.
2. Switch to the graph type desired.
3. Click the signal button that corresponds to the signal you want to plot.

The button depresses, and the signal is plotted onto the graph in the NetPower Waveform Display window.



4. Repeat step 3 to display additional signals, up to the maximum number of signals you can display.

The NetPower Waveform Display window displays the selected signals.



Note
 When a graph contains the maximum number of signals, the remaining signal buttons in the Graph Tools palette are grayed-out. To add another signal, you must first remove an existing signal.

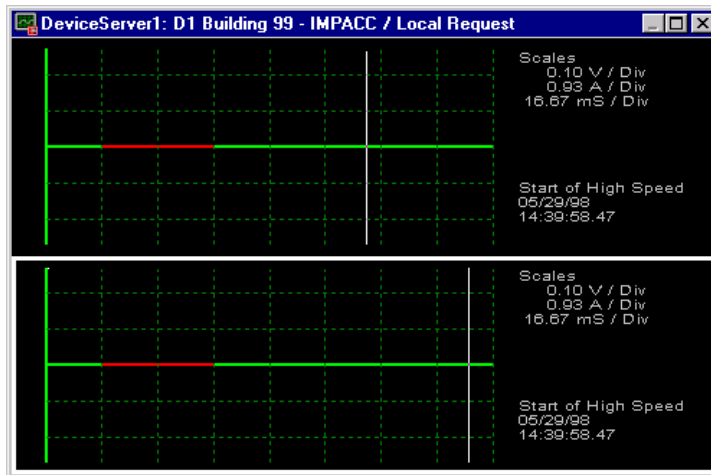
Using Multiple Graphs

The NetPower Waveform Display window can show up to three separate graphs of the current waveform data at the same time, allowing you to view several signals or combinations of signals.

To add an additional graph to the NetPower Waveform Display window, do the following:

1. In the Graph Tools palette, click ADD.

NetPower Waveform adds a new graph to the window.



2. To add another graph, repeat step 1.
 NetPower Waveform adds a third graph.

The newest graph added becomes the active graph and is framed by a white border. All actions and selections you perform display in the active graph. Only one graph may be active at a time.

To switch active graphs, click the graph you want to be active.

Deleting the Active Graph

To delete a graph, do the following.

1. In the NetPower Waveform Display window, select the graph you want to delete.
2. In the Graph Tools palette, click DEL.

NetPower Waveform removes the graph.

Scrolling

The IQ Analyzer has the ability to capture a series of consecutive waveforms and store them in separate files. The MPCV Network Protector captures a single waveform of 16 cycles. Both captures contain more data than one NetPower Waveform Display window can display; however, NetPower Waveform provides the ability to scroll to the next screen of a graph.

Consecutive Waveforms from the IQ Analyzer

The IQ Analyzer can capture several consecutive waveforms, allowing you to view and analyze the patterns that emerge across a series of waveforms.

Before you can scroll through a series of waveforms, you must download all of the files that are a part of the capture.

To capture consecutive waveforms, the IQ Analyzer must be set to trigger multiple times on the same event. The IQ Analyzer can capture up to seven consecutive events.

MPCV 16-Cycle Waveform

The Network Protector Relay can capture 16 cycles of waveform data in a single file. Since the NetPower Waveform Display window can only show up to eight cycles at a time, whenever an MPCV Network Protector waveform is opened, the scroll buttons are enabled.

Scrolling Through Waveform Data

To scroll, do the following:

1. Open the first waveform of an IQ Analyzer continuation or open an MPCV Network Protector waveform.
2. Display the signal you want to view.
3. Click the scroll buttons to move forward and backward through the waveform.

Note

When you are at the beginning of the waveform data, the scroll backward button is grayed-out. When you reach the end of the waveform data, the scroll forward button is grayed-out.

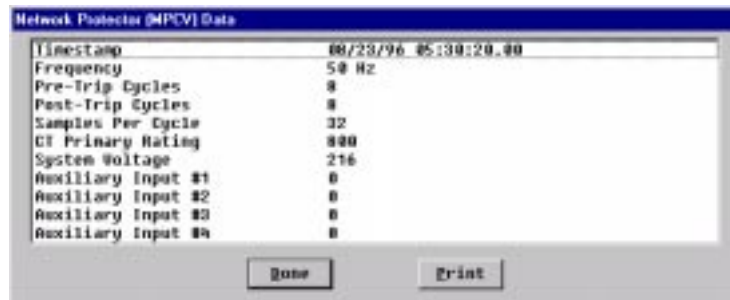
Viewing Associated Data

When a device captures a waveform, it also captures relevant information about the device and conditions at the time. After opening a waveform, you can access this associated data. The data applies to the entire waveform, not to a specific signal, so you can view the data whether or not you plotted a signal.

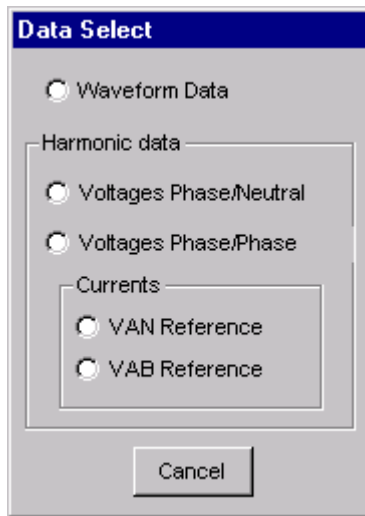
To view the associated data, do the following:

1. Open the waveform for which you want to view data.
2. Click DATA.

The data dialog box for the device or type of data you chose displays.



If you are viewing data from the IQ Analyzer, the Data Select dialog box displays.



Select the radio button for the type of data you want to display.

3. When you finish viewing the data, click Done.

If you are viewing data from a Digitrip 910, Digitrip Optim, or an MPCV Network Protector, the data dialog box closes.

If you are viewing data from the IQ Analyzer, the Data Select dialog box re-displays. Either select another type of data to view, or press cancel to close the dialog box.

Customizing Colors

NetPower Waveform assigns a color to each button on the Graph Tools palette. When you click the button, the corresponding signal displays, using the same color. You can customize the default colors of the Graph Tools palette.

To customize the colors of the Graph Tools palette, do the following:

1. Right-click on a signal button.

The Color palette displays.



2. Click on a new color for the button and corresponding signal.
3. Click OK.

The signal button and corresponding signal change to the color you selected.

Copying to the Clipboard

NetPower Waveform supports the copy command, which allows you to copy signal graphs onto the Windows clipboard. From the clipboard, you can copy the waveform graph to another application, such as a graphics or word processing package.

To copy the contents of the NetPower Waveform Display window to the clipboard, do the following:

1. Display the desired signals in the NetPower Waveform Display window.
2. On the Graph Tool palette, click CLIP.

NetPower Waveform copies the information to the clipboard.

Exporting CSV Files

The waveform data captured by devices is unprocessed data in binary units, rather than in engineering units. Because NetPower Waveform uses unprocessed data, you can download a file from the device and immediately view the waveform without manipulating the data first. However, to make the data available for use in other applications, you must convert the file into a format other applications can recognize.

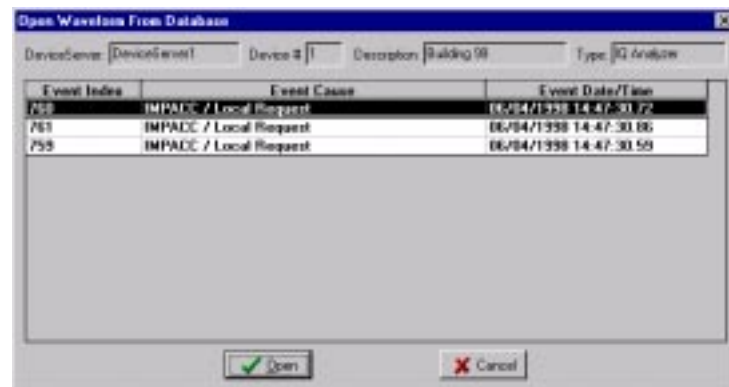
NetPower Waveform contains an Export feature that allows you to convert a waveform file into Comma Separated Values (CSV) format. CSV format stores data in engineering units, and is widely accessible to other applications.

When you export a waveform file, you are converting the data in the waveform file and saving the converted data to a new file. When the export is complete, there are two files, the original waveform file (.OSW) and the export file (.CSV).

To export a waveform from the database to a file, do the following:

1. On the NetPower Waveform main window, click the Open Waveform From Database icon.

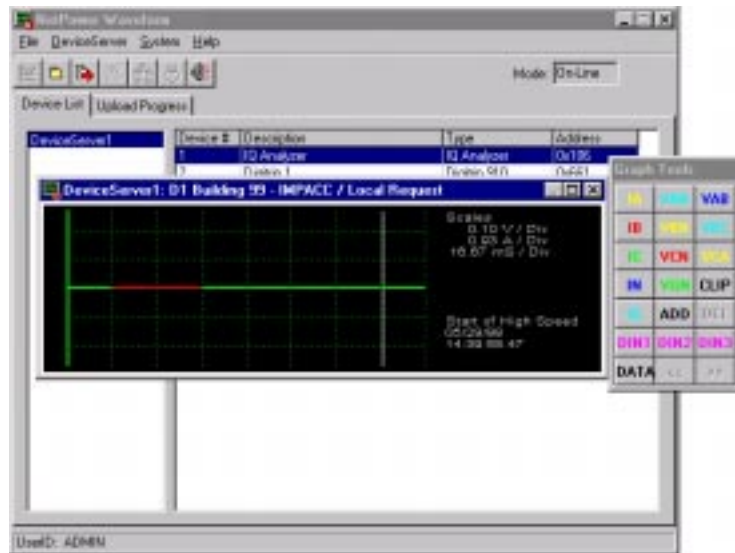
The Open Waveform From Database dialog box displays.



2. From the list box, select the file you want to export.

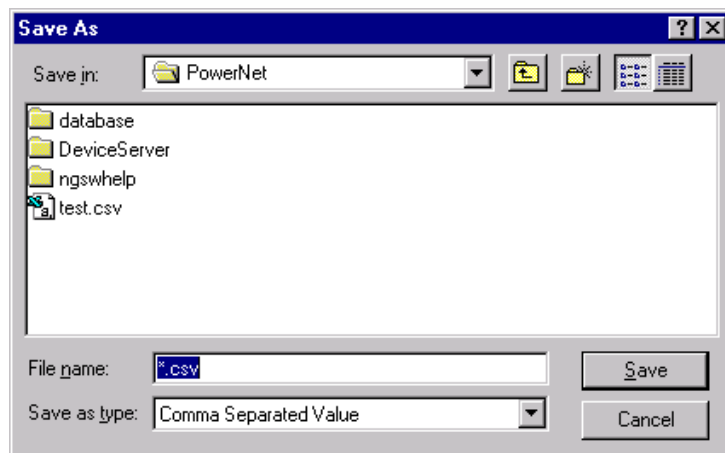
3. Click OK.

The NetPower Waveform Display window displays on top of the Waveform main window.



4. On the NetPower Waveform main window, click the Export CSV File icon.

The Save As dialog box displays.



5. Choose the location to which you want to save the file.

6. In the File name field, type a name for the .CSV file.

7. Click Save.

The waveform data is converted to CSV format and saved to the location that you specified.

Note

You can also save a local waveform file to a .CSV file by displaying the waveform and clicking the Export CSV File icon.