*em**Power*** ®
Device Driver Reference Manual

Part No. 09-0252

REVISION D

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Document History

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1. INTRODUCTION

Test routines for *emPower*** ® **are implemented using a technology known as Component Object Model (COM). COM technology is widely used in the software industry to make modular, component based, and designs. Microsoft© Word© and Excel© are built upon COM. ActiveX controls (found in Visual Basic) are also based on COM.**

By using COM, test routines can be developed, independent of the program that uses it. This enables easy addition of new test routines. NH Research or anyone who follows the requirements for a test routine can develop test routines.

2. DEVICE CONTROL

2.1 Description

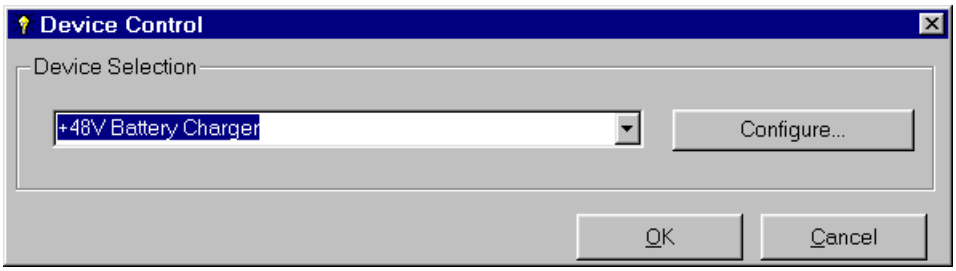
Configured *emPower* ® devices can be accessed using this test routine. This test routine enables the user to set up a device independently of other devices. Applying a vector using from the program pane is the primary way to set up device states. This method has the drawback of setting states for all the devices that are contained in the vector.

Using this test routine, individual states for any device can be set while leaving other devices untouched. Furthermore, access is enabled to devices that are not contained in the program input, output, analog, or digital configurations but exist in the system configuration.

2.2 Method

The test routine is used to create an instance of a user-specified device. The stored device properties are applied and the test routine returns a Pass result.

2.3 Test Routine Properties



2.4 Device Control

- **Device Selection - enables selection of the required device**
- **Configure - enables access to the device properties**

2.5 Sequence

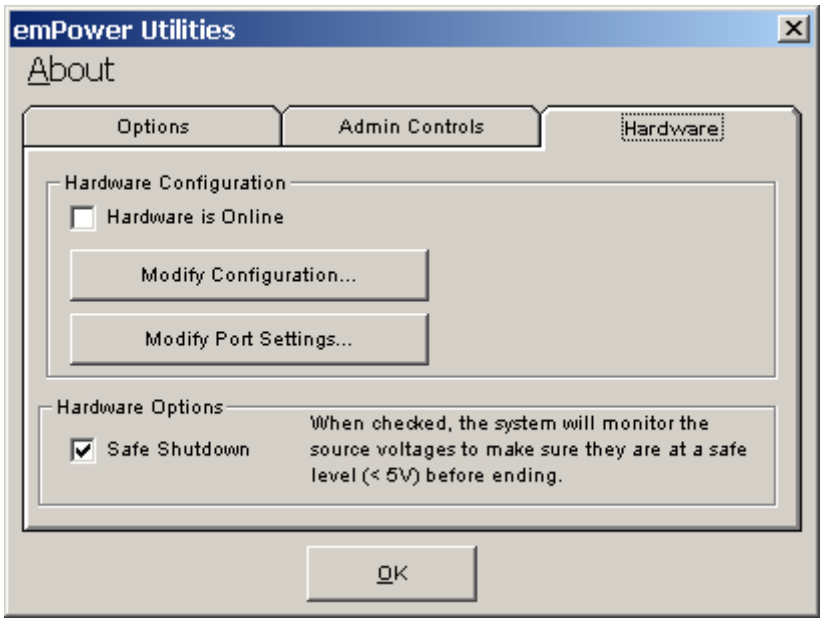
- **Apply load vector settings**
- **Apply source vector settings**
- **Apply digital vector settings**
- **Apply analog vector settings**
- **Initiate test routine - apply stored device properties**

3. AC LOAD

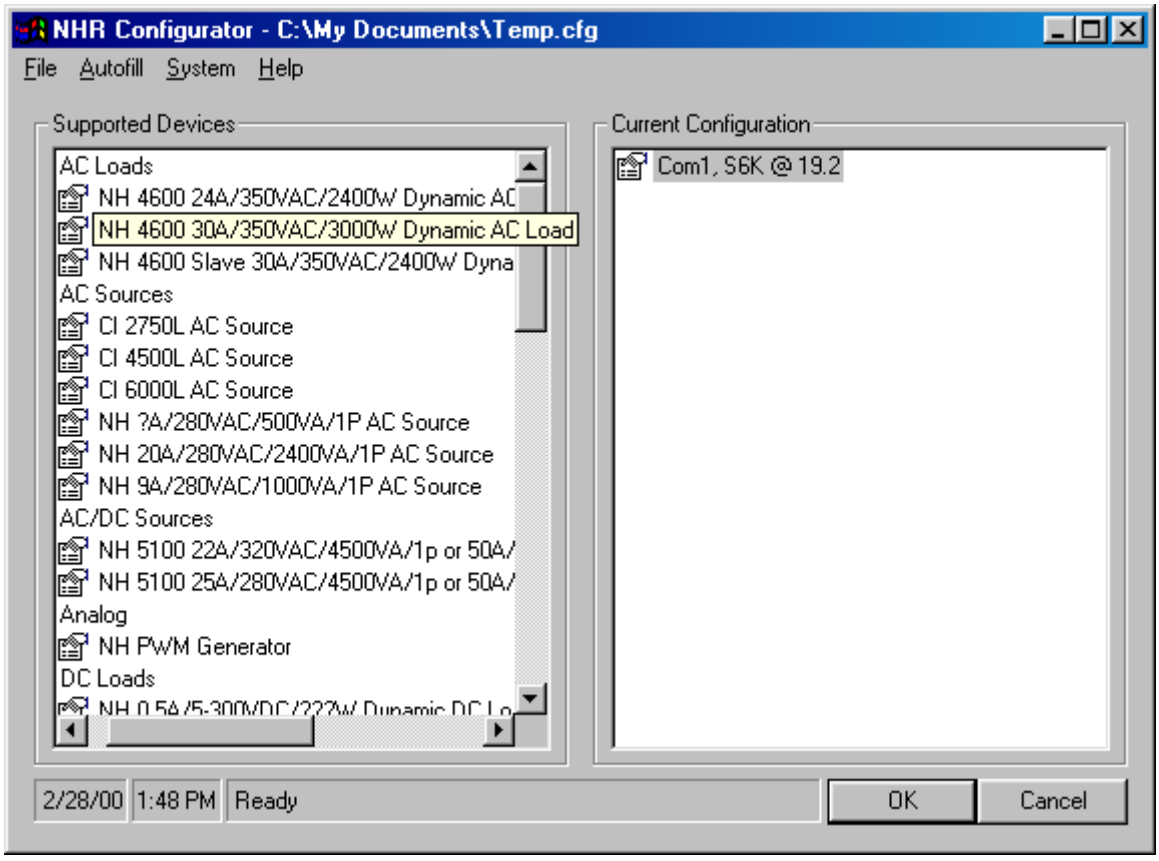
3.1 Initial Setup

3.1.1 Adding the Device to *emPower* ®

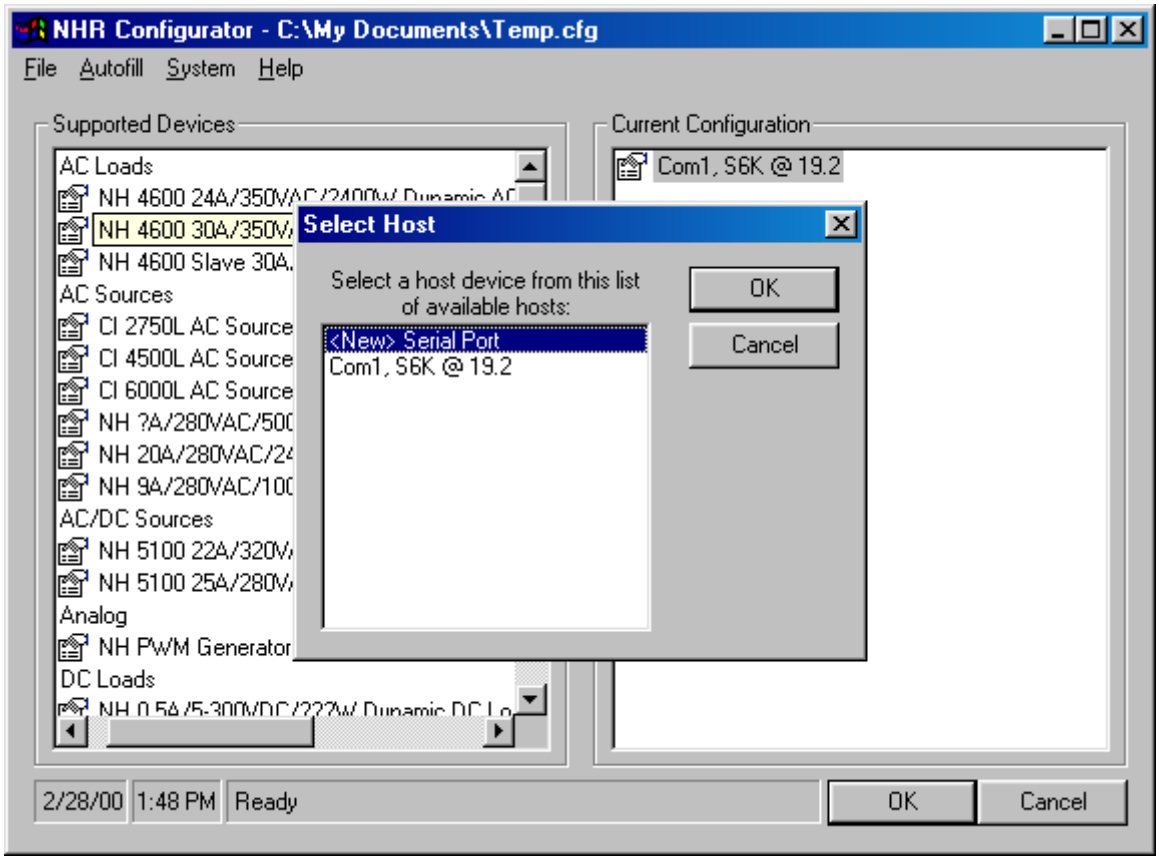
After the device driver is installed, log onto *emPower* ® and select Utilities. The *emPower* ® Utilities dialog displays. Select the Hardware tab, then select the Modify Configuration... button.



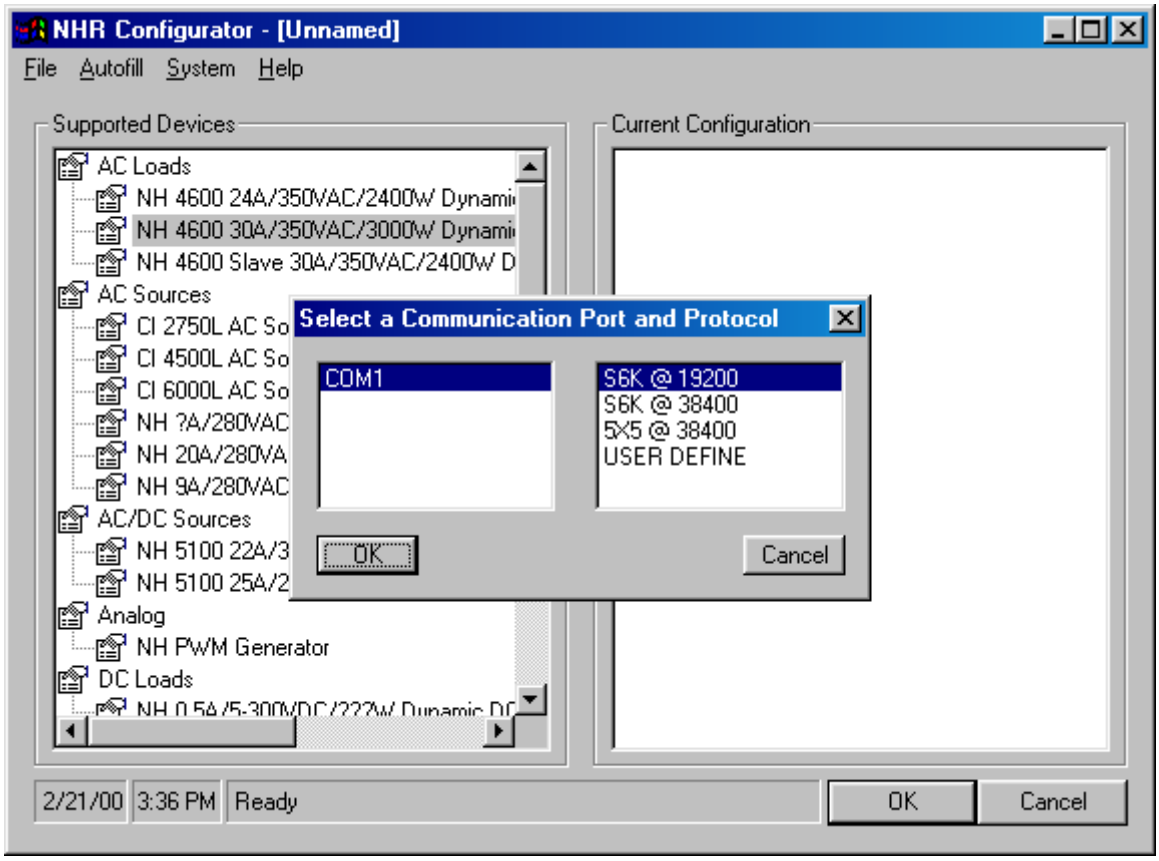
This device driver supports a (discontinued) 24 amp AC load, a 30 amp AC load, and a 30 amp slave AC load. Find the 30 amp AC load in the Supported Devices list. If the host serial port is in the Current Configuration, drag and drop the load onto the port.



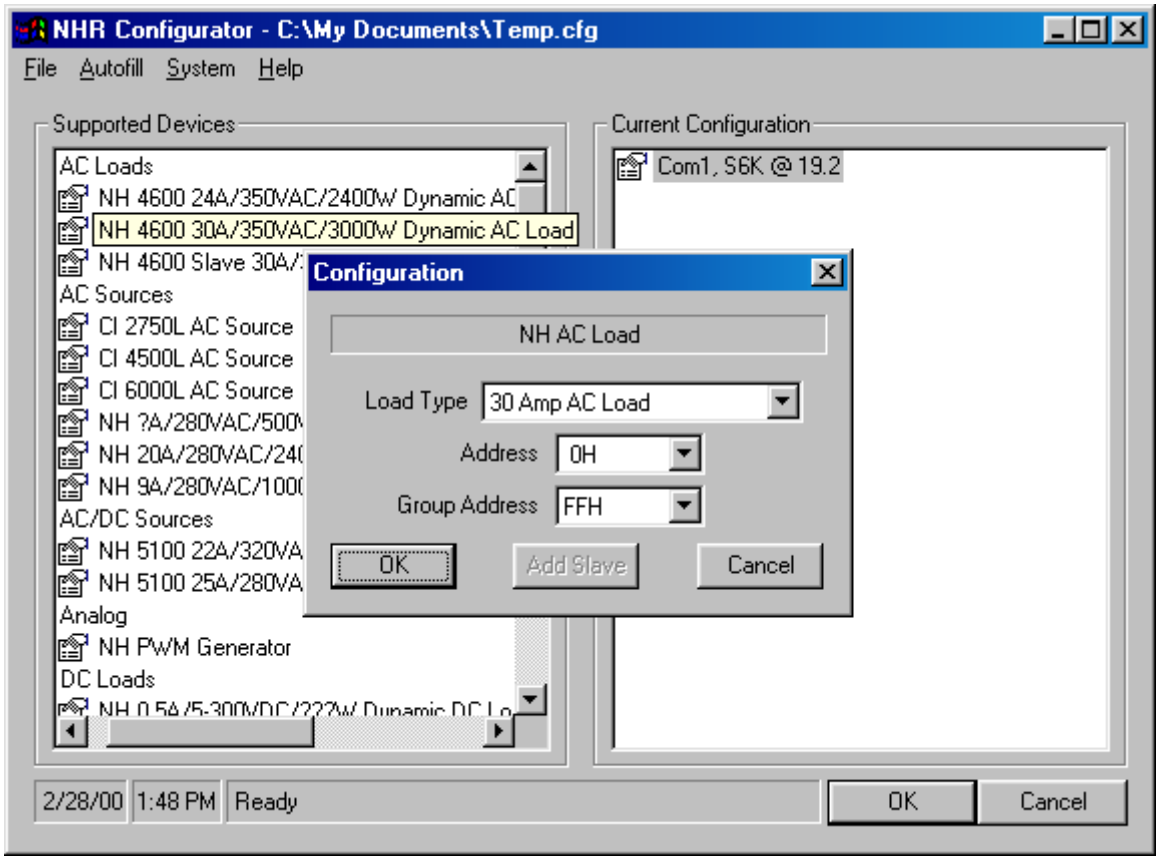
Double-click on the load and select the host from the list of available hosts.



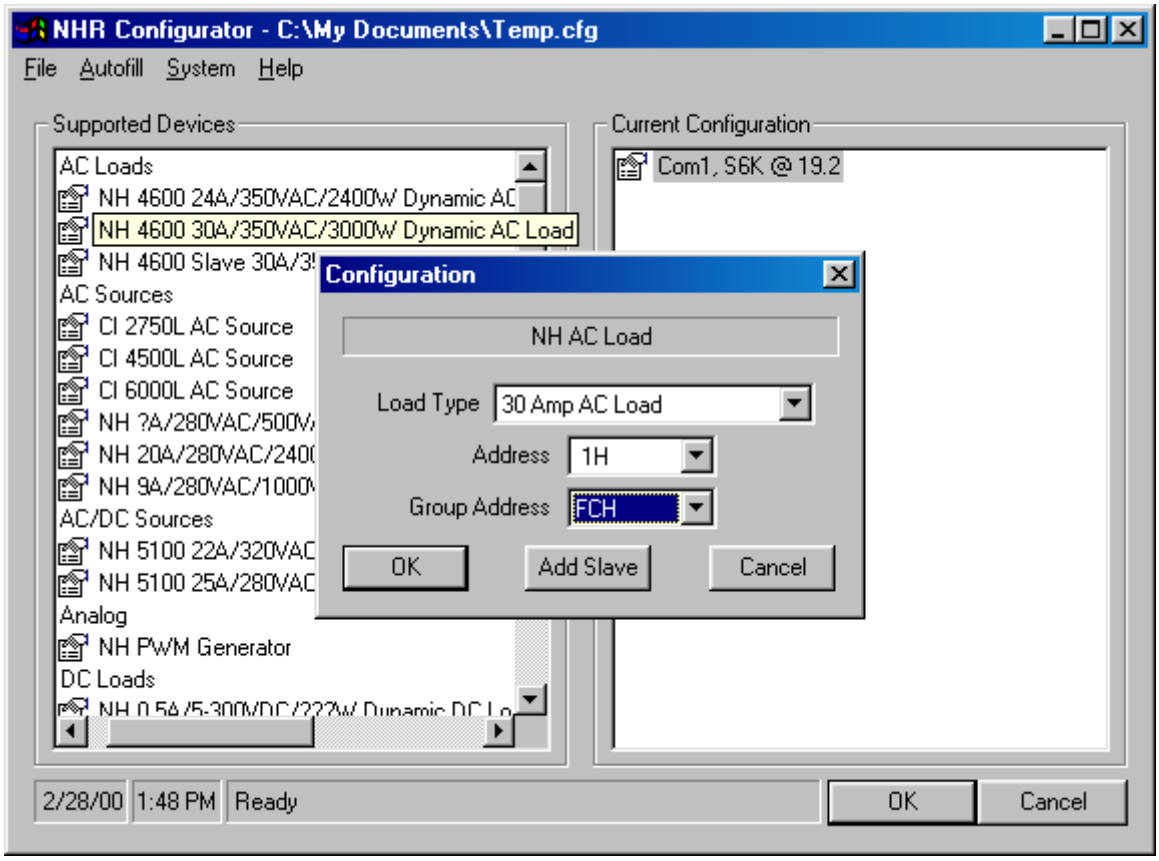
If the host serial port is not in the Current Configuration, drag and drop the load onto the Current Configuration side or double click on the load and select <New> Serial Port from the list of available hosts.



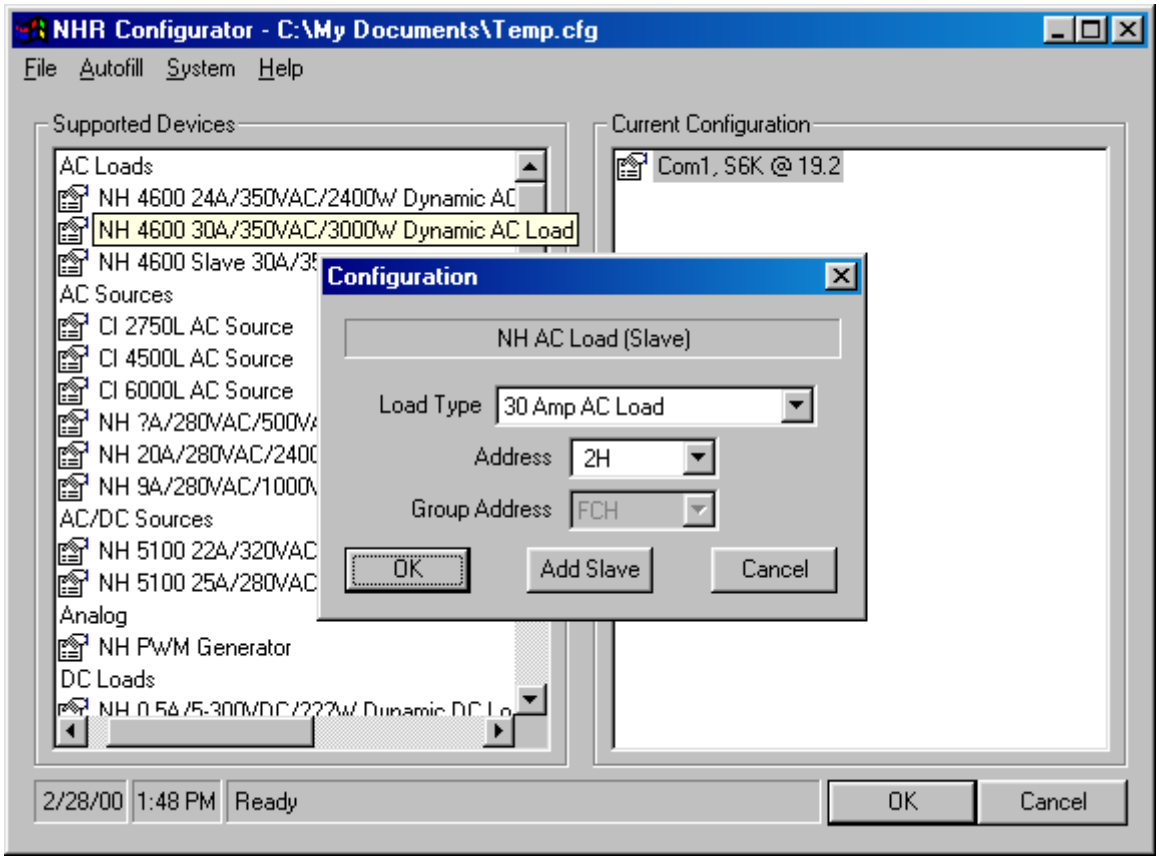
These loads require a serial port configured for S6K protocol at a baud rate of 19200. If the COM port is not in the list, refer to PortConfig documentation to configure the port.



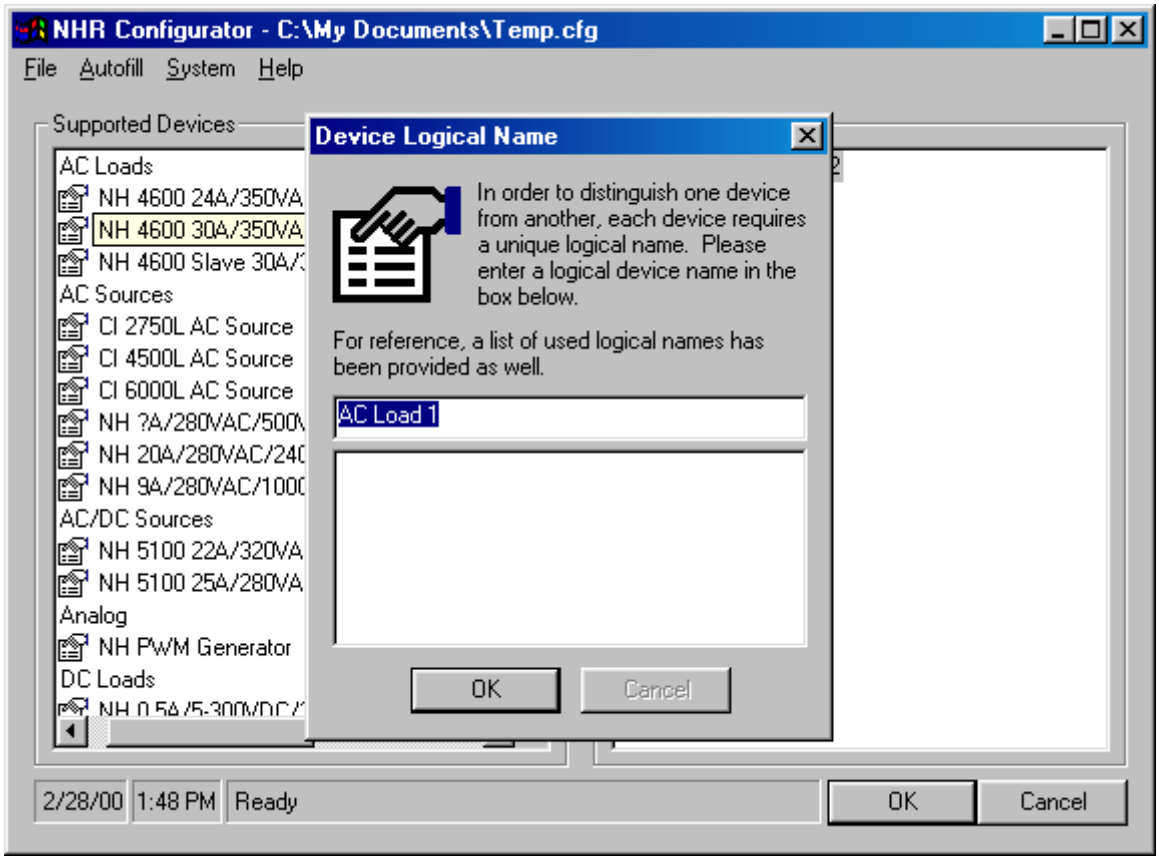
Set the address and the group address so that the driver can communicate with the hardware. If the group address is <u>not</u> 0xFF and it is the same as another AC Load group address, the two loads will be paralleled and act as one load.



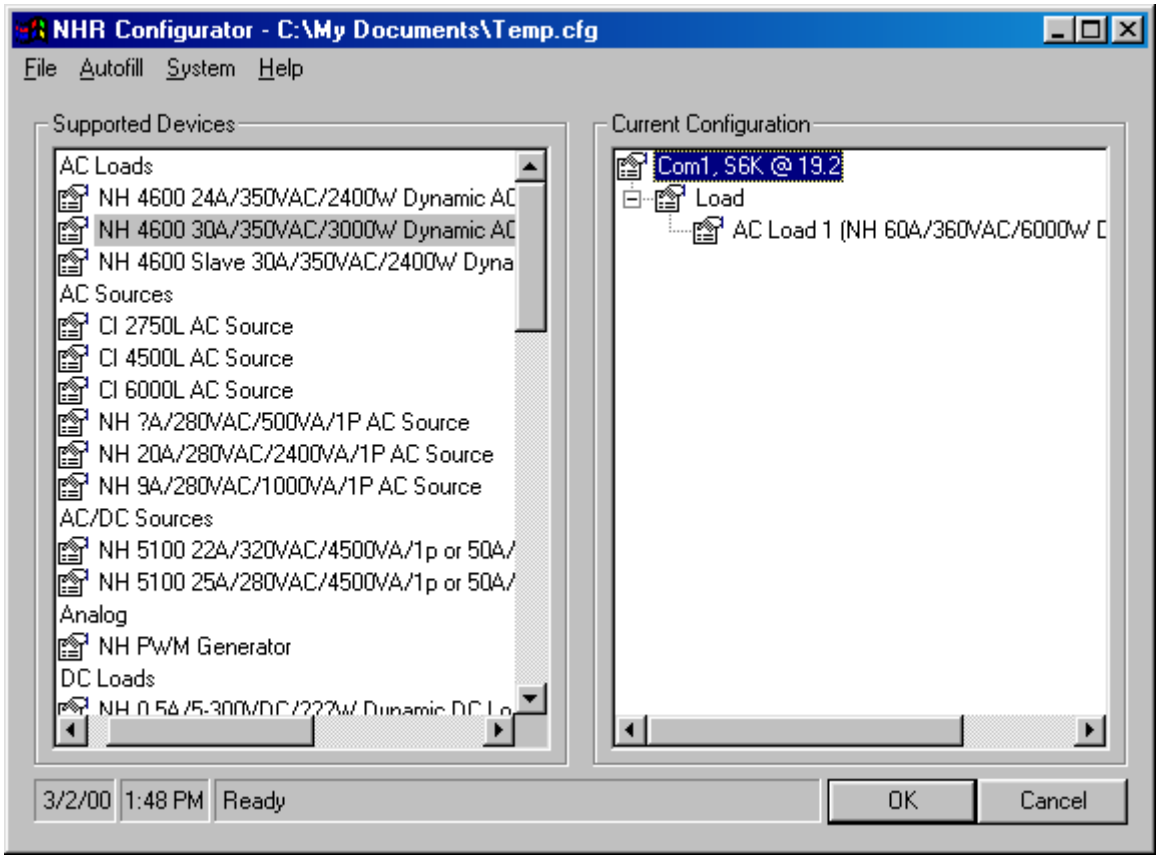
To add a parallel load, click on the Add Slave button.



Set its address and click on the OK button.



Enter a logical name.



3.2 Operation

3.2.1 Creating the Measurement Vectors

3.2.2 Defining the UUT Outputs

3.2.3 Making Measurements

3.2.4 Running the Test

3.2.5 Other Considerations

3.3 CONTROL

3.3.1 Configure Measurements

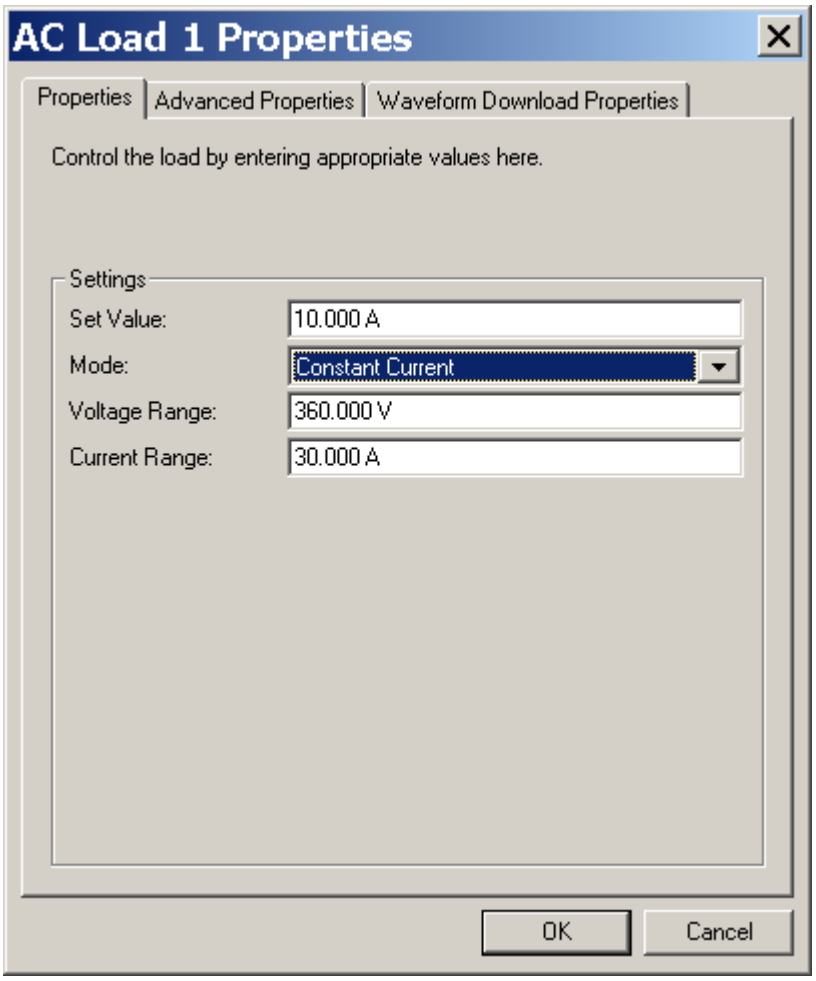
3.3.2 Taking Measurements

3.3.3 Saving and Restoring Configuration

3.4 Programming

Note: See the *emPower* ® Programming Manual for a description of the standard device driver interface functions.

All NHR loads support these four commands: Set Value, Mode, Voltage Range, and Current Range.



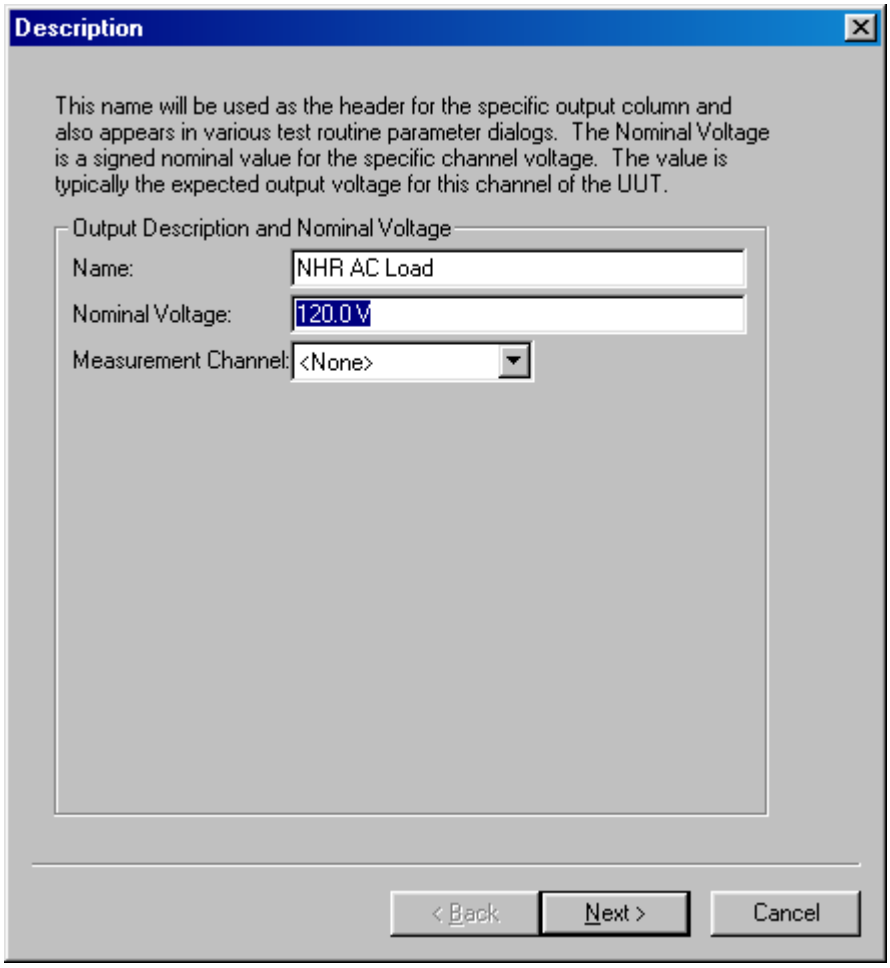
Set Value's meaning depends on the load's operation mode. A value 10.0 with Constant Current selected for the mode the load will draw 10.0 amps of current. If the mode is Constant Power, the load will draw 10.0 watts. Set Value is not used when the mode is Off or Short Circuit.

Mode is the load's operation mode. This load supports: Constant Current, Constant Power, Constant Voltage, Constant Resistance, Short Circuit, and Off. In Constant Current mode the load will draw the Set Value amps without regard to the voltage. In Constant Power mode to load will draw the current required for the Set Value watts. In Constant Voltage mode the load will draw the current required to lower the voltage to the Set Value volts. In Constant Resistance mode to load will draw a current proportional to the voltage.

Voltage Range is used only for error checking when the load is in constant voltage mode. This load has only one voltage range.

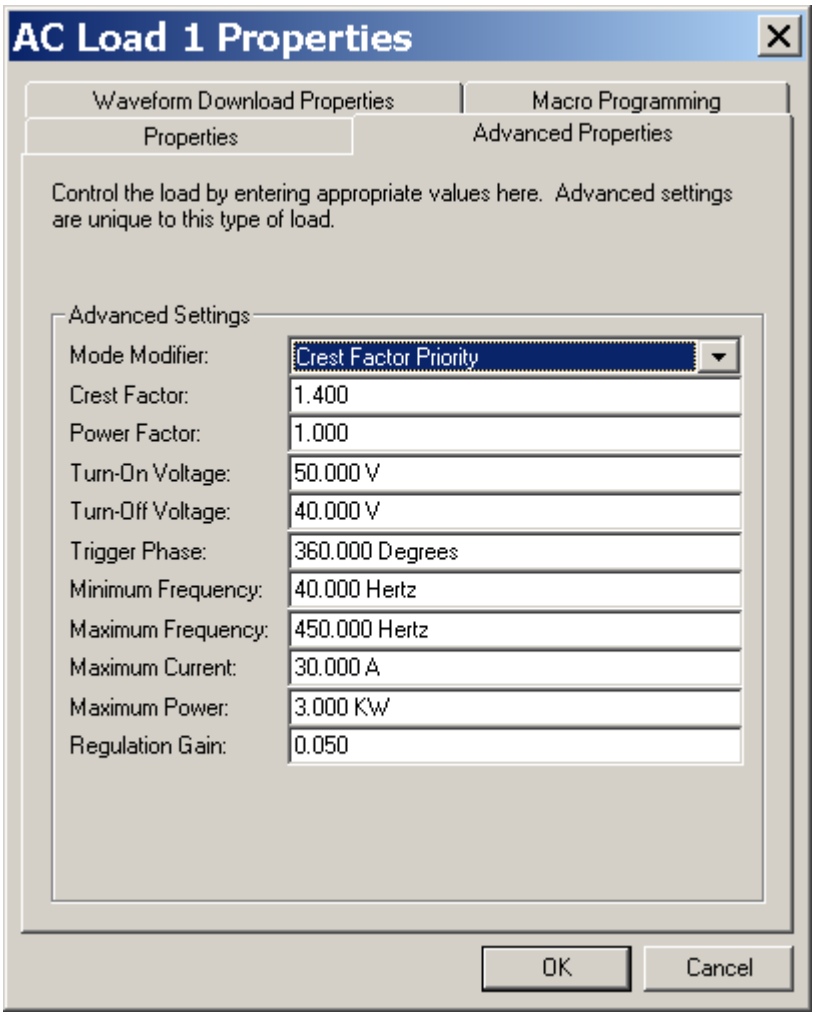
Current Range is used only for error checking when the load is in constant current mode. This load has only one current range.

All NHR loads also support Nominal Voltage.



The NHR AC Load hardware does not use Nominal Voltage. The AC Load driver uses Nominal Voltage when the load is offline (hardware not required). Nominal Voltage is used to simulate measuring voltage and power.

NHR AC Load's device specific functions:

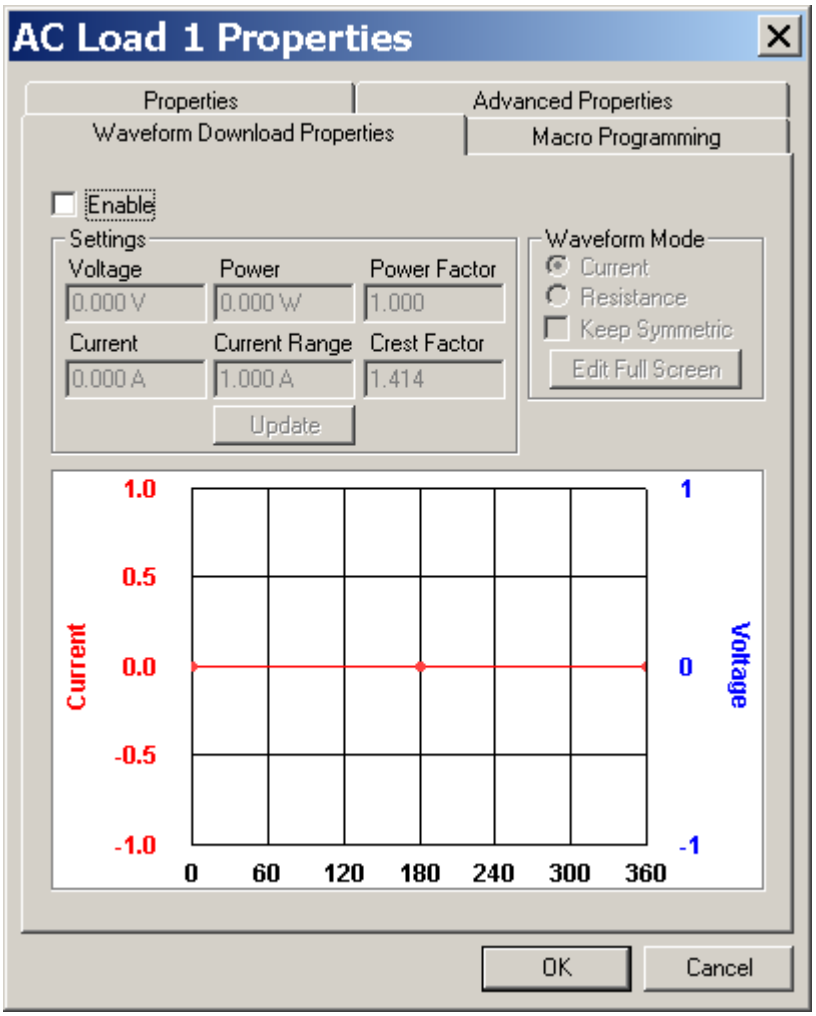


Mode modifier controls how Crest Factor and Power Factor are used. The load must be in constant current or constant power mode or else the mode modifier is ignored. There are three settings:

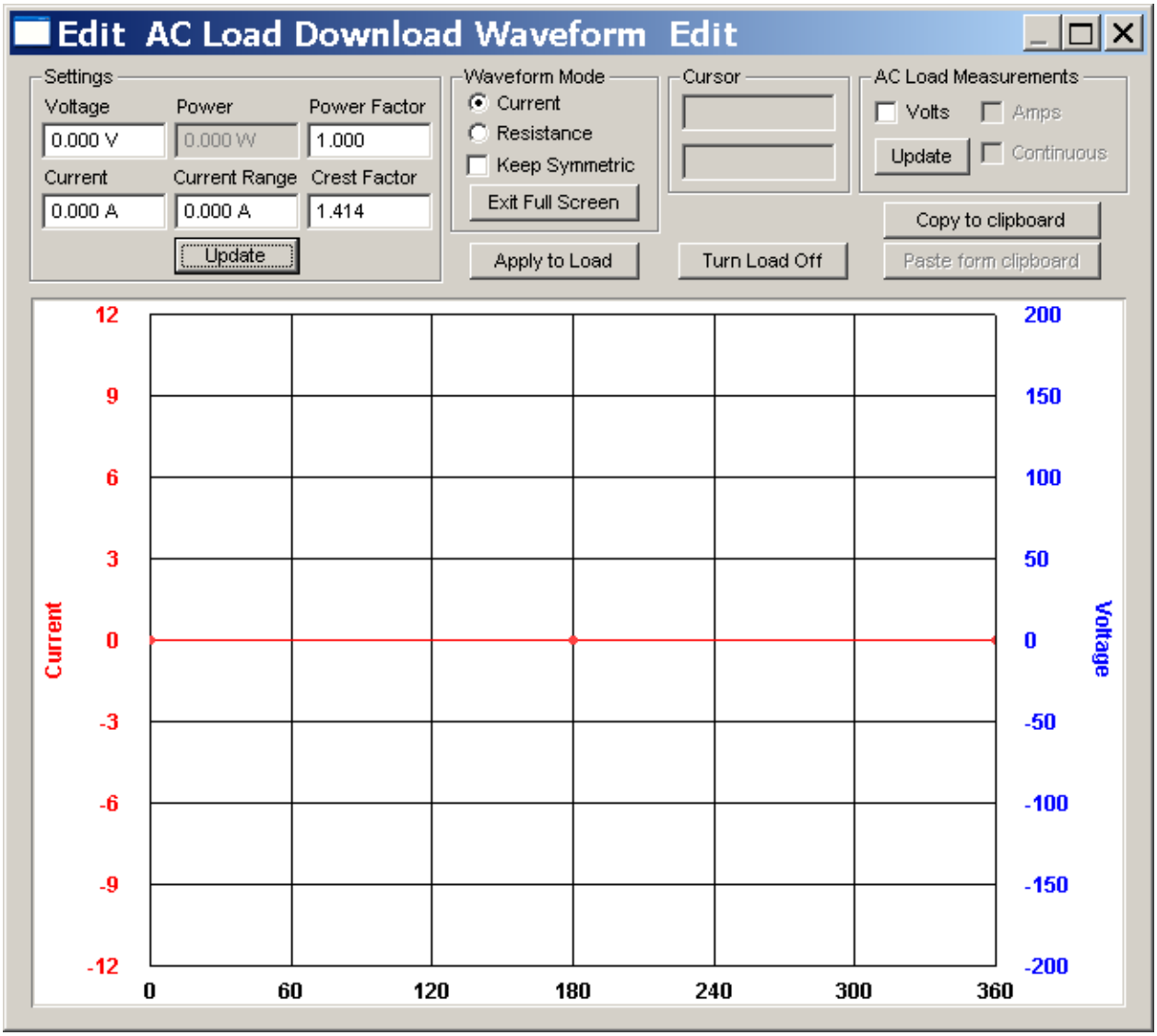
- **Crest Factor priority – load generates a waveform with the assigned crest factor. The waveform is phase shifted to get as close as possible to the programmed power factor.**
- **Power Factor priority - set value for the Power Factor. A load generates a waveform with the Crest Factor that has the programmed Power Factor with no phase shift. The mode modifier must be Crest Factor priority or Power Factor priority for this to be used.**
- **Unity Power factor - current drawn is a function only of the set value and the voltage. No waveform generated.**

- **Turn-On Voltage - minimum voltage the load must detect before it will start drawing current.**
- **Turn-Off Voltage - maximum voltage the load must detect and not stop drawing current. When the voltage goes below Turn-Off Voltage, the AC Load turns off until the voltage goes above Turn-On Voltage.**
- **Trigger Phase - determines the phase angle of the AC voltage that commands are executed. For example: if load current changes are to only happen at a zero crossing, set the trigger phase to either 0.0 degrees or 180.0 degrees. 360.0 degrees is a special value, commands are executed as quickly as possible.**
- **Minimum Frequency - lowest frequency the load will detect and draw current.**
- **Maximum Frequency - highest frequency the load will detect and draw current.**
- **Maximum Current - sets the maximum current the load will draw regardless of other programmed values and modes.**
- **Maximum Power - sets the maximum Power the load will draw regardless of other programmed values and modes.**
- **Regulation Gain – sets gain of the correction circuit. For example: if the load is set to 12.0 amps in constant current mode and it measures 11.9 amps, a regulation gain of 0.05 will cause the load to increase the current by 5% of 0.1 amps.**

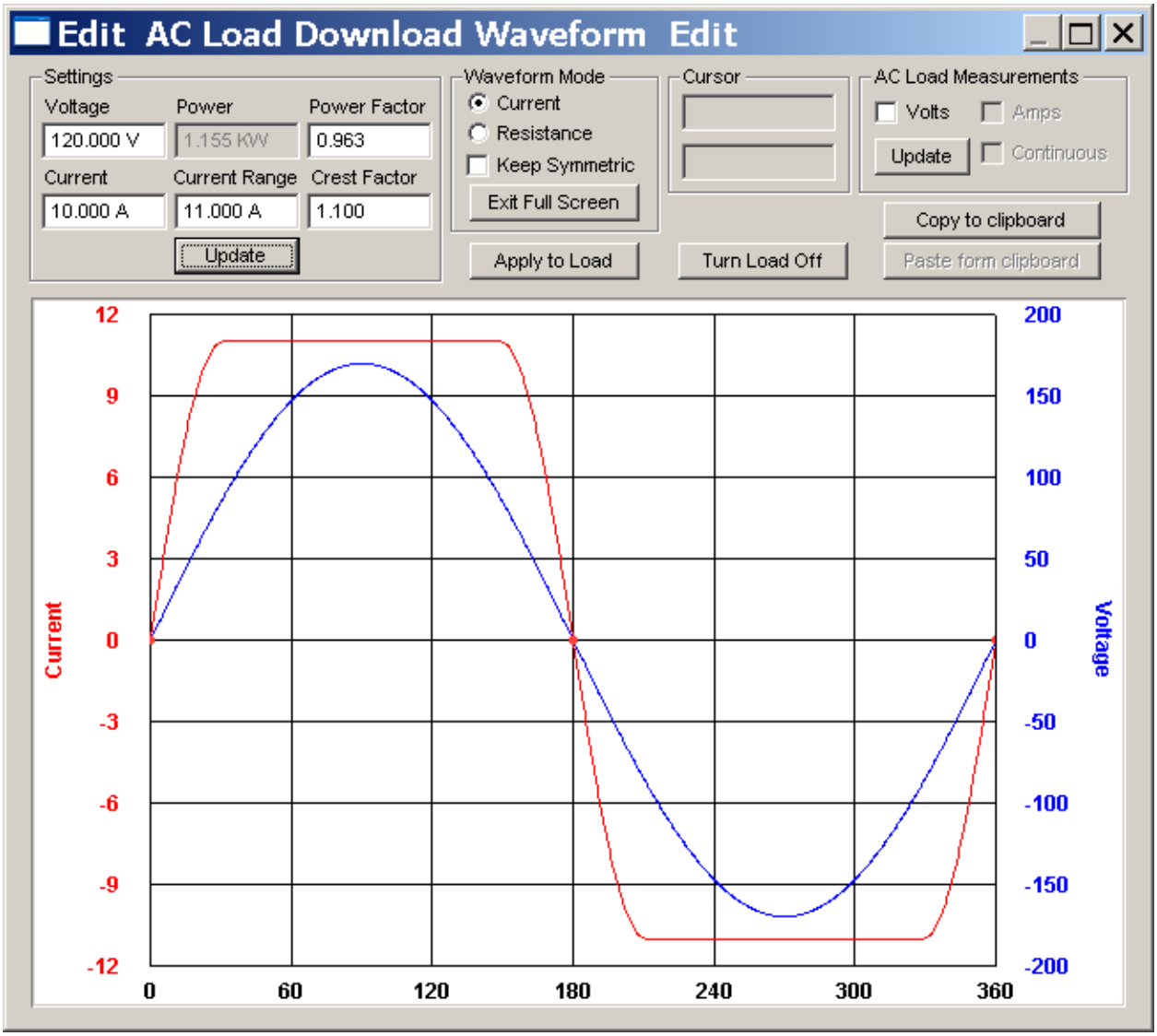
NHR AC Load's downloading waveform functions:



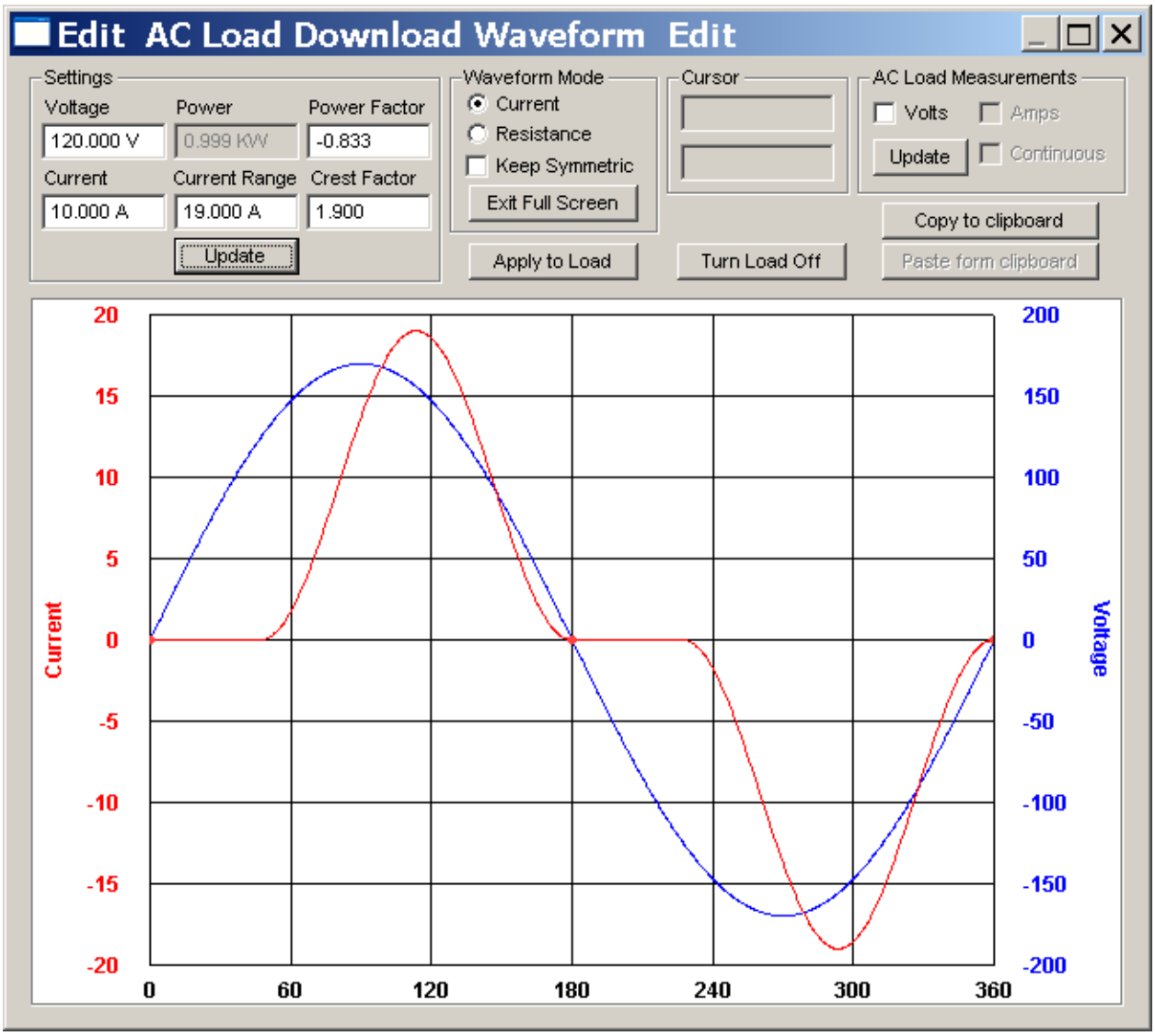
NHR AC Loads supports two operation modes that are not discussed as load properties. These modes use downloaded waveforms to define the current or resistance of the load. Enabling this property allows the user to create the waveform to be downloaded. After checking the Enable check box, clicking on the Edit Full Screen button brings up an editing dialog that displays all the editing controls.



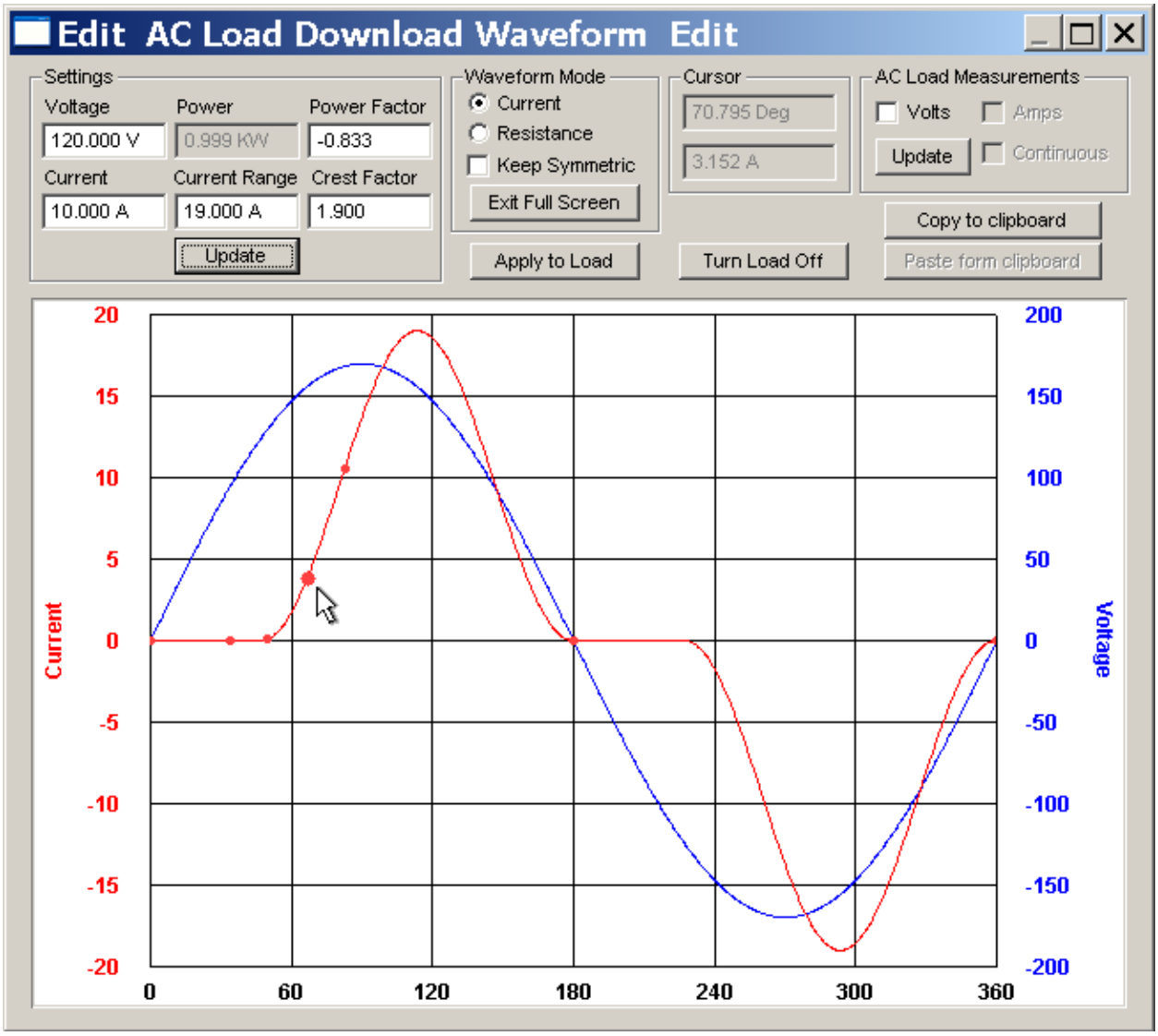
Smooth waveforms can be generated by editing the fields in the Settings group and then clicking Update. Setting the Voltage field to 120V will draw a sine wave with an RMS value of 120V. Setting the Current field to 10A will draw a sine wave with an RMS value of 10A. Increasing the Crest Factor will make more narrow current peaks. Decrease the Crest Factor and the Current waveform becomes more of a square wave.



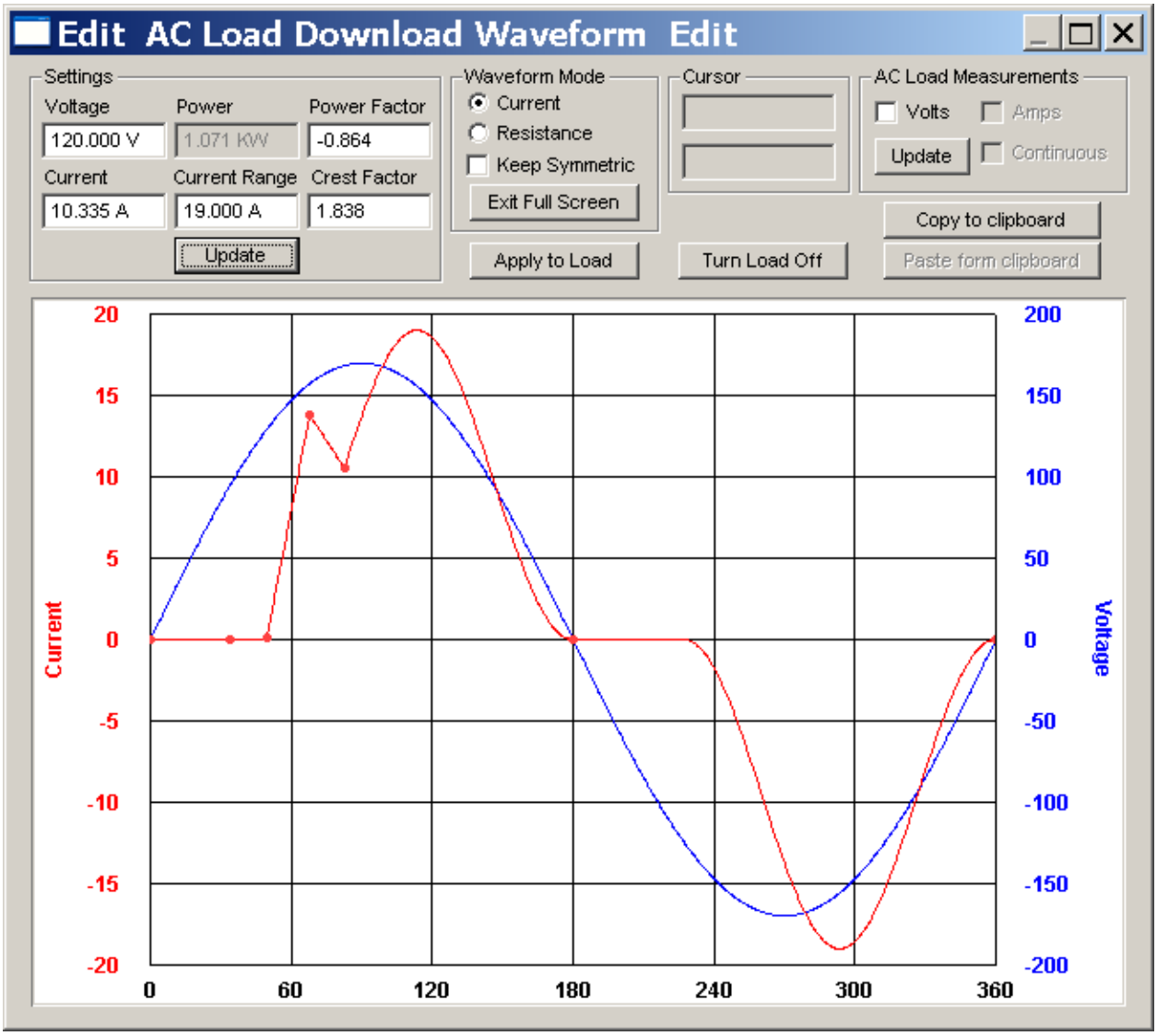
When the Crest Factor is about 1.66 and greater, the Power Factor can shift the Current waveform. Positive values cause the current to lead the voltage and negative values cause the current to lag the voltage. Large Power Factors center the waveform while small Power Factors shift. Clicking the Update button not only draws the best waveform to fit the settings, it also recalculates the actual Power Factor of the waveform and will increase the current range if it is required.



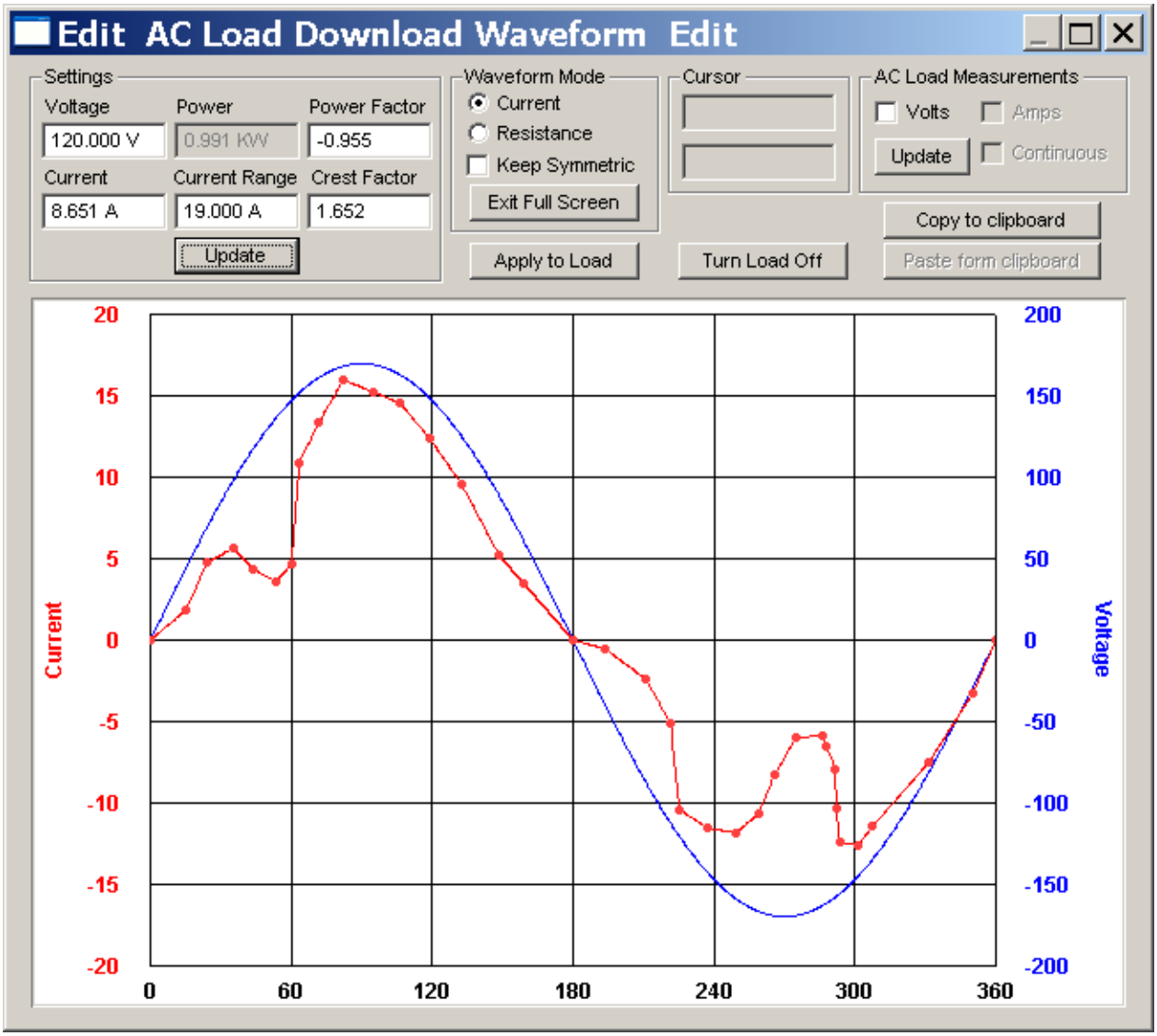
With the mouse in the edit array and between 0 and 360 degrees, a left click will add an anchor to the current waveform. There are three anchors that are always on the waveform. They are at 0, 180, and 360 degrees and all must be at 0.0A. These three anchors cannot be selected and cannot be moved. Any other anchor can be selected by moving the mouse to it and the anchor will get larger.



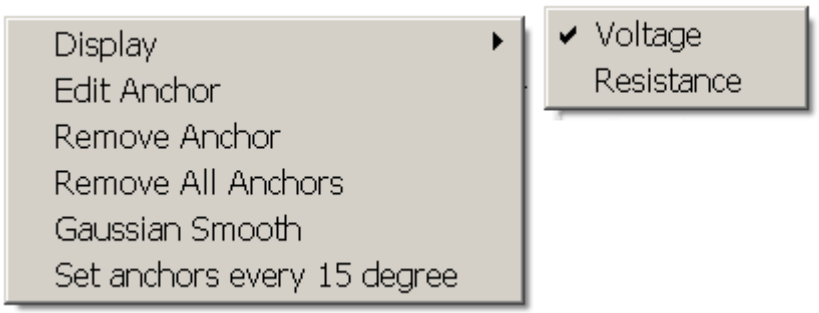
To move an anchor, select the anchor by moving the mouse near and hold the left mouse button down. Move the mouse to the new location and let the left mouse button up. The waveform becomes straight lines from the selected anchor to the nearest anchors on each side.



An anchor is not allowed to pass another anchor. An anchor on the left side of 180 degrees is not allowed below zero or above the Current Range displayed in the Settings group. An anchor on the right side of 180 degrees is not allowed above zero or below the negative Current Range displayed in the Settings group. To make a waveform for the load, add and move anchors until the waveform is defined.

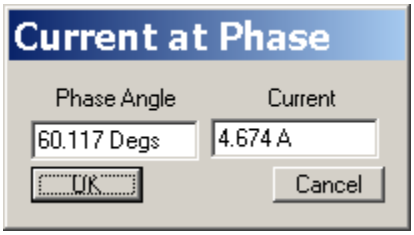


Right clicking the mouse, while it is in the drawing area, will bring up a menu for editing the waveform.



Display: Selects which waveforms are to be displayed. Note that the Current waveform is always displayed.

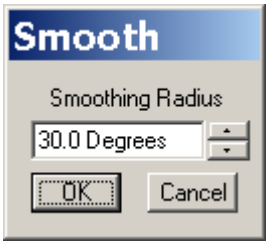
Edit Anchor: If an anchor is selected, brings up a form to define the positioning of the anchor. Note that there are 1024 values evenly distributed across 360 degrees.



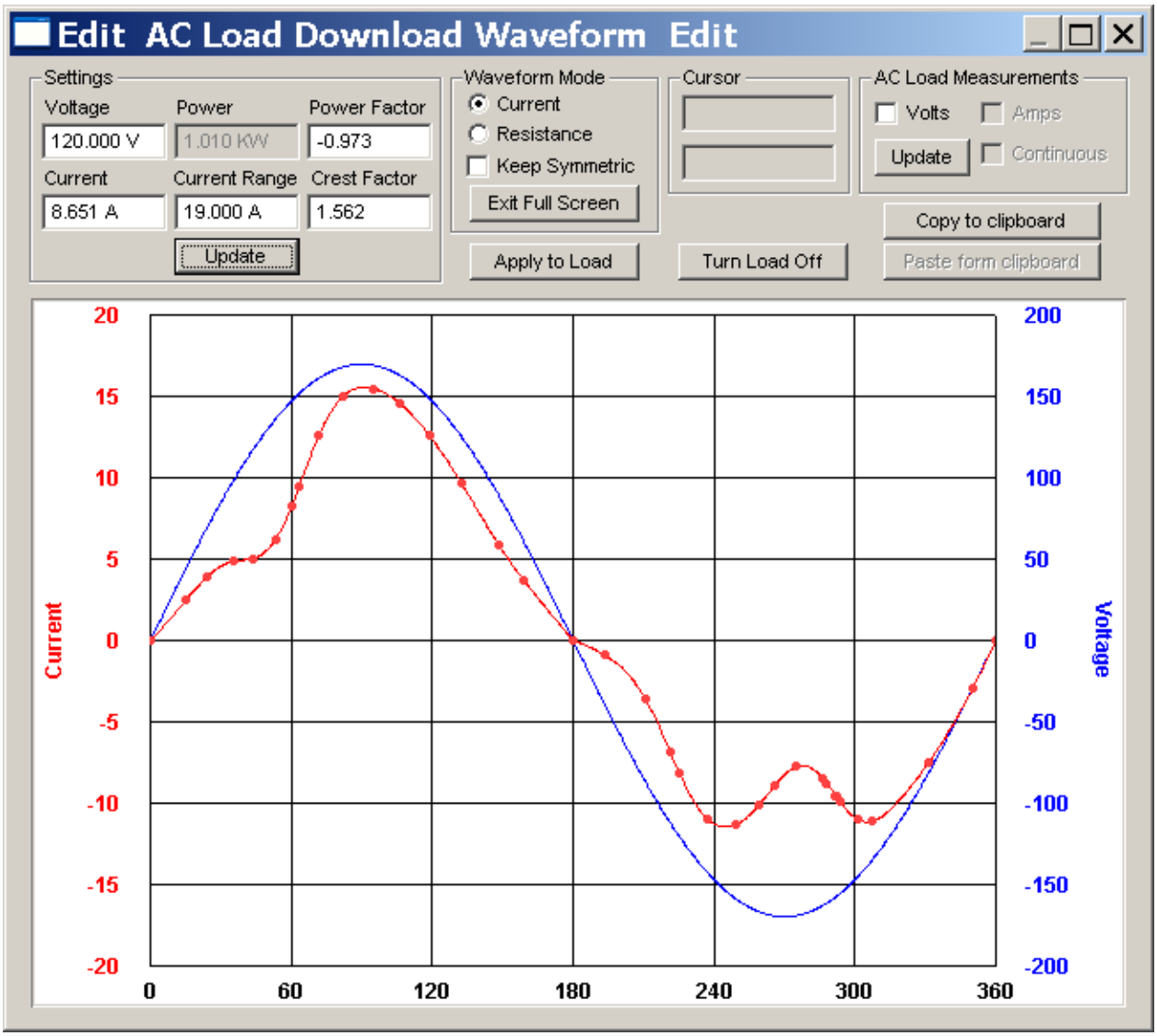
Remove Anchor: If an anchor is selected, deletes the anchor.

Remove All Anchors: Removes all anchors.

Gaussian Smooth: Smoothes the waveform by using the Gaussian or binomial algorithm. Note that excessive smoothing will result in a sine wave.



Set anchors every 15 degrees: Adds anchors every 15 degrees starting at 15 degrees.



Waveforms can be created that exceed the capabilities of the AC Load. The load cannot perform a rise/fall time as fast as can be drawn. The load cannot draw current that the source does not supply. The load recalibrates it's internal measurements immediately after every voltage zero crossing. During that time, the load is busy and may distort the current waveform.

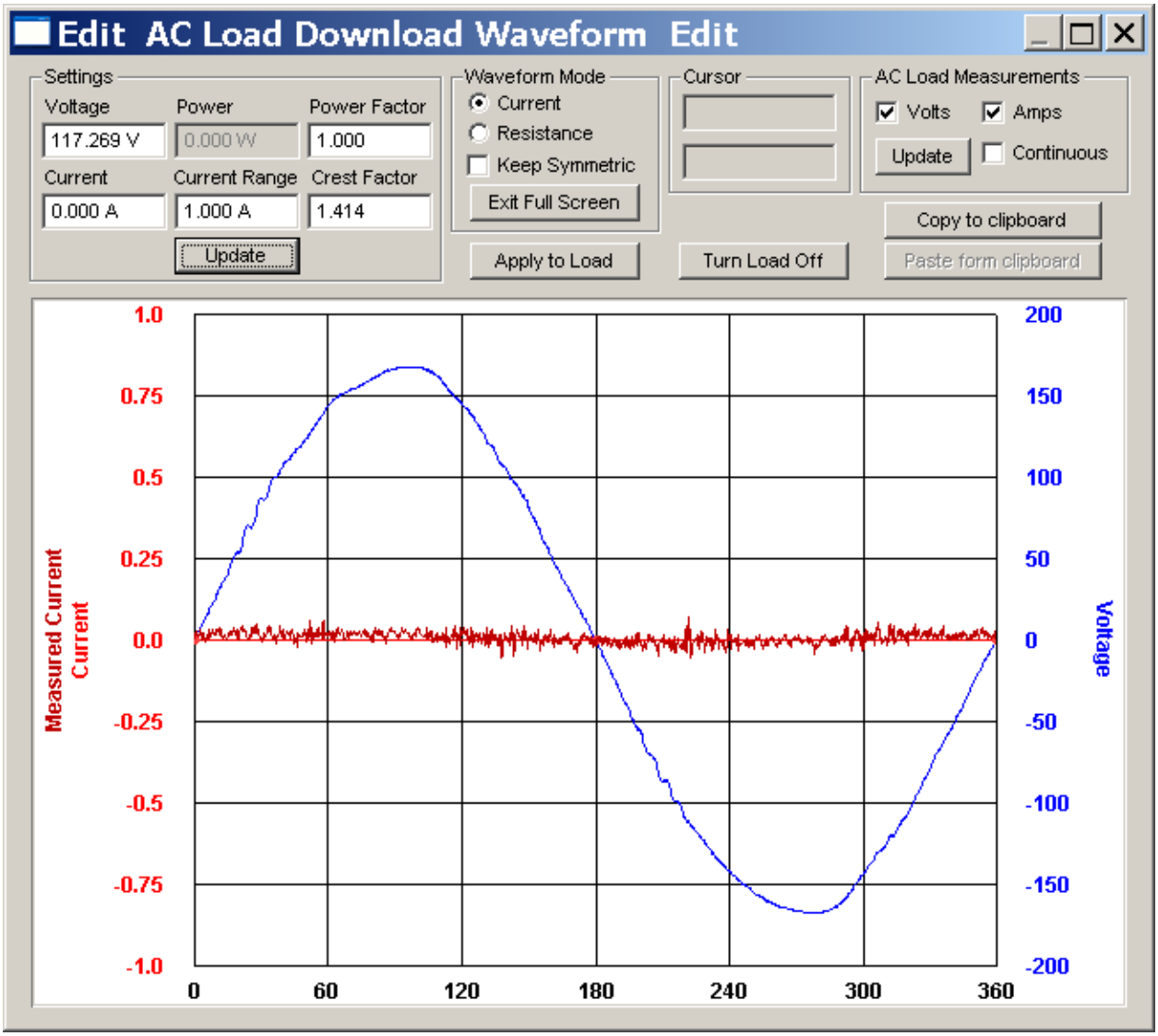
Example: Creating a downloaded waveform in a test.

Since the AC Load might distort the voltage waveform and might try to draw more current than is available, creating downloadable waveforms should be online with the actual hardware to be tested. emPower Edit does not usually send commands to hardware.

With emPower Edit already running start emPower Control. From emPower Control, turn on sources and all other devices needed to create the environment required for the waveform test.

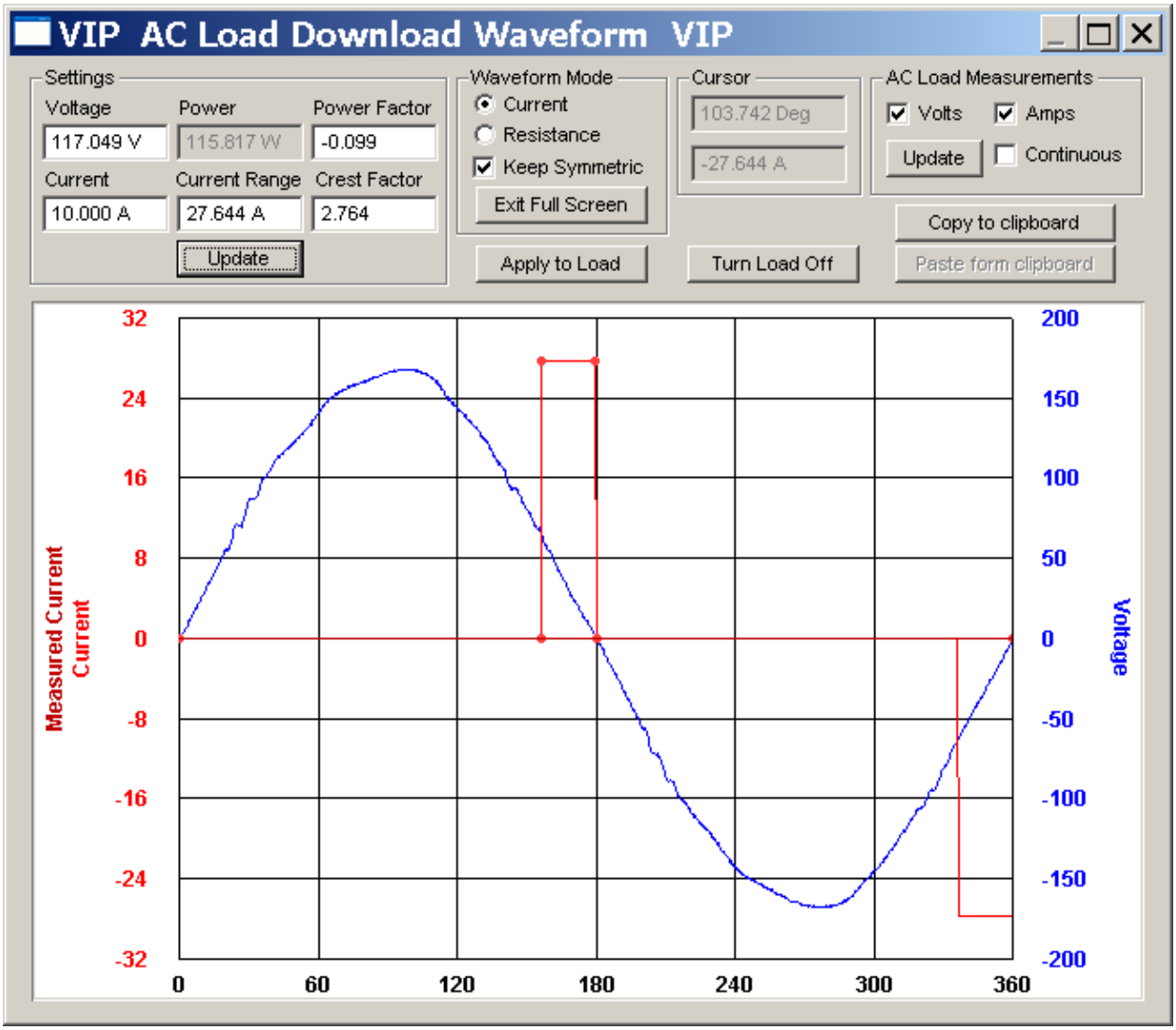
Create an AC Load vector, select load properties, click on the Advanced Properties button, and select the Download Waveform Properties tab. Check the Enable check box and click the Edit Full Screen button. Under the AC Load Measurements group, check the Volts check box, check the Amps check box, and click the Update button.

The result should look something like this:

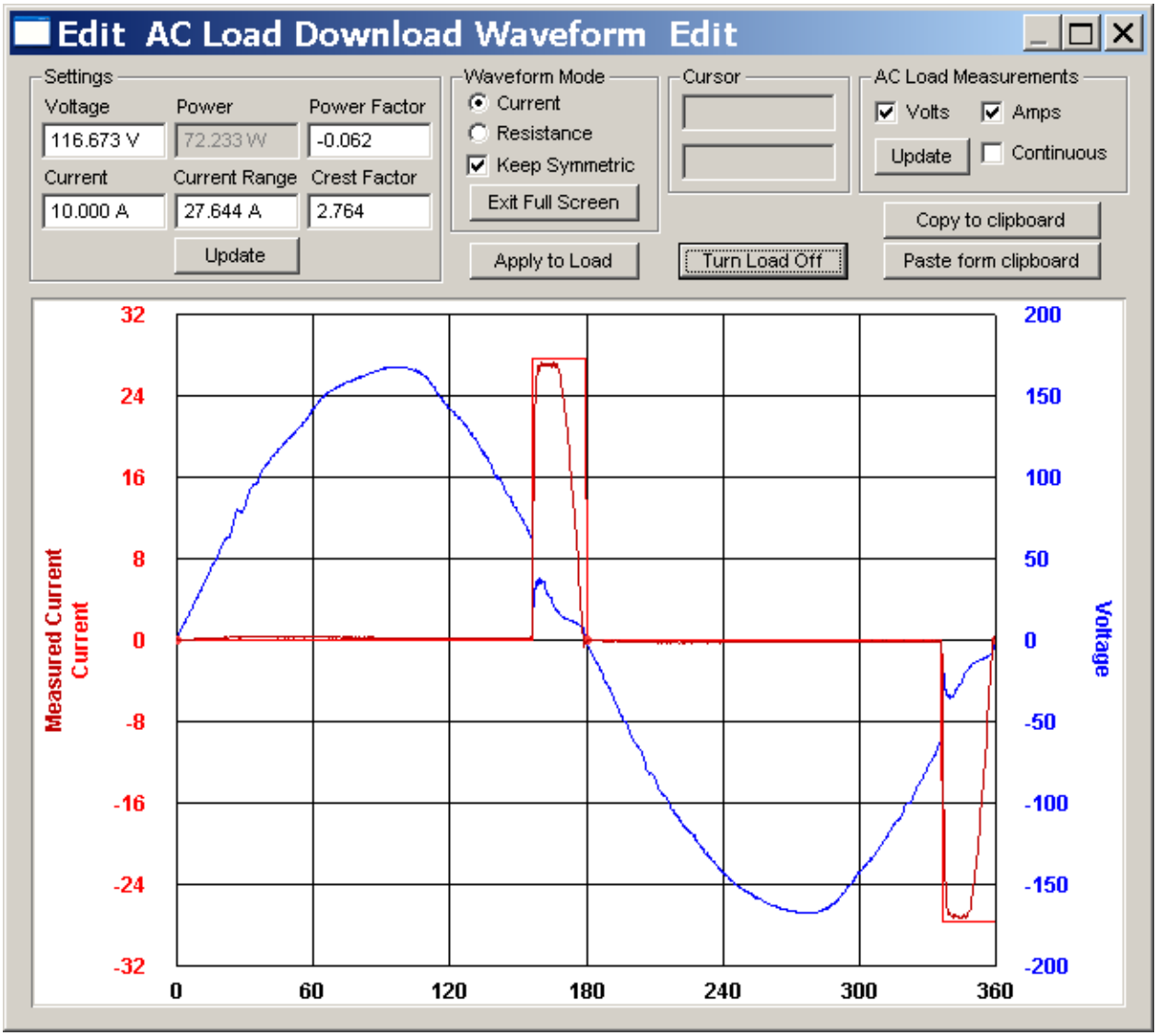


Create the desired current waveform by adding anchors and dragging them until the desired waveform is complete. The Waveform Mode group has a Keep Symmetric check box. Checking this will keep the positive and negative waveforms identical and insure that the average DC current is zero.

In this example, we will create a waveform that is too extreme for the source to accommodate.

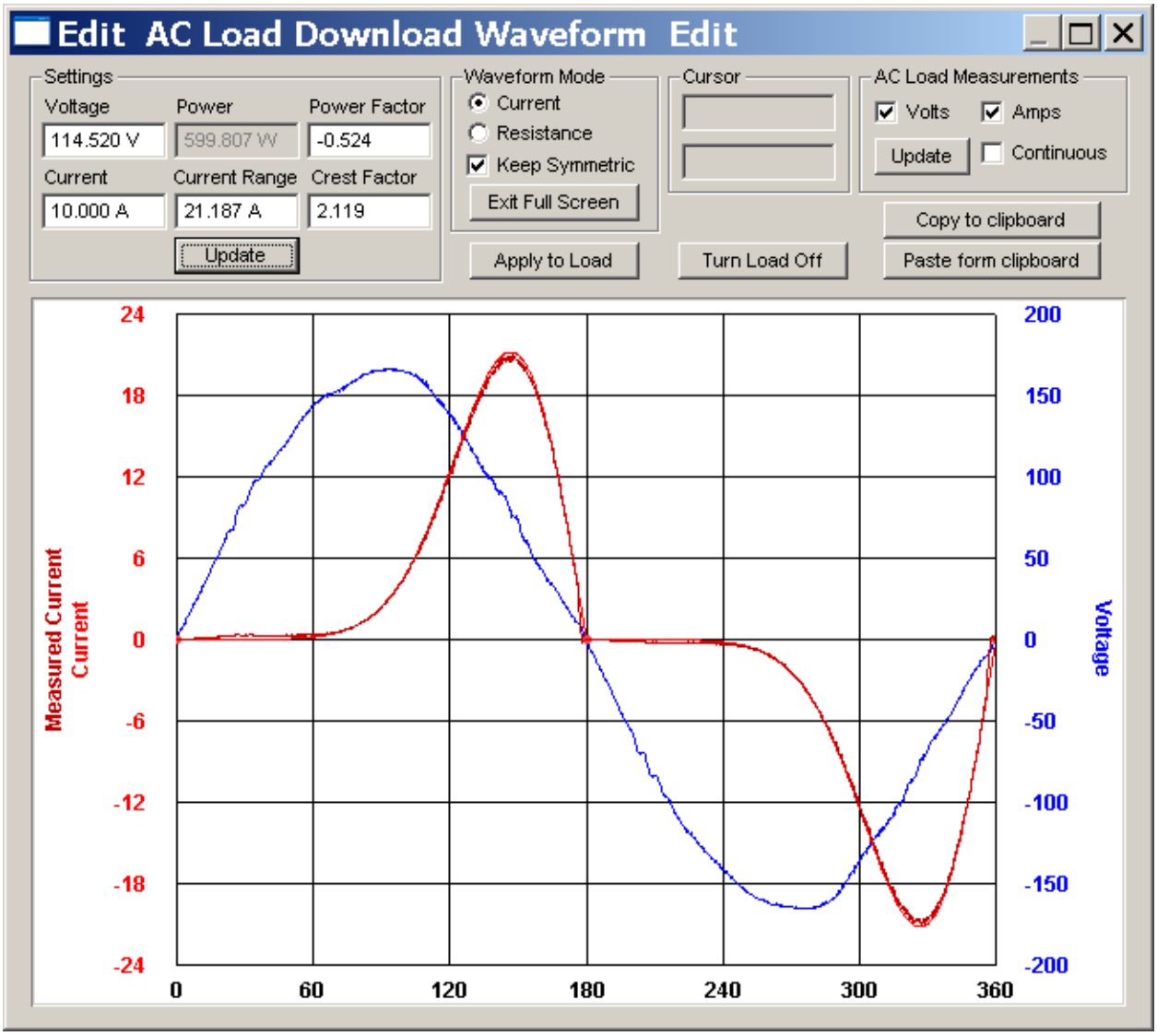


The waveform can be tested by clicking the Apply to Load button, the Update button, and the Turn Load Off button. "Apply" sends the waveform to the load and puts the load in Current waveform mode. "Update" reads the actual Voltage and Current waveforms and displays them. "Turn Load Off" puts the load in off mode so that the UUT and other hardware are not working while deciding on what kind of waveform to use.



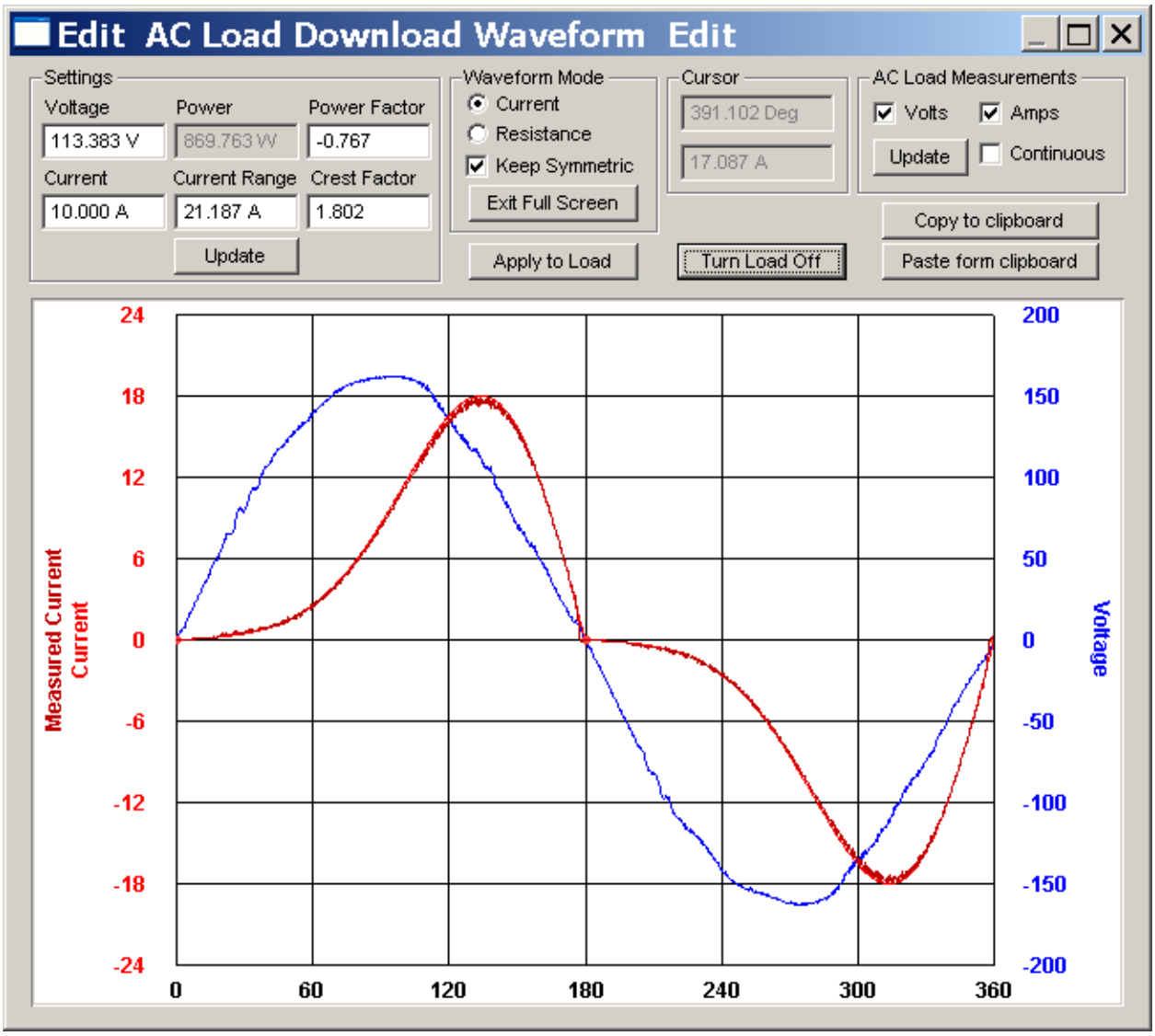
This waveform is too abrupt of a current change. It is distorting the voltage waveform. The high current is too close to zero crossing for the source to supply the requested current.

Smooth for 90 degrees, using the Gaussian Smooth function and reapply to hardware. Smoothing the waveform shifts the current away from zero crossing, where there is not enough voltage to draw much current. Smoothing also removes abrupt transitions that cause the voltage to overshoot or undershoot.

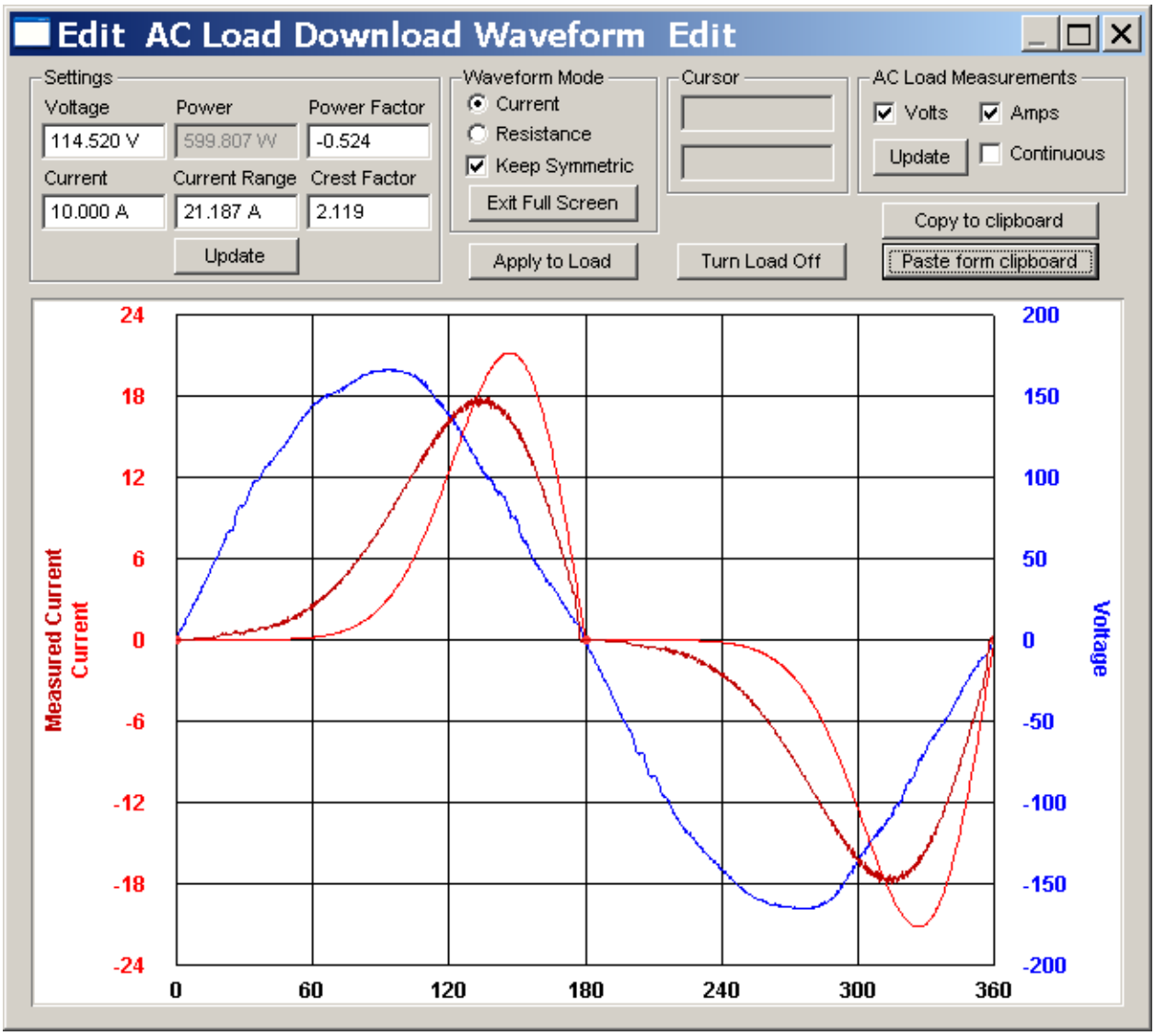


Click Copy to clipboard to save a temporary copy. This is a good method for saving a waveform to retrieve later or to transfer a waveform from emPower Control to emPower Edit.

Smooth for another 90 degrees and reapply to hardware.

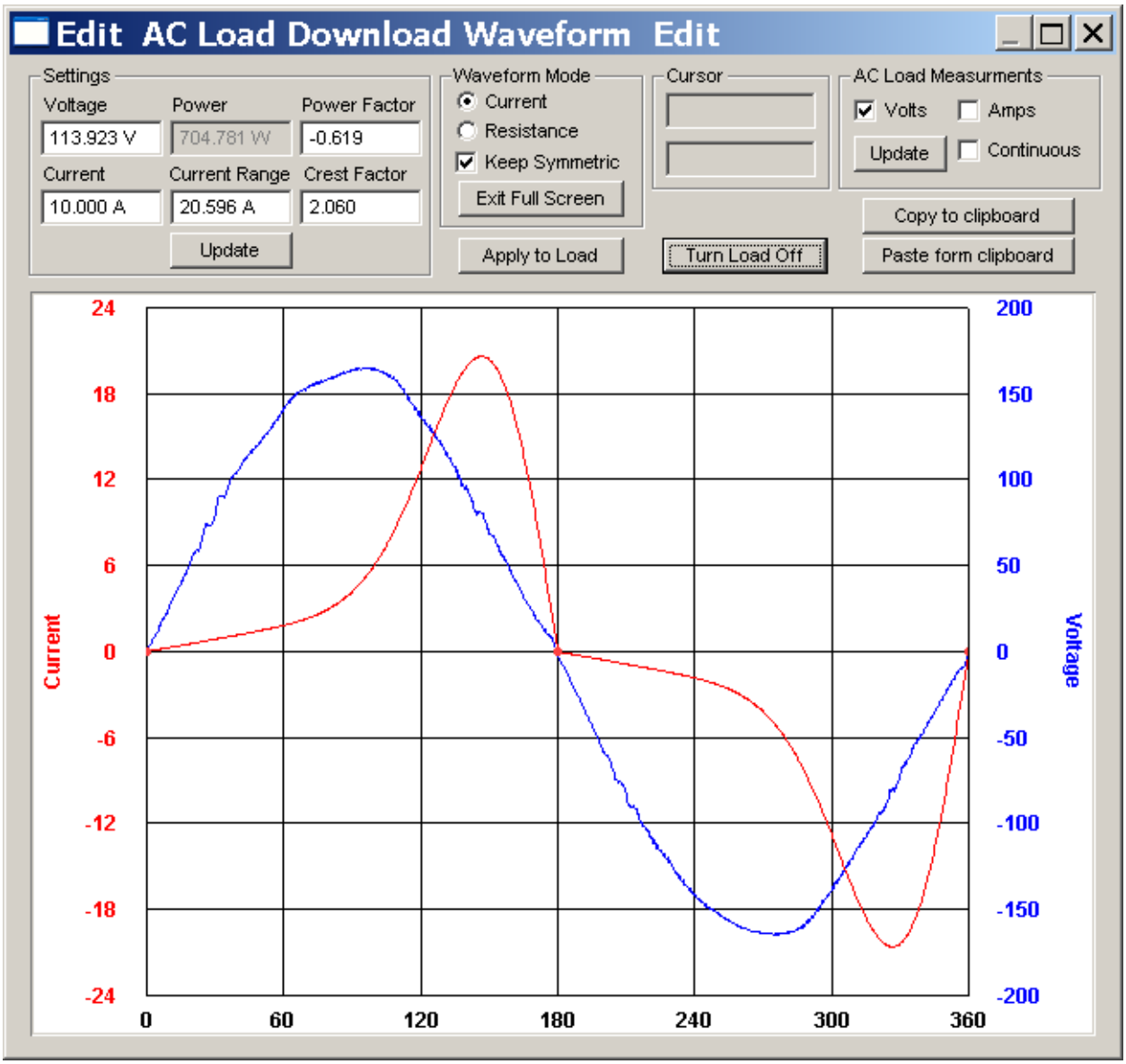


Retrieve the saved waveform by clicking Paste from clipboard but do not retry.

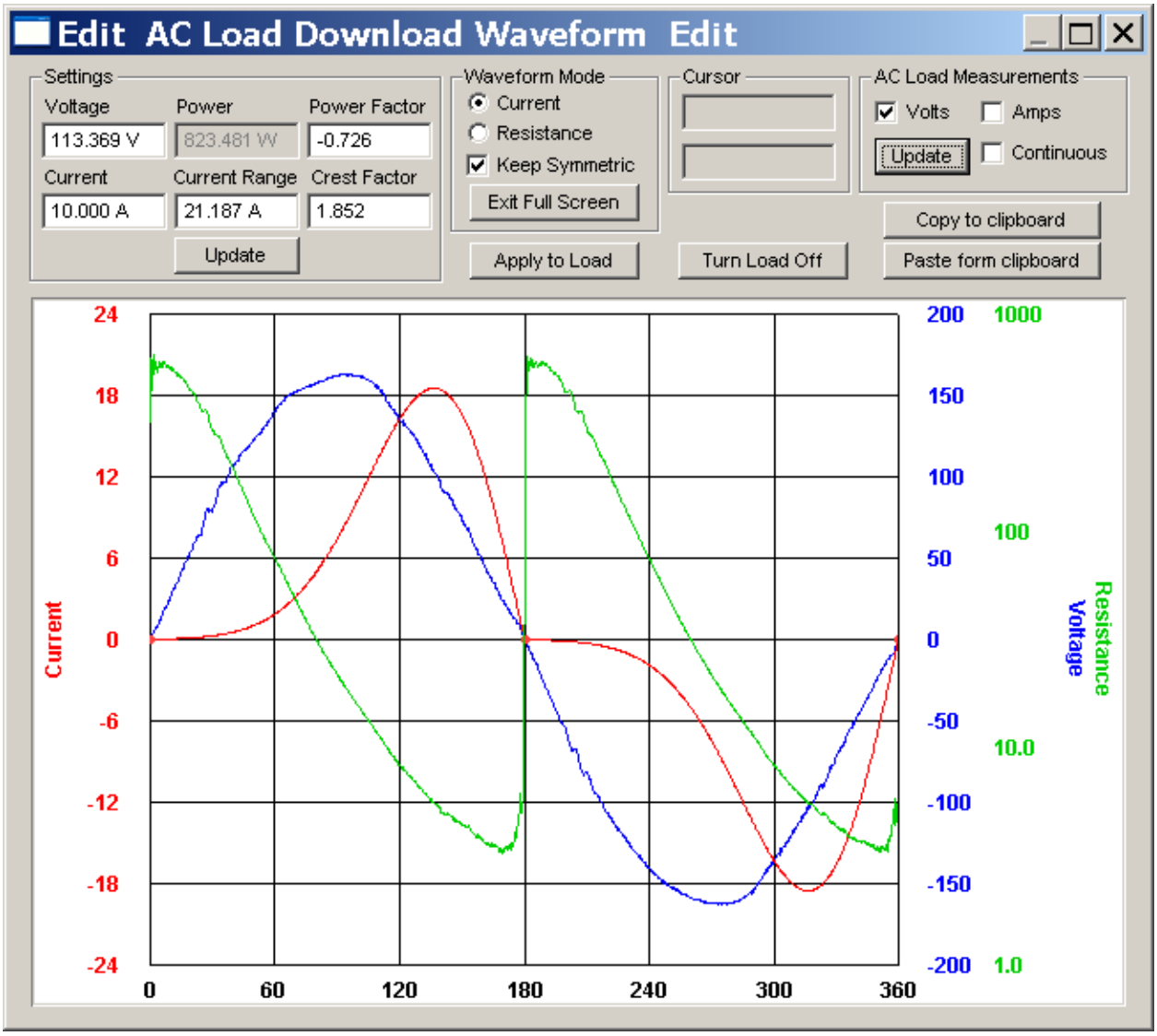


This shows the difference between the last two waveforms.

Remove the measured current waveform by unchecking the Amps check box.



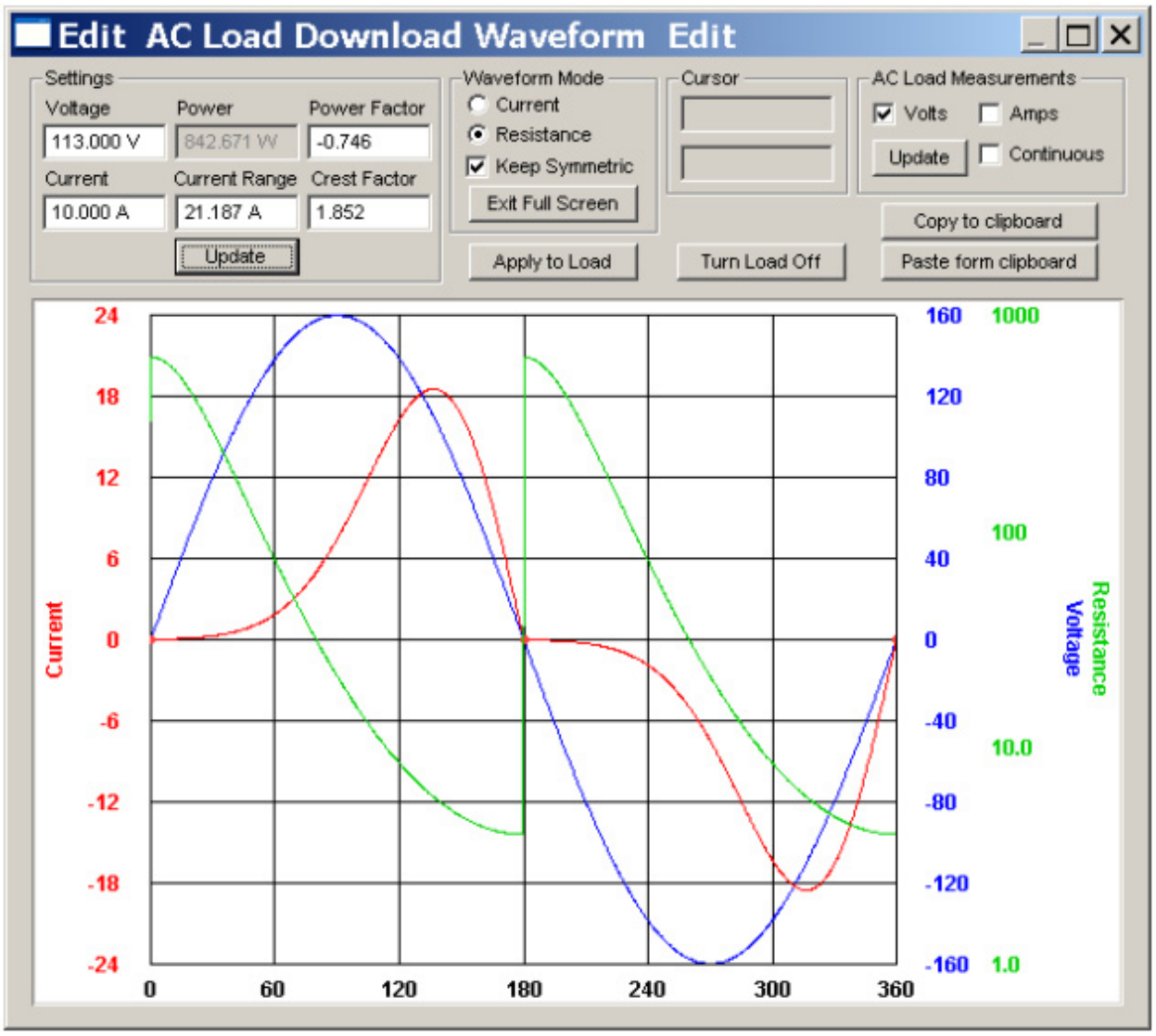
To consider this waveform as a resistance waveform, display the resistance waveform: right click in the graph area, select Display, and select Resistance.



The resistance waveform cannot be edited directly. It is generated from the voltage and current waveforms. Pay close attention to the resistance scale, it is logarithmic.

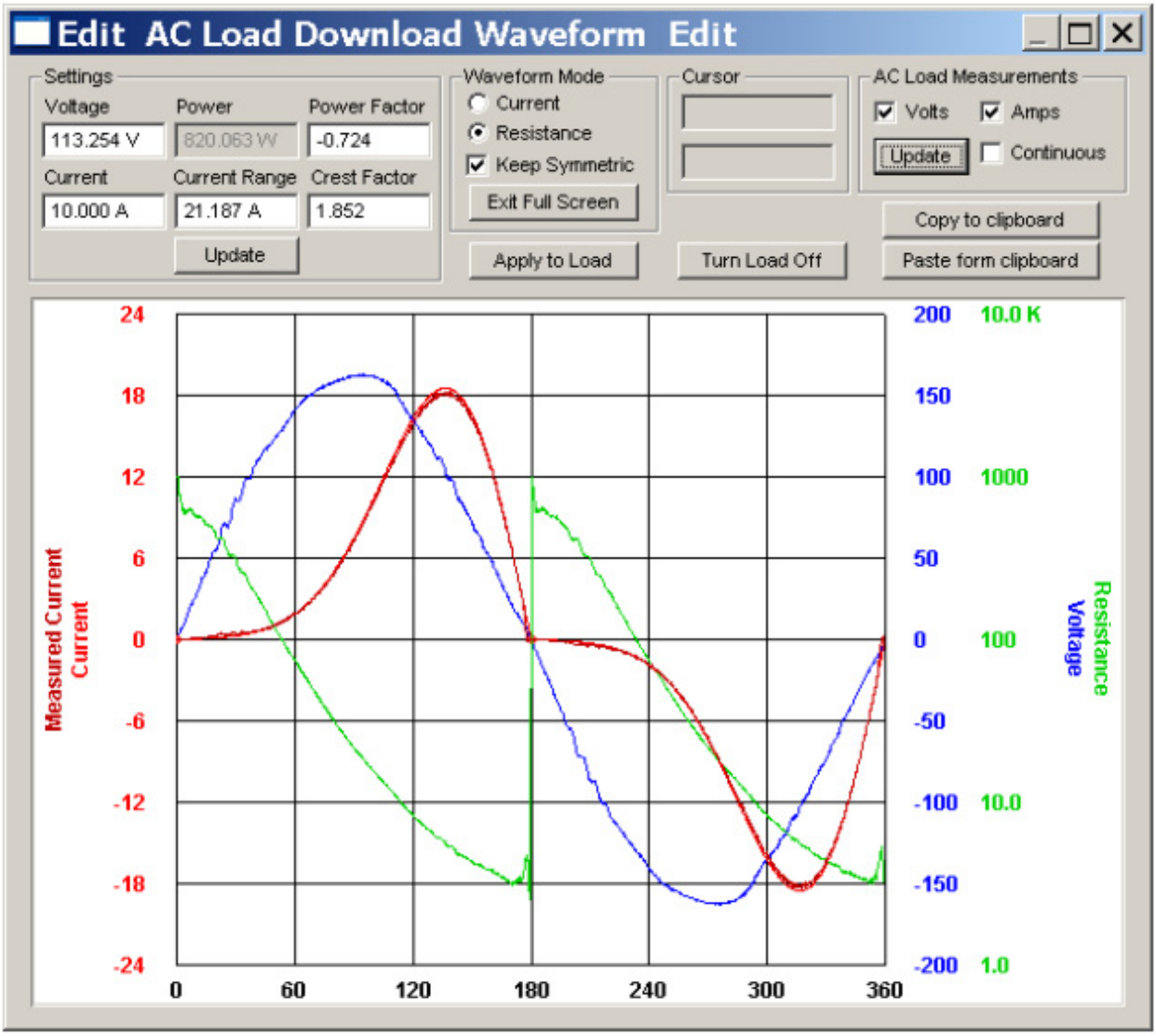
Two observations to notice: The unloaded AC voltage is around 117 volts RMS but with this 10.0 amp RMS load the RMS voltage is between 113 and 114 volts. And, noise in the actual voltage is also in the resistance waveform.

To create a smooth resistance waveform, set the voltage to 113.0 volts and click the Update button. Select Resistance in the Waveform Mode group.



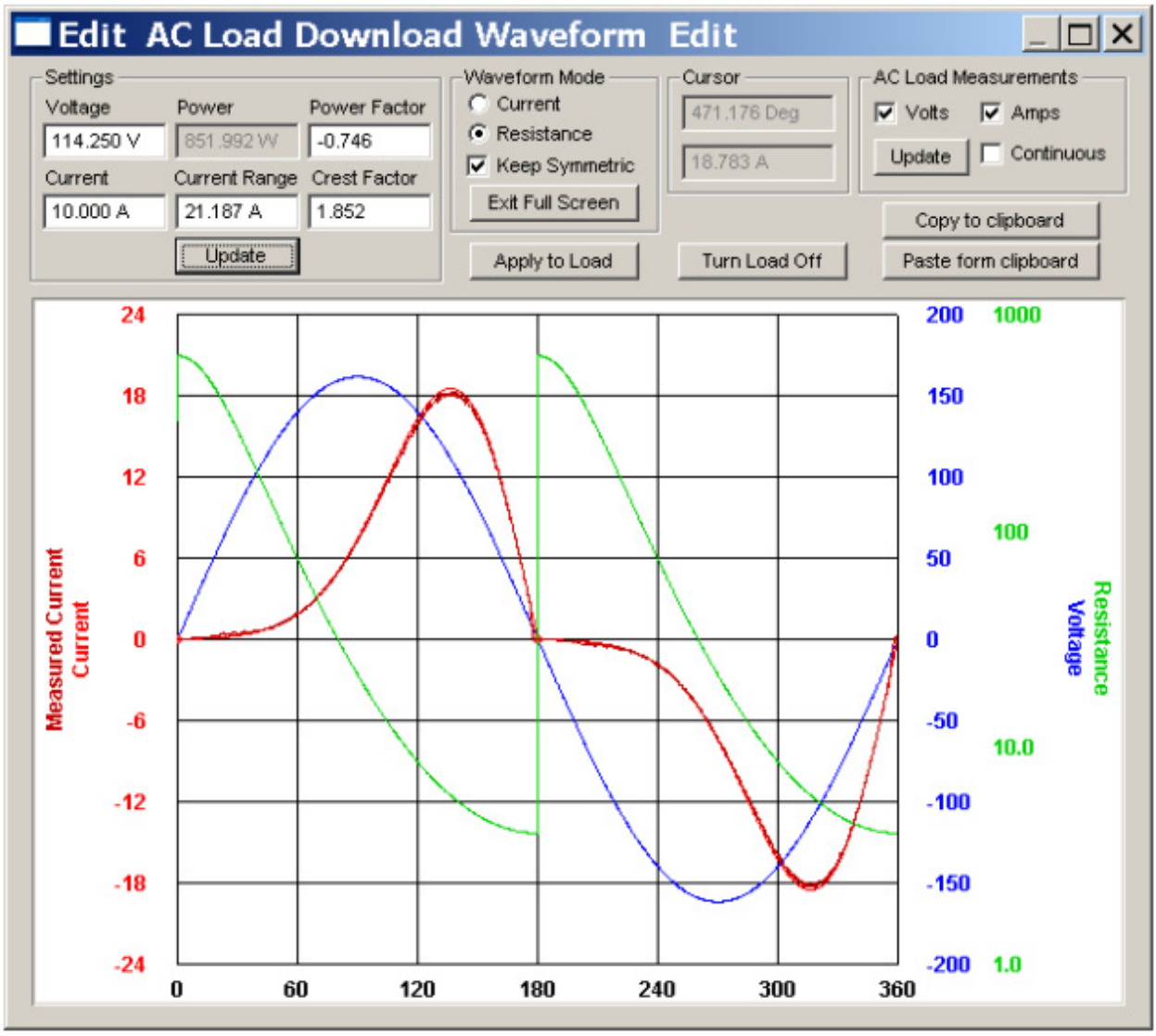
The perfect voltage sine wave has generated a much smoother resistance. Click the Copy to clipboard button. You may want to restore it later.

To view the result, select Volts and Amps in the Measurements group, click the Apply to Load button, the update button, and the Turn Load Off button.

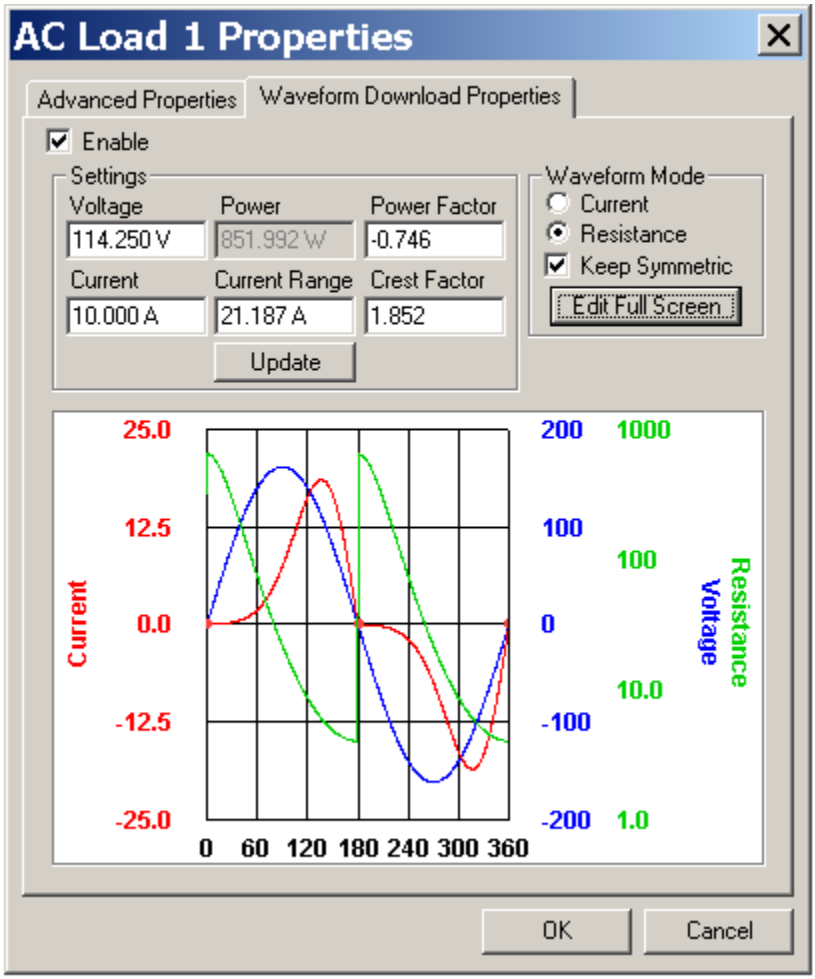


Set Voltage to 113.9 and click Update, to see a better view of the resistance.

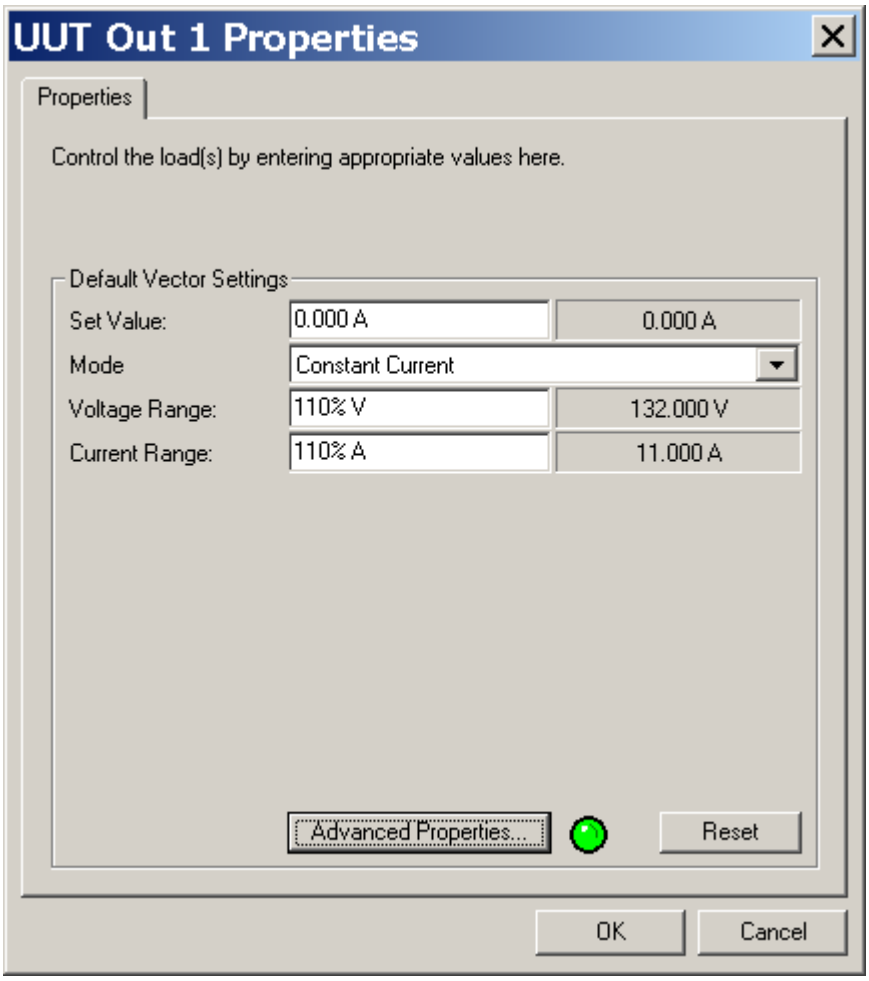
Repeat applying the waveform and resetting the voltage until the desired result is repeatable.



Click the Exit Full Screen button.

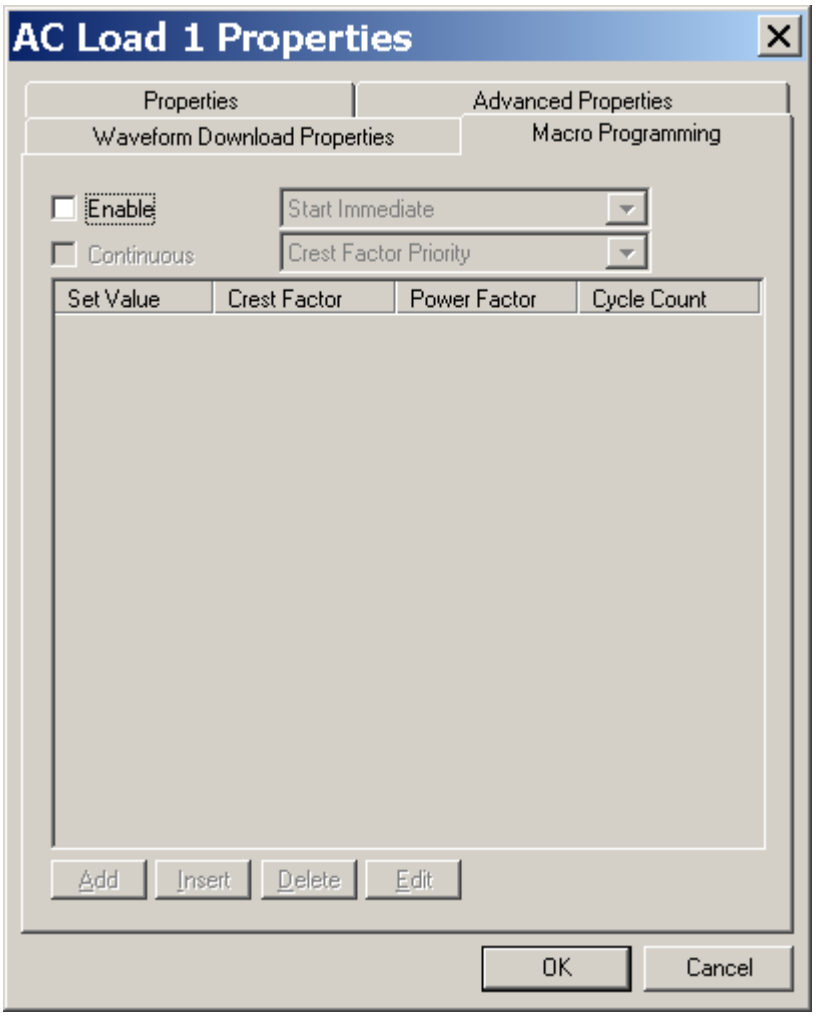


Click the OK button.

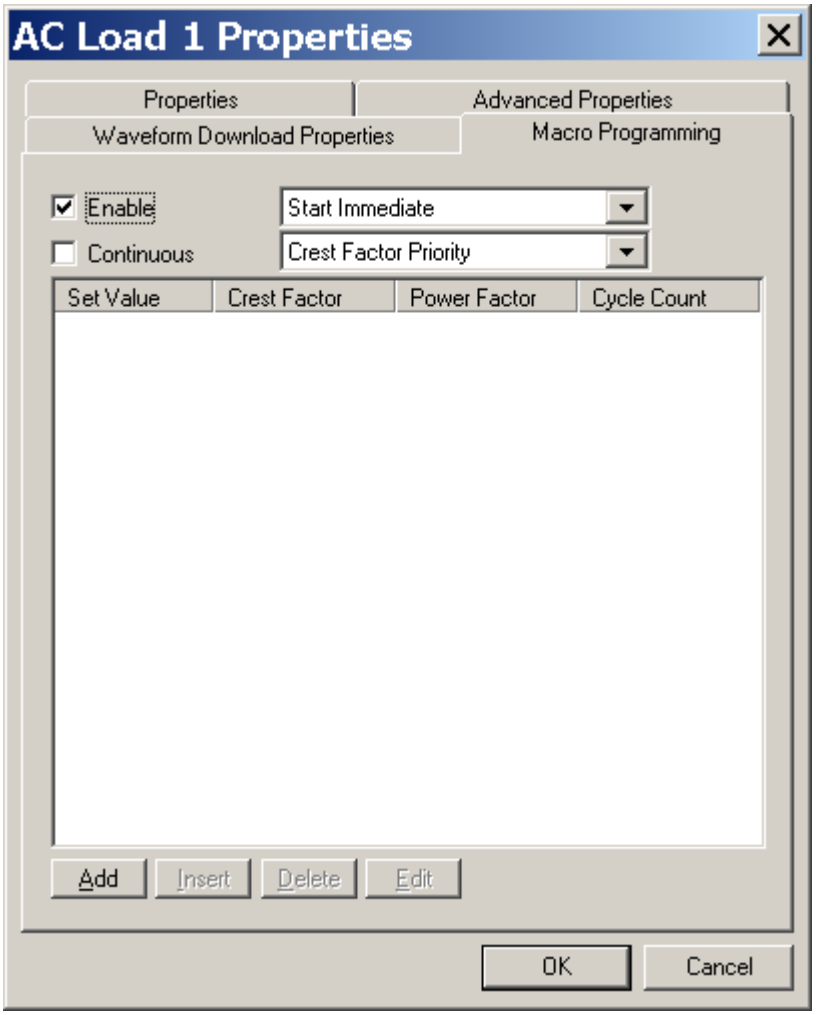


Click the OK button. The downloaded waveform is now ready to be used in a test.

NHR AC Load's macro programming functions:



NHR AC Loads supports storing a series of commands to be executed as a macro. Enabling this property allows the user to create the macro to be downloaded. Check the Enable check box to create a macro.



The first dropdown list defines how the macro begins. The choices are:

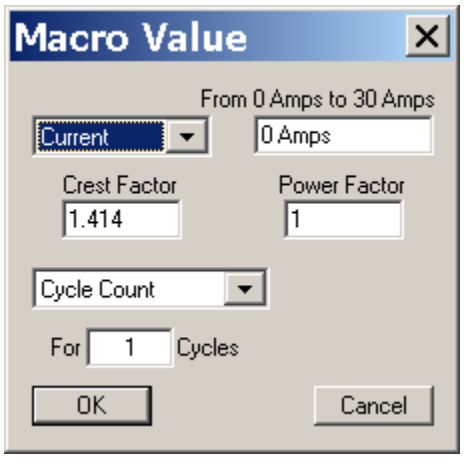
- **Start Immediate – Begin executing the macro as soon as it is loaded.**
- **Start at System Trigger - After the macro is loaded, wait for a system trigger and then start execute the macro.**
- **Start at Turn-On Voltage - After the macro is loaded, wait for the voltage to increase above the turn on voltage and then start execute the macro.**

The second dropdown list defines the crest factor mode operating during the macro. This mode cannot be changed during macro execution. The choices are:

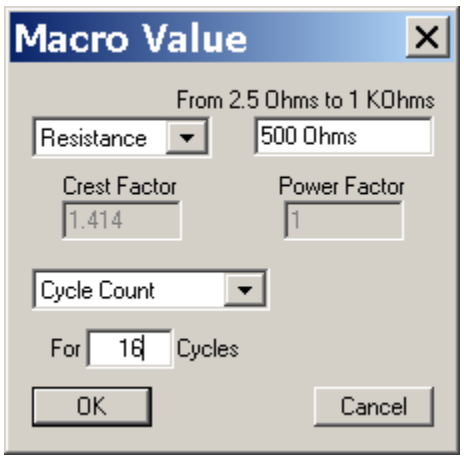
- **Crest Factor priority – load generates a waveform with the assigned crest factor. The waveform is phase shifted to get as close as possible to the programmed power factor.**
- **Power Factor priority - set value for the Power Factor. A load generates a waveform with the Crest Factor that has the programmed Power Factor with no phase shift. The mode modifier must be Crest Factor priority or Power Factor priority for this to be used.**

- **Unity Power factor - current drawn is a function only of the set value and the voltage. No waveform generated.**

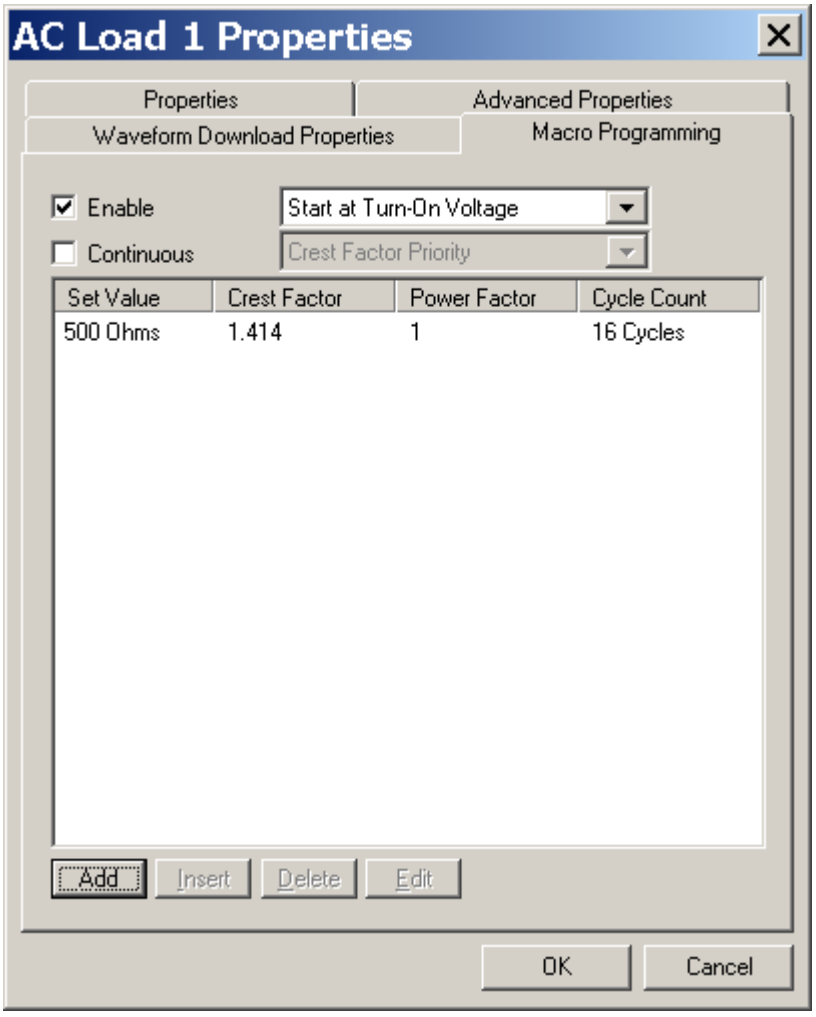
Click the Add button create the first step of the macro.



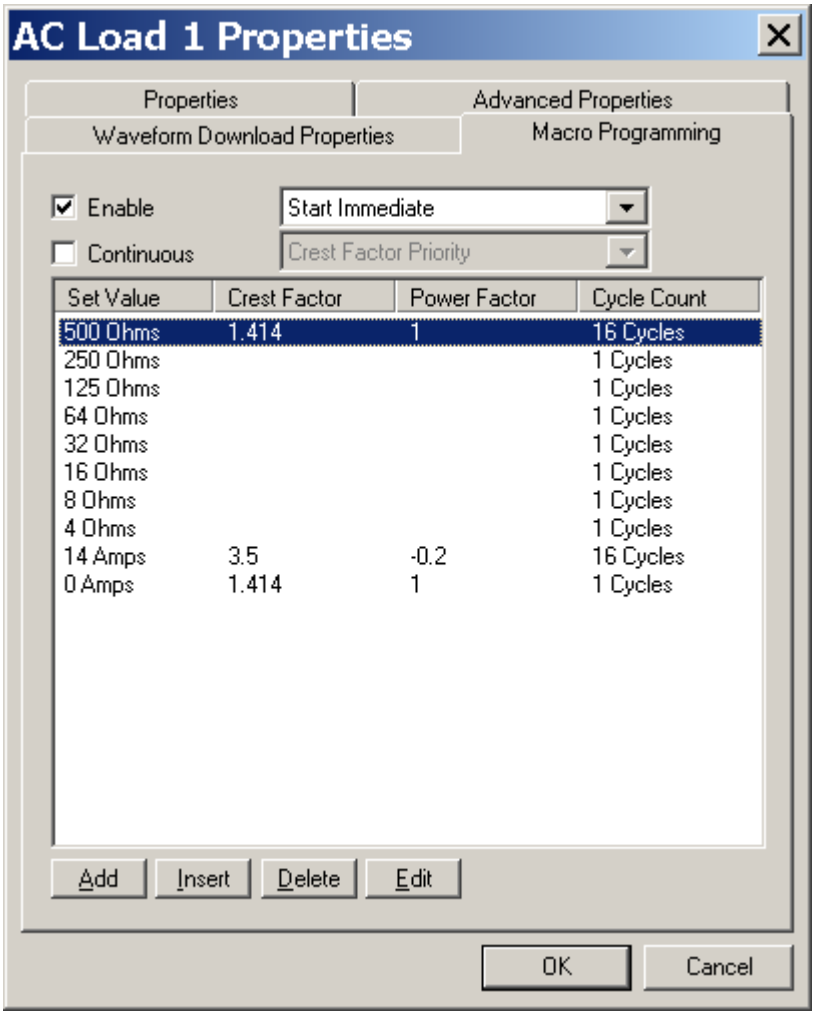
Select either Current, Power, Resistance, or Voltage, from the dropdown list. Assign the desired values including Crest Factor and Power Factor if they are available.



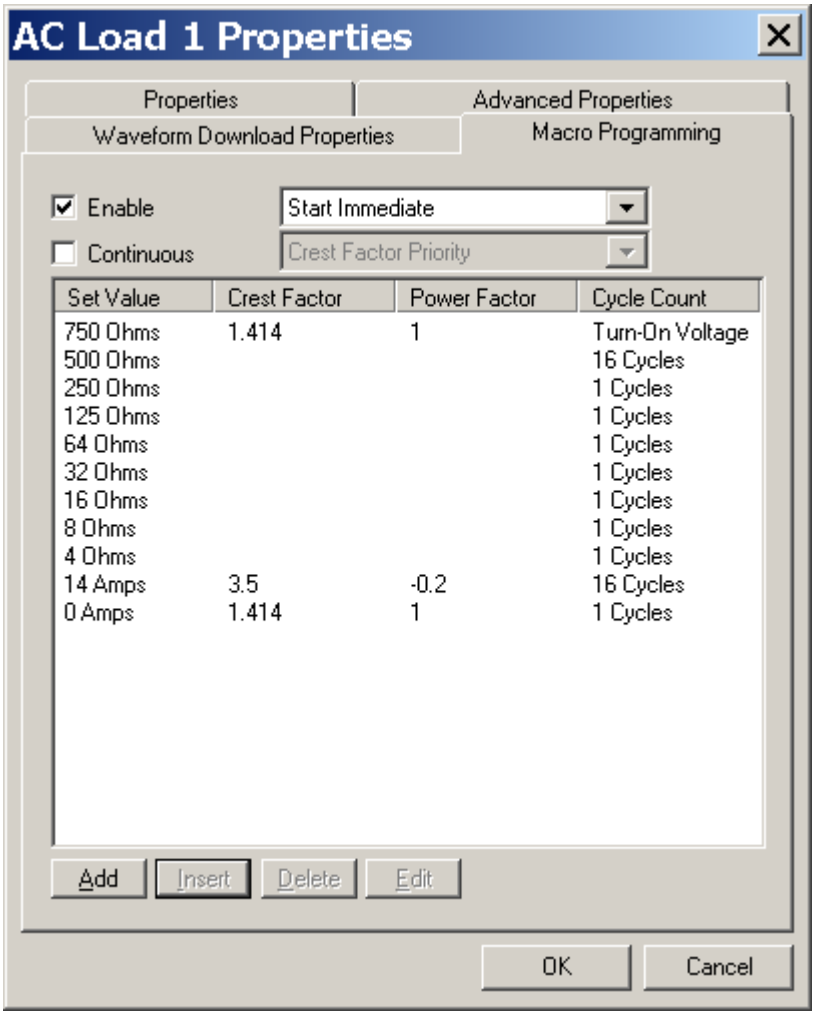
The lower dropdown menu determines the duration of this step of the macro. The selections are Cycle Count, System Trigger, and Turn-On Voltage. The load will stay at this programmed value until these conditions are met. The click OK and continue to the next step of the macro.



Click the Add button create more steppes.

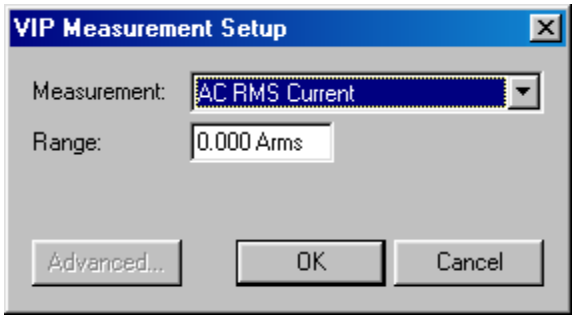


High lighting a line of the macro enables Insert a new line before the high lighted line, Delete the line, and Edit the line.



The macro is done.

NHR AC Load's measurements:



Measurements supported: RMS Voltage, Peak Voltage, RMS Current, Peak Current, True Power, Peak Power, Apparent Power, Reactive Power, Power Factor, Crest Factor, Resistance, and Frequency.

Measurement commands include a measurement range. The NHR AC Load has only one range and the measurement range value is not used.

For more information, refer to the 4600 AC Load User Manual.

4. DIGITAL MEASUREMENT SYSTEM (DMS)

Note: For more information on the features, capabilities, and requirements of the NHR DMS, please refer to the NHR Digital Measurement System Hardware Reference Manual and Digital Measurement System Programmers Reference Manual.

The standard NHR DMS includes the following components:

- **Sixteen-channel user MUX**
- **Eight-channel system MUX**
- **DMM**
- **Timing measurement system**
- **Scanner input system**
- **Transient measurement system**
- **System control panel interface**
- **Eight digital inputs**
- **Eight GPRs and sixteen drivers**
- **Sixteen digital outputs**
- **OV relay system**

These components are exposed within *emPower* ® as logical devices. Refer to the *emPower*® Utilities Reference Manual for additional information on logical devices and how they are used in the *emPower* ® programming environment.

Refer to the NHR Digital Measurement System Hardware Reference Manual for additional information on the hardware components that are part of the NHR DMS.

4.1 Installation

4.1.1 Initial Setup

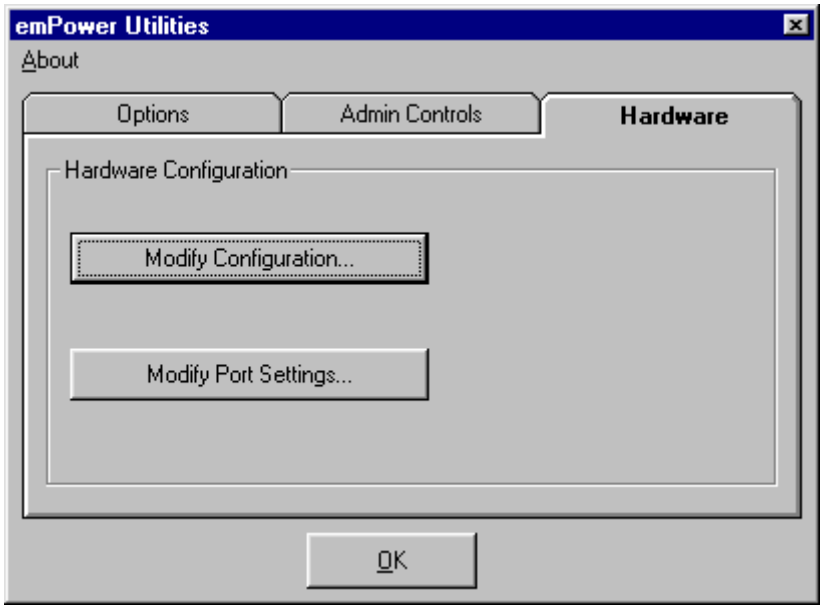
Install the communications port interface card and its driver. Refer to the manufacturer's documentation for assistance.

Connect the NHR DMS to the desired communications port with an appropriate cable and insure that the device is configured at an address that does not conflict with any other S6K devices on that communications port. Refer to the NHR Digital Measurement System Hardware Reference Manual for assistance.

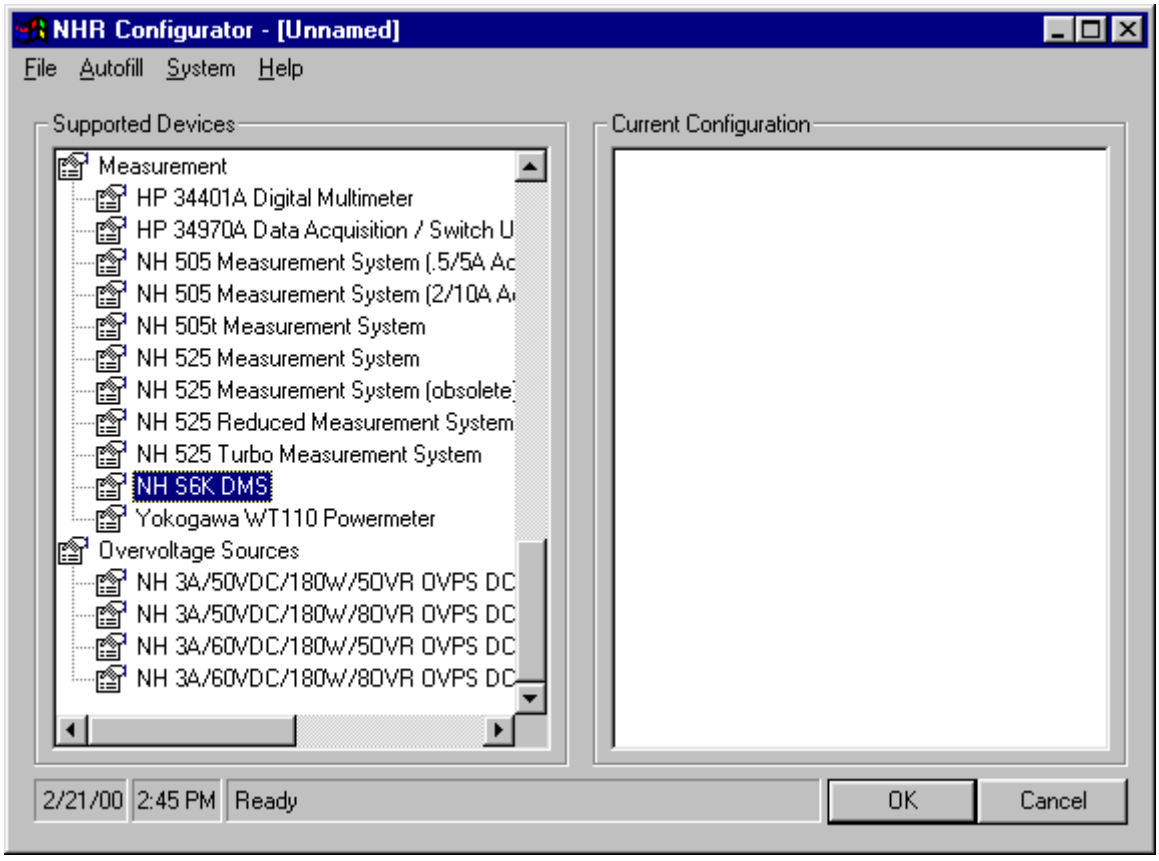
Run the Setup program to install the device driver on your system. The device driver will need to be installed on each system that will be using it. Follow the on-screen instructions presented by the setup program to complete installation.

4.1.2 Add the Device to *em**Power*** ®

After the device driver is installed launch *emPower*** ® **and logon. Select Utilities. The *em**Power*** ® **Utilities dialog will be displayed. Select the Hardware tab, then select the Modify Configuration... button.**



The NHR Configurator launches. For additional information regarding the NHR Configurator, please see the NHR Configurator Users Manual.



4.1.3 Select the Communications Port and Protocol

Note: The NHR DMS requires a configured communications port. Refer to the NHR Port Configuration Utility Users Manual for important information regarding configuring communications ports for *emPower*® software.

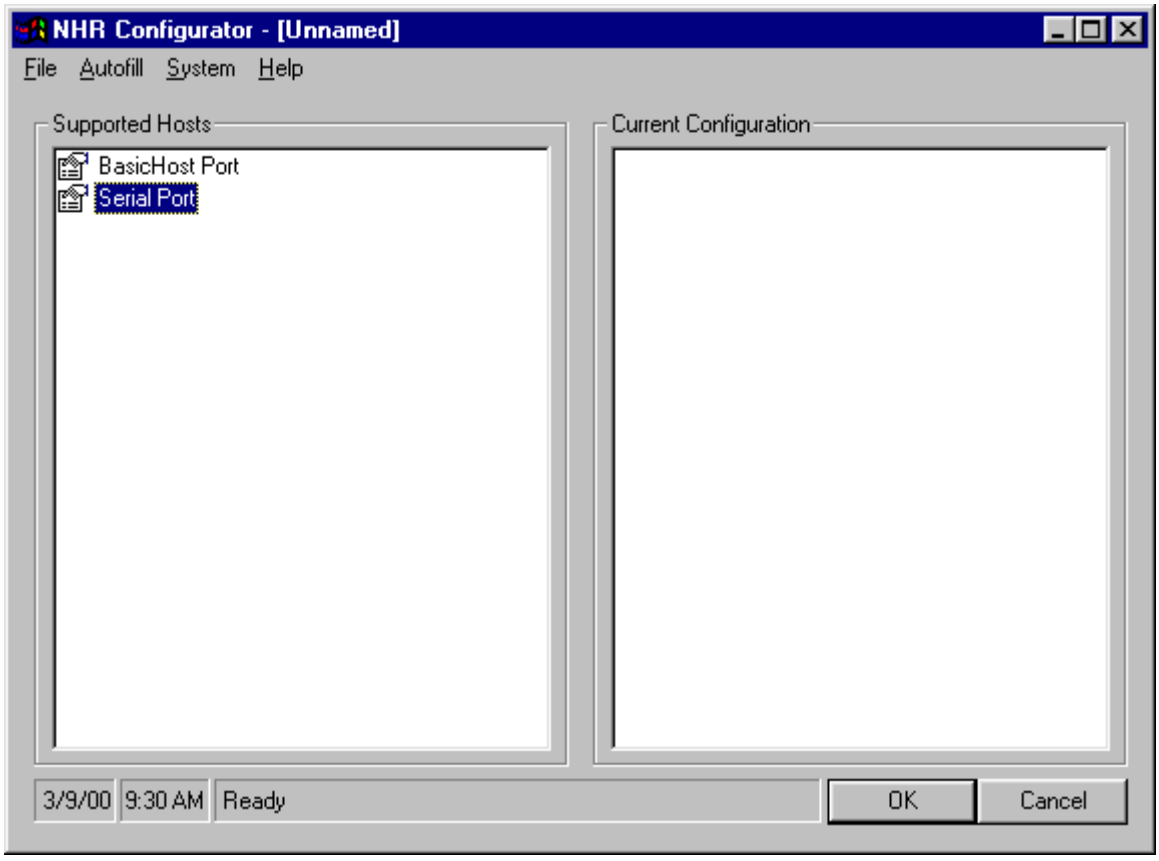
There are two supported methods of adding S6K devices to an *emPower*® configuration.

- **Use autofill capabilities of the S6K protocol online.**
- **Configure the port, protocol, and device parameters manually and offline.**

Only one of the two methods is required.

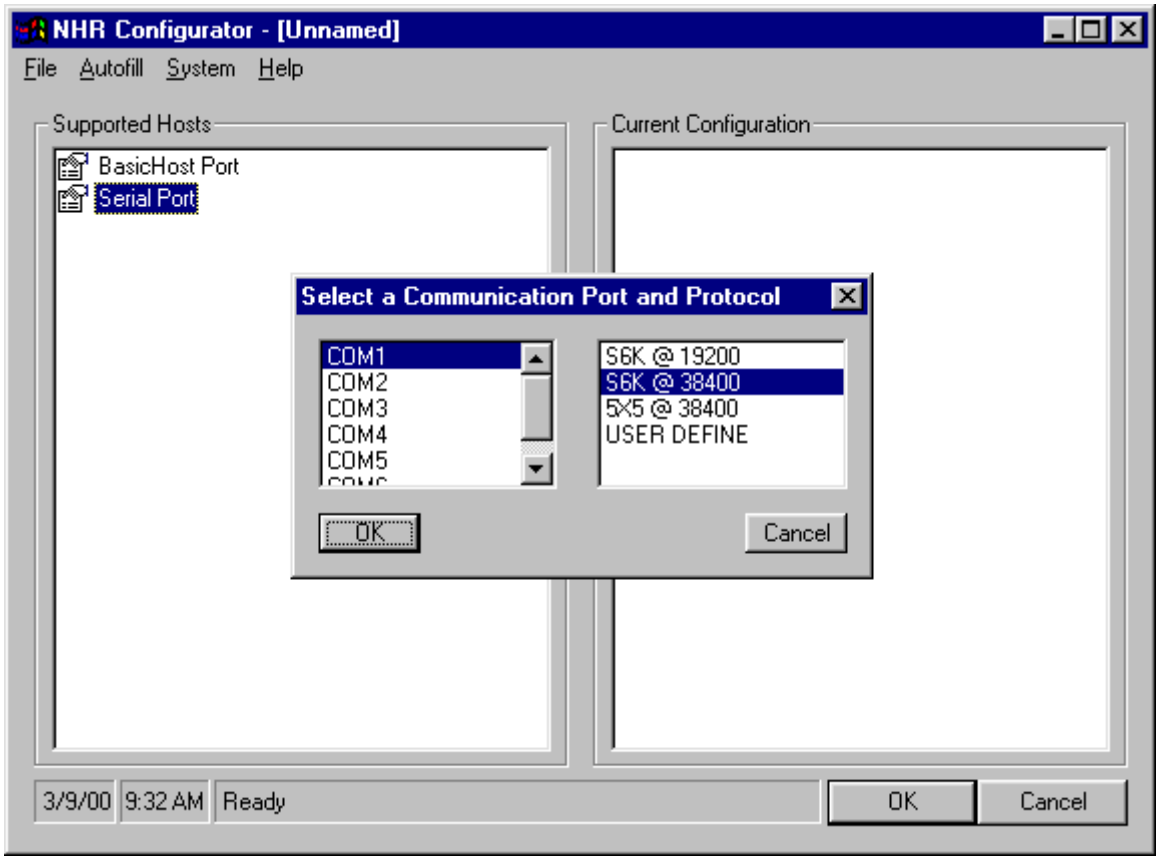
4.1.4 Auto fill Configuration – Online

In NHR Configurator, click the Autofill menu, and then click Setup.

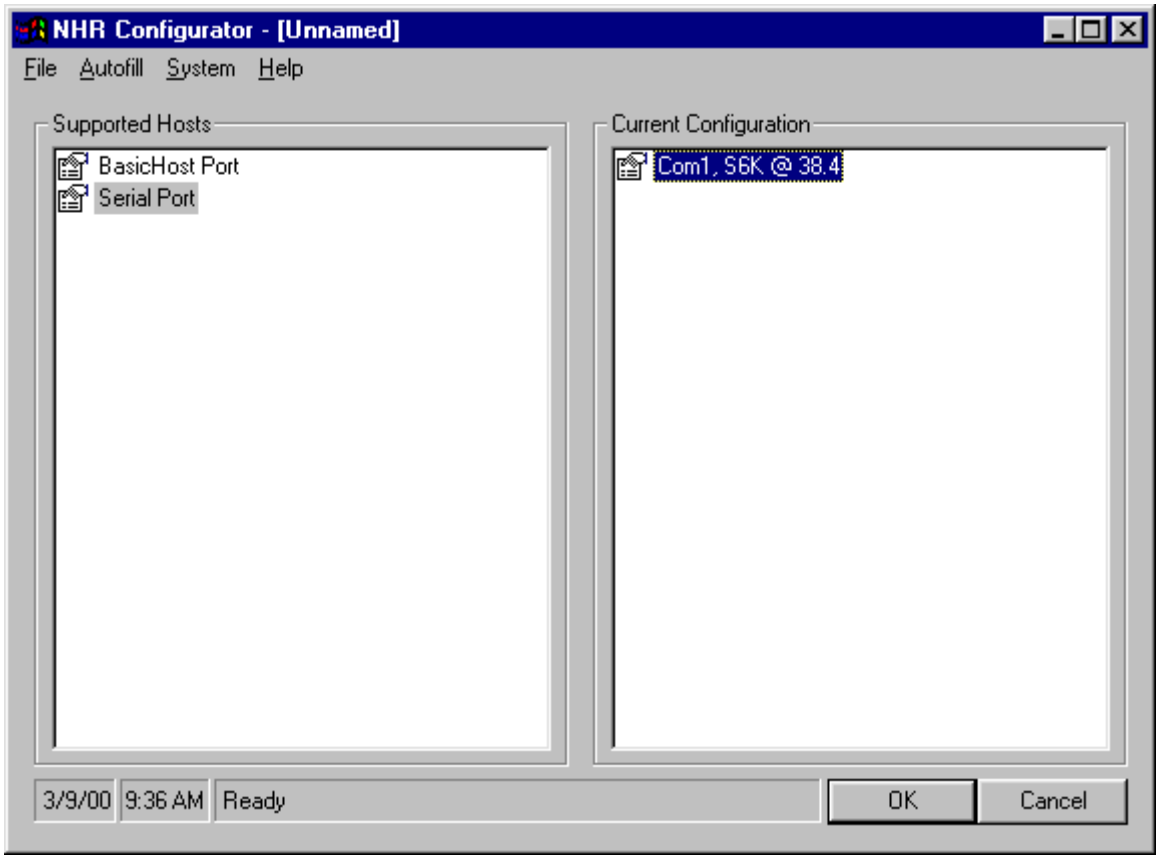


The left hand column will change to a Supported Hosts pane. Double-click Serial Port or drag and drop it to the current configuration pane. The Select a Communication Port and Protocol dialog will be displayed. Select the desired port and protocol. Select Ok to add the Port to the current configuration.

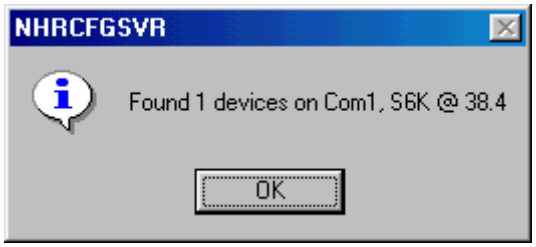
Note: Only Serial Ports running the S6K protocol support autofill. Autofill will not find devices on other ports or protocols (e.g. A BasicHost Port or a Serial Port running a User Defined Protocol do not support autofill).



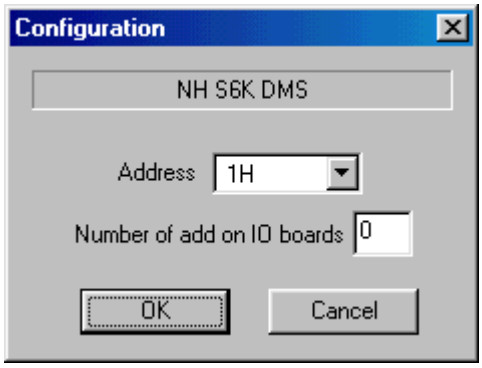
The current configuration pane will now show the selected port. In NHR Configurator, click the Autofill menu, and then click Search for Devices.



NHR Configurator will query for supported S6K devices on all serial ports in the current configuration pane. When it completes the search for devices, the NHRCFGSVR informational message is shown. Select Ok to continue.

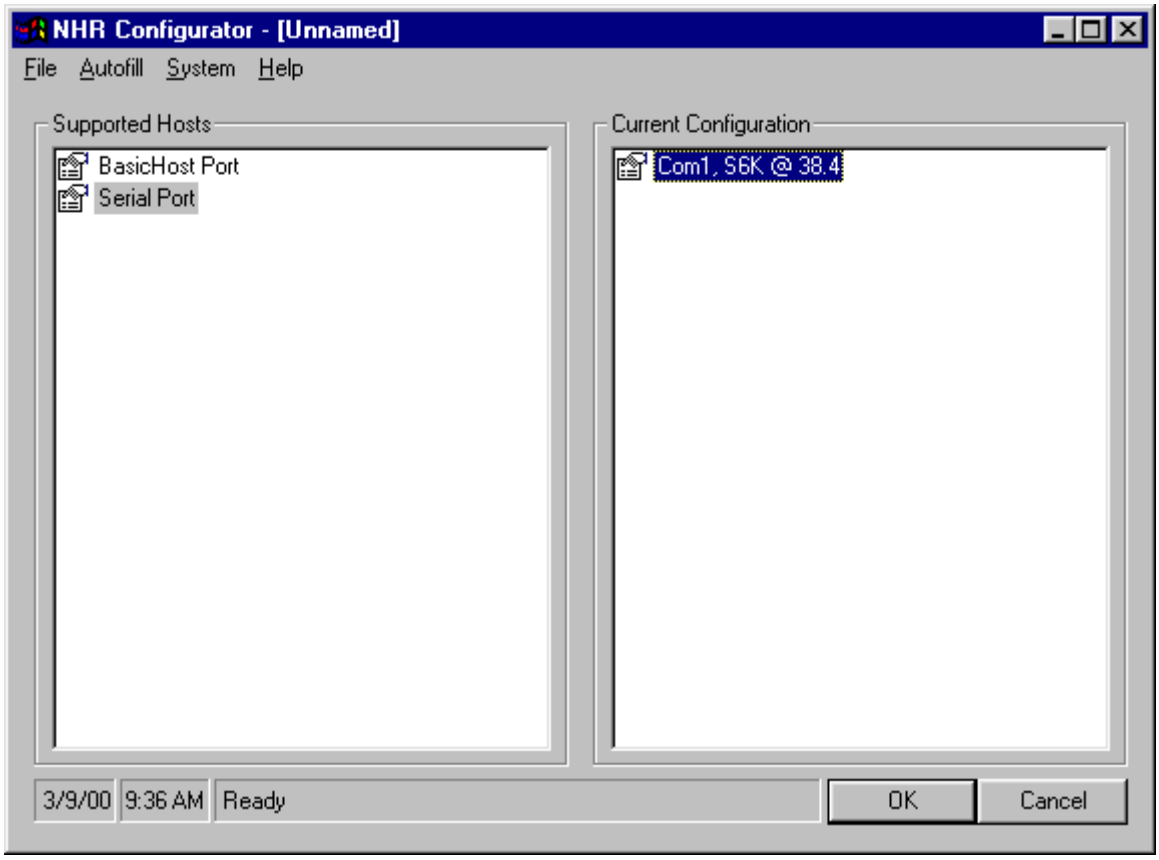


The NH S6K DMS configuration dialog is displayed. Confirm the device found is at the address selected and the number of add on IO boards is correct. Select Ok to continue.



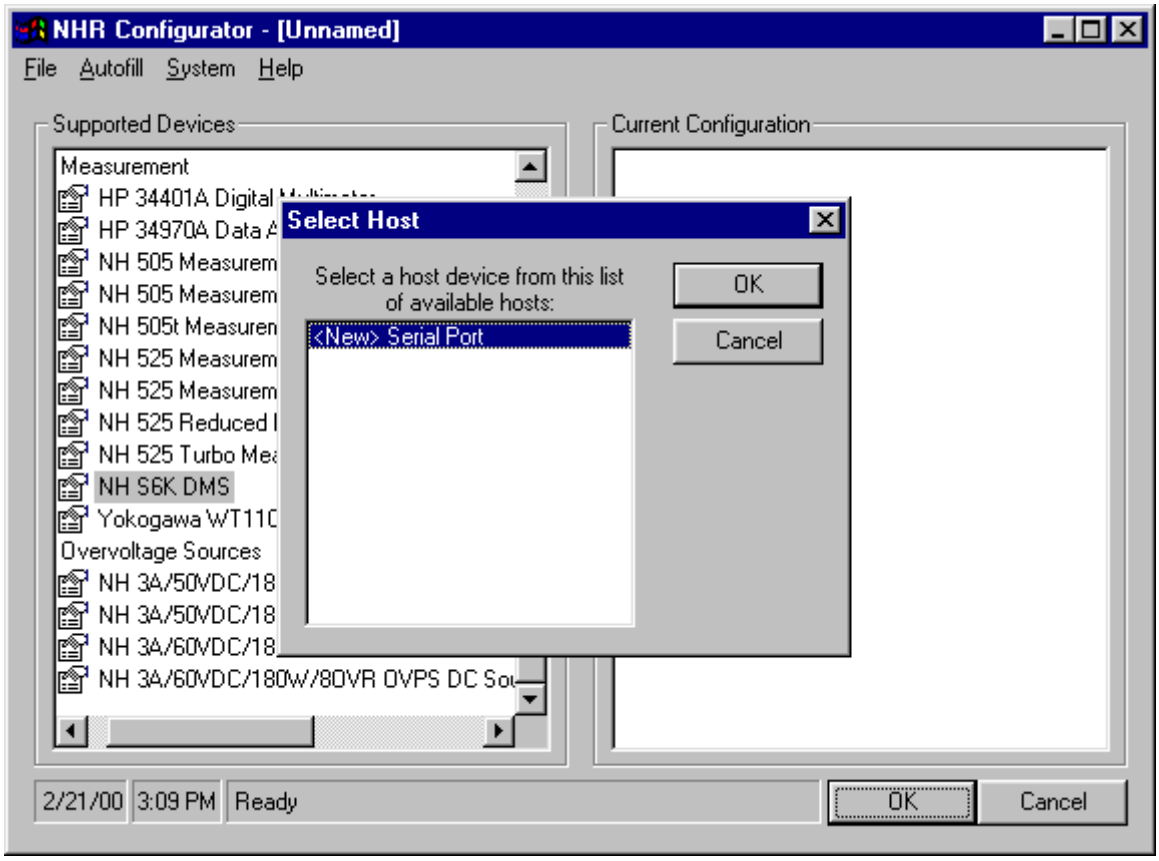
To continue adding the NHR DMS, skip to section 4.1.6 Configure the Device in this document.

When completed with the autofill configuration dialogs for the new devices In NHR Configurator, click the Autofill menu, and then click Exit Autofill.

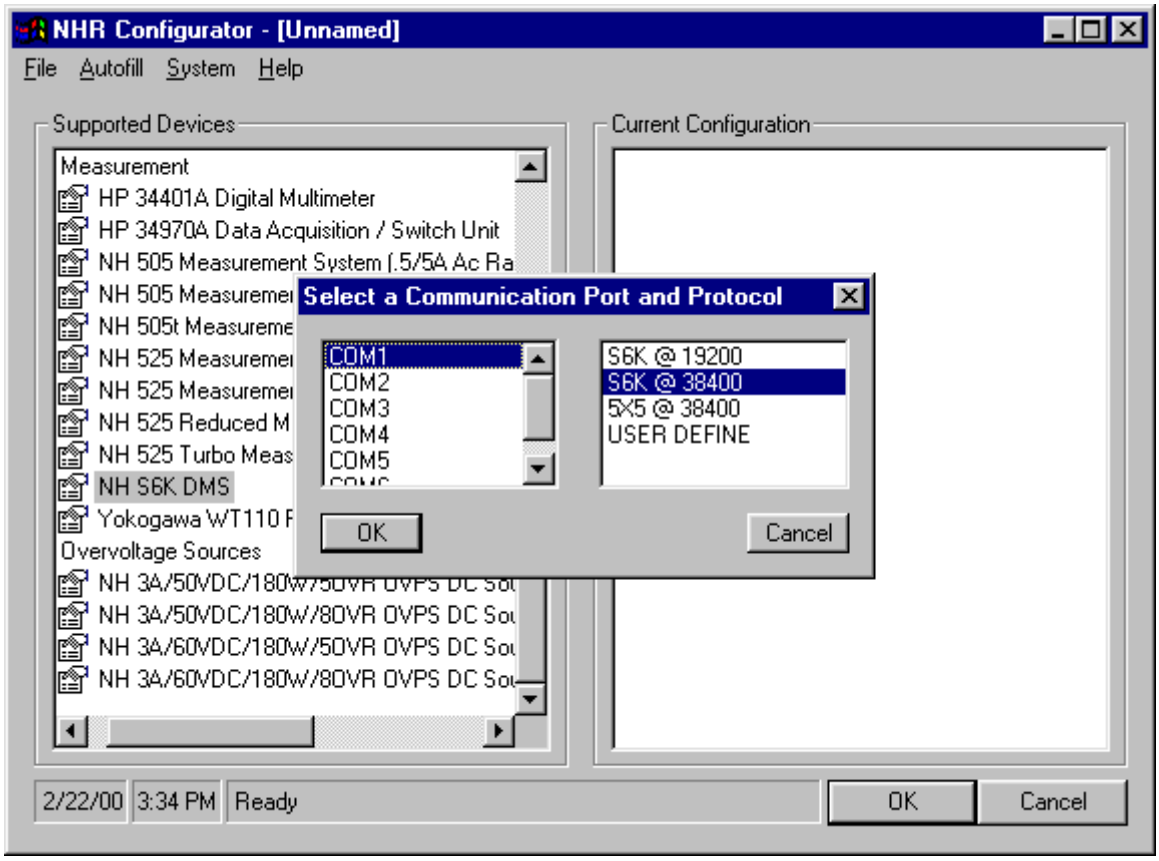


4.1.5 Manual Configuration – Offline

When the device is added to the system configuration the user is prompted to select a host device. Select an existing communications port if the hardware is connected to an existing port, or select <new> Serial Port to configure a new communications port.

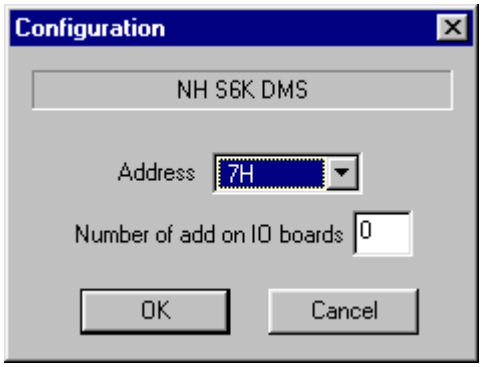


Use the Select a Communication Port and Protocol dialog to select both the serial communication port that the hardware is connected to and the protocol. The NHR DMS can support the S6K protocol at two different baud rates. Choose S6K @ 19200 Baud or S6K @ 38400 Baud as appropriate for the NHR DMS hardware selection. Refer to the NHR Digital Measurement System Hardware Reference for information on selecting protocol baud rate.



The Configuration dialog prompts the user for an S6K address and the number of DMS add on IO boards. Select the correct S6K address and number of additional IO boards. A default NHR DMS should indicate zero (0) add on IO boards.

Select OK to continue the configuration process. Refer to the NHR Digital Measurement System Hardware Reference for additional information regarding selecting an S6K address and configuring additional IO boards.



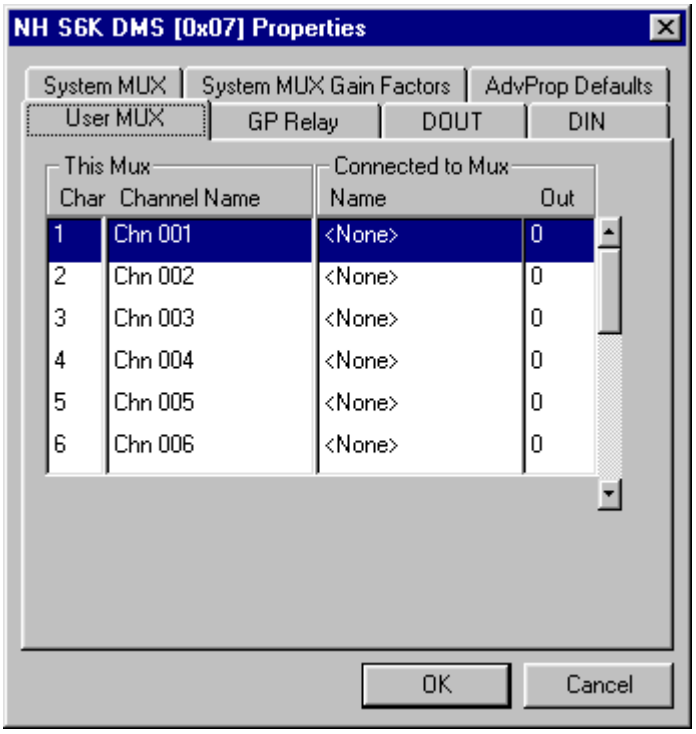
To continue adding the NHR DMS to the *emPower* ® configuration proceed to the next section.

4.1.6 Configure the Device

Note: Refer to the NHR Digital Measurement System Hardware Reference for additional information regarding configuration.

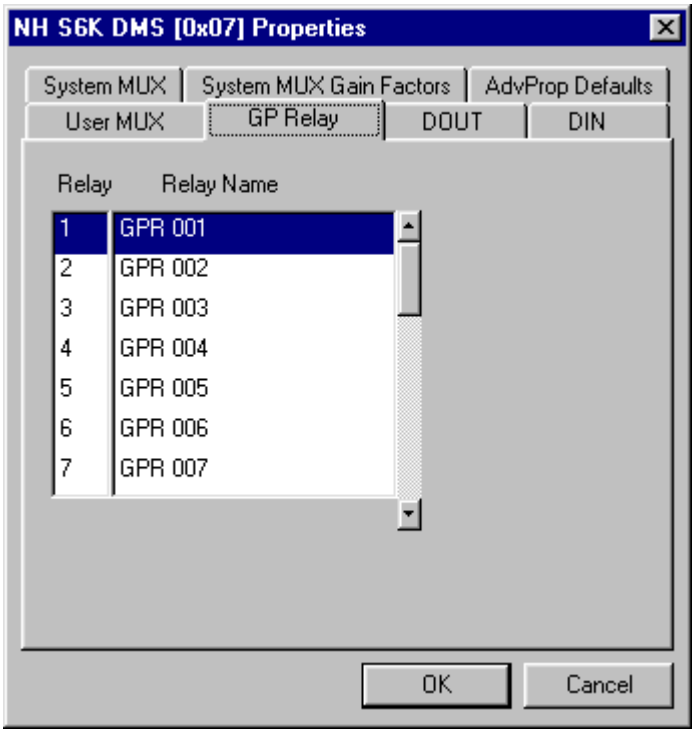
The configuration dialog now presents the NH S6K DMS Properties dialog to configure the logical devices of the NHR DMS. The title bar of the property dialog includes the S6K address of the device. If no changes are required to the default configuration of the DMS, select Ok to continue. Otherwise, select and modify the properties referring to the following sections for guidance.

4.1.7 User MUX



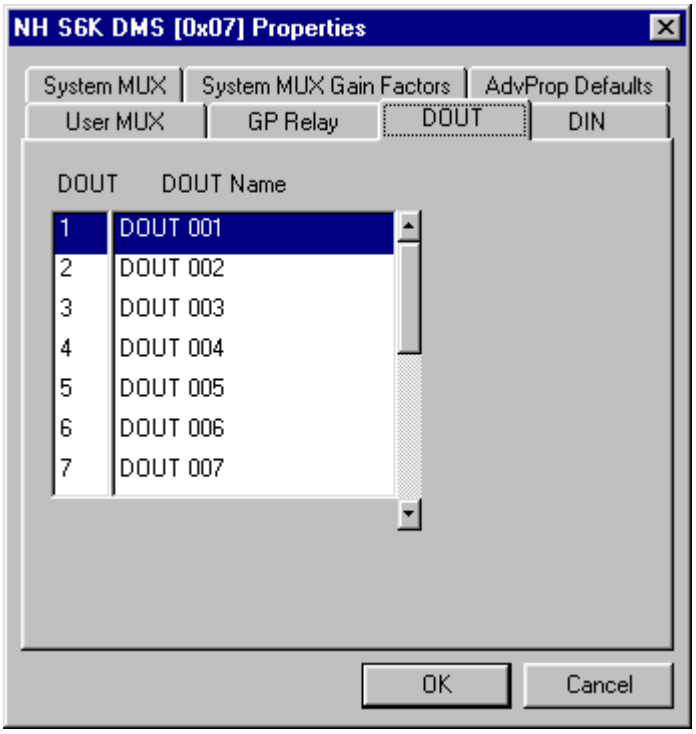
The user can select the User MUX page and rename the channels to more descriptive channel names. The channel names may be left at default values for maximum flexibility. The NHR DMS includes an internal 16 channel multiplexer.

4.1.8 GPR



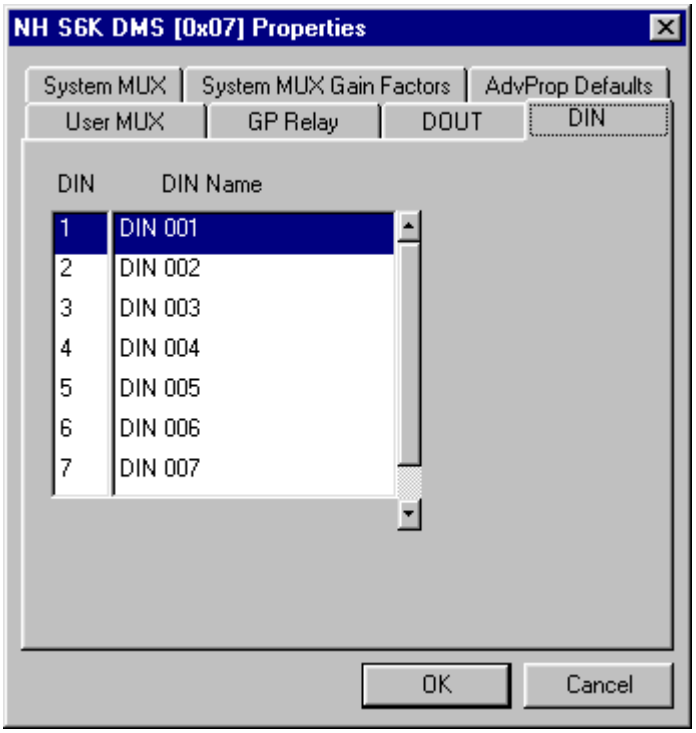
The user can select the GPR page and rename the relay names to more descriptive relay names. The relay names can be left at default values for maximum flexibility. The NHR DMS includes hardware supports for 24 GPRs (8 GPRs and 16 GPR Drivers).

4.1.9 DOUT



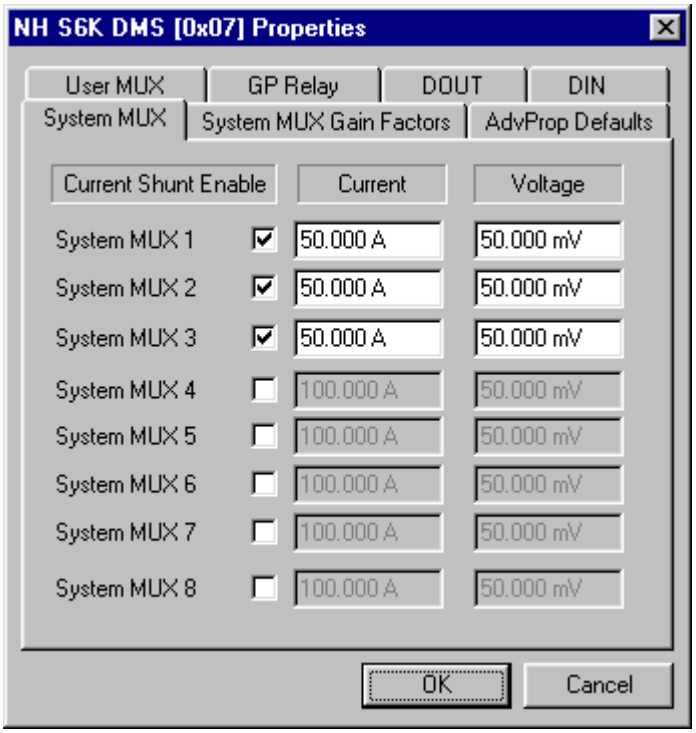
The user can select the DOUT page and rename the DOUT names to more descriptive DOUT names. The DOUT names can be left at default values for maximum flexibility. The NHR DMS includes hardware supports for 16 digital output signals.

4.1.10 DIN



The user can select the DIN page and rename the DIN names to more descriptive DIN names. The DIN names can be left at default values for maximum flexibility. The NHR DMS includes hardware supports for eight digital input signals.

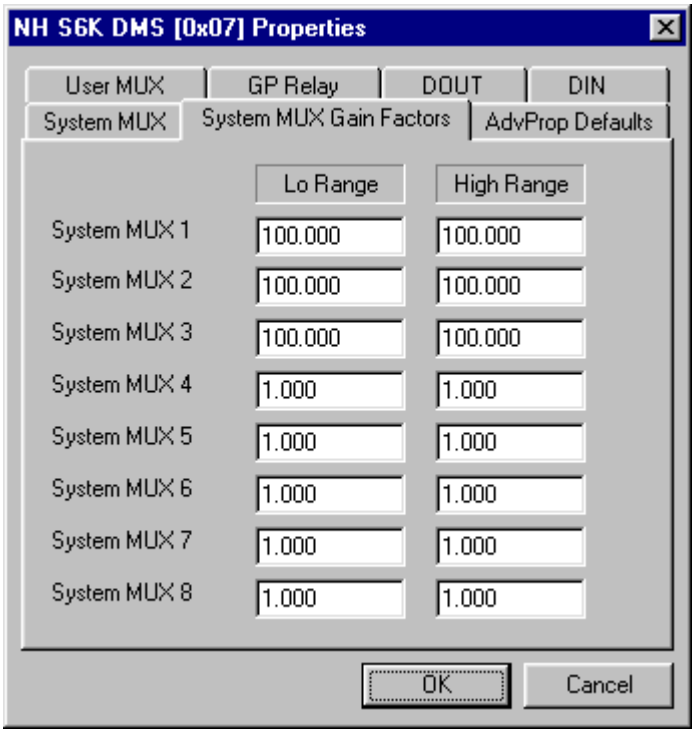
4.1.11 System MUX



The user can select the System MUX page to indicate which System MUX channels are to be used as current shunt inputs. Selection here is required to enable the device driver to provide correct current measurements if a current shunt used. Make the appropriate selections.

The NHR DMS includes an internal eight-channel multiplexer used for internal signals such as current shunt inputs or voltage and current monitoring inputs for legacy devices. This system MUX is not available to other devices, but the device driver and NHR DMS hardware use it internally to support advanced measurements and features of the NHR DMS.

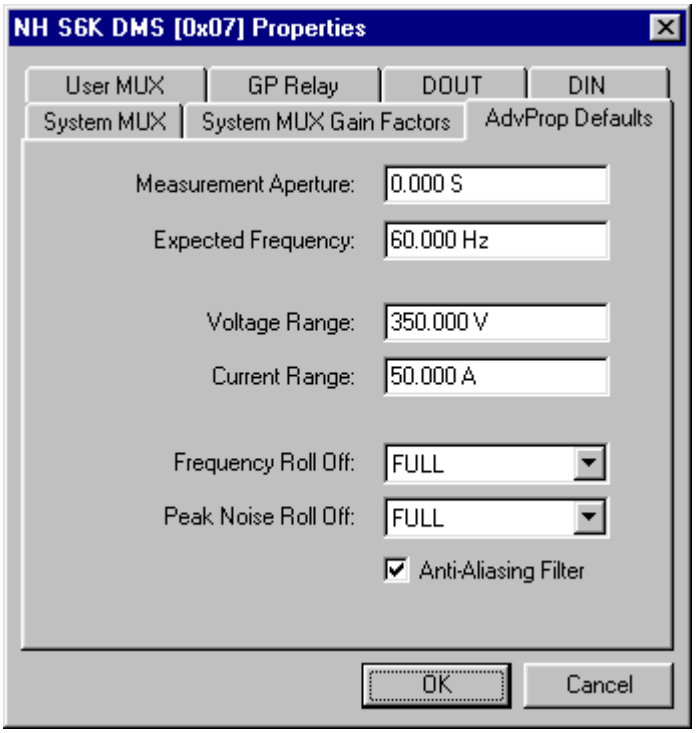
4.1.12 System MUX Gain Factors



The user can select the System MUX Gain Factors page to indicate external signal conditioning on the System MUX channels. Selection is required to enable the device driver to properly scale measurement results. Make the appropriate selections.

The NHR DMS includes an internal eight-channel multiplexer used for internal signals such as current shunt inputs or voltage and current monitoring inputs for legacy devices. This system MUX is not available to other devices, but the device driver and NHR DMS hardware use it internally to support advanced measurements and features of the NHR DMS.

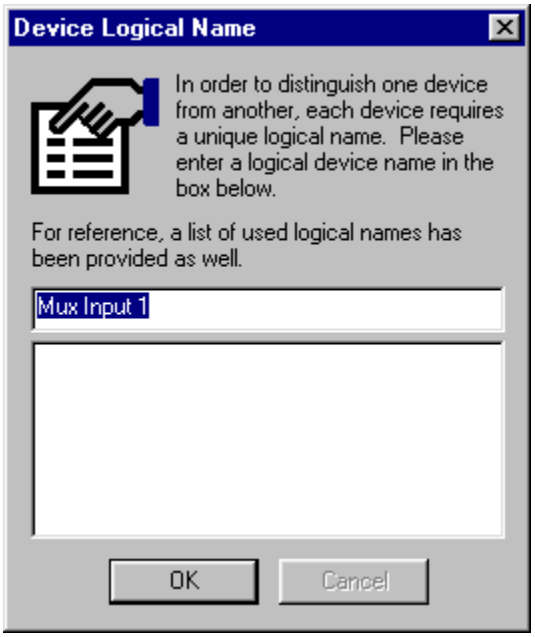
4.1.13 AdvProp Defaults



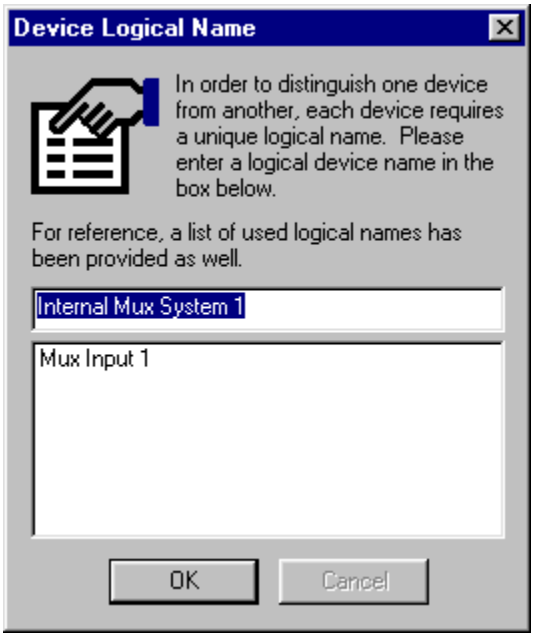
The user can select the AdvProp Defaults page to customize the advanced measurement properties page. Advanced measurement properties are used for DMM measurements. See section 4.3 for more information on advanced measurement properties for DMM measurements.

4.1.14 Logical Device Names

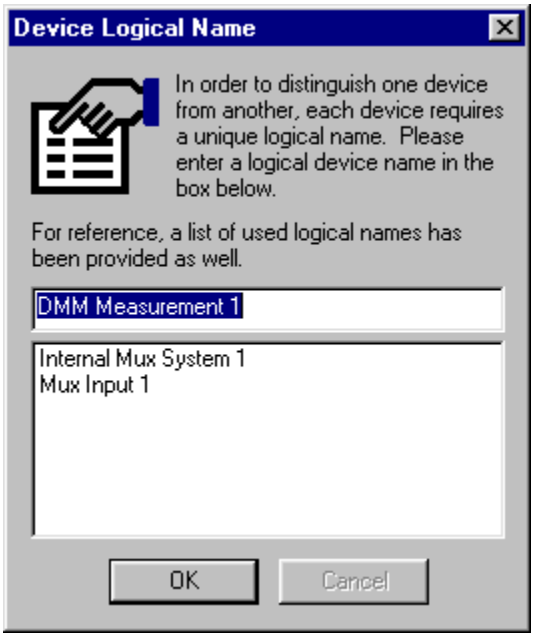
The user is prompted to enter a logical device name for the devices internal MUX. This is the name that will be used to designate the devices MUX when developing test programs.



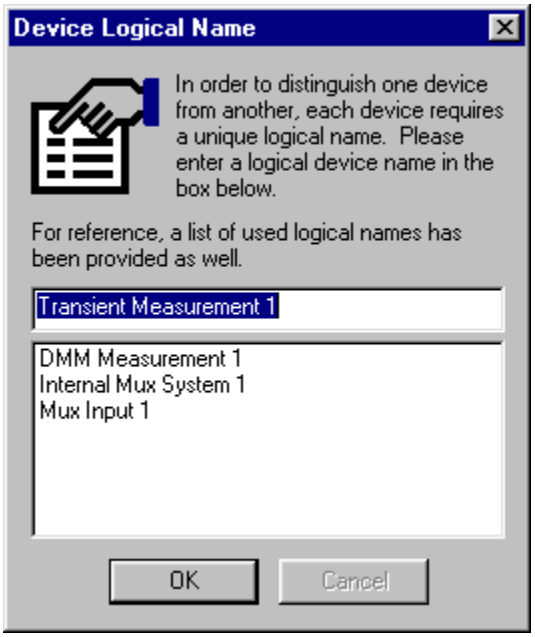
The user is prompted to enter a logical device name for the devices internal MUX System. This is the name that will be used to designate the devices internal MUX System when developing test programs.



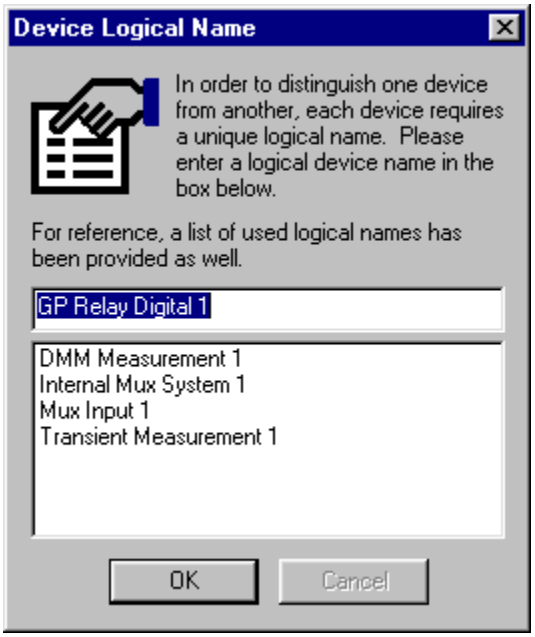
The user is prompted to enter a logical device name for the devices DMM Measurement System. This is the name that will be used to designate the devices DMM Measurement System when developing test programs.



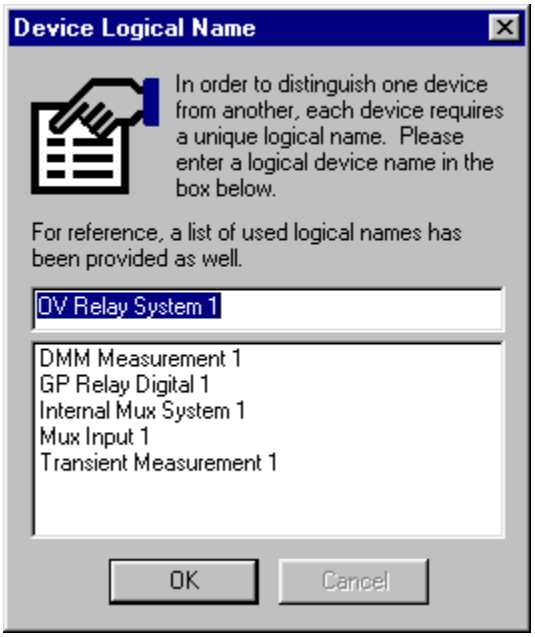
The user is prompted to enter a logical device name for the devices Transient Measurement System. This is the name that will be used to designate the devices Transient Measurement System when developing test programs.



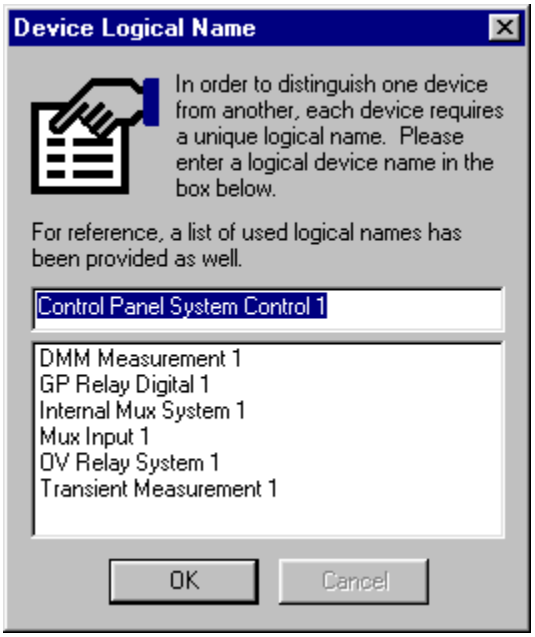
The user is prompted to enter a logical device name for the devices GPR Digital System. This is the name that will be used to designate the devices internal GPR Digital System when developing test programs.



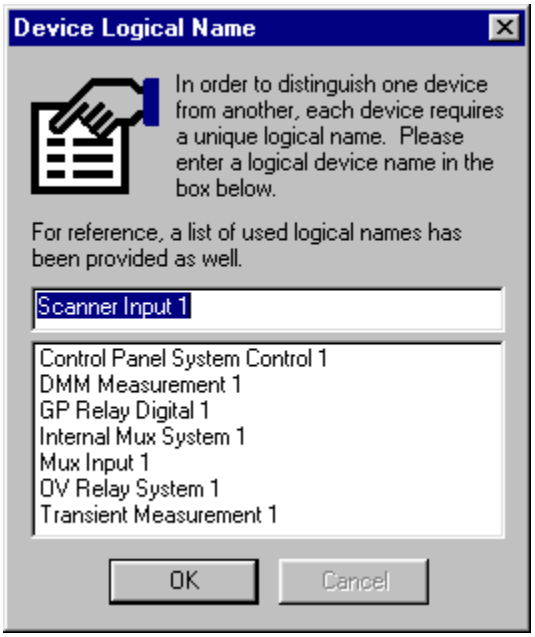
The user is prompted to enter a logical device name for the devices OV Relay System. This is the name that will be used to designate the devices OV Relay System when developing test programs.



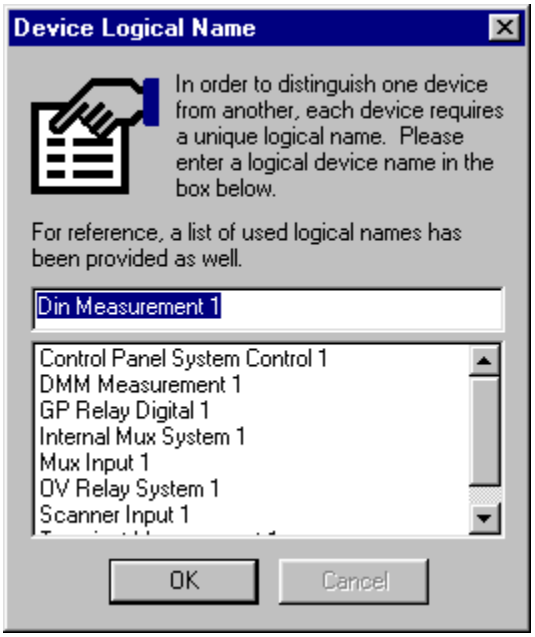
The user is prompted to enter a logical device name for the devices Control Panel System Control. This is the name that will be used to designate the devices Control Panel System Control when developing test programs.



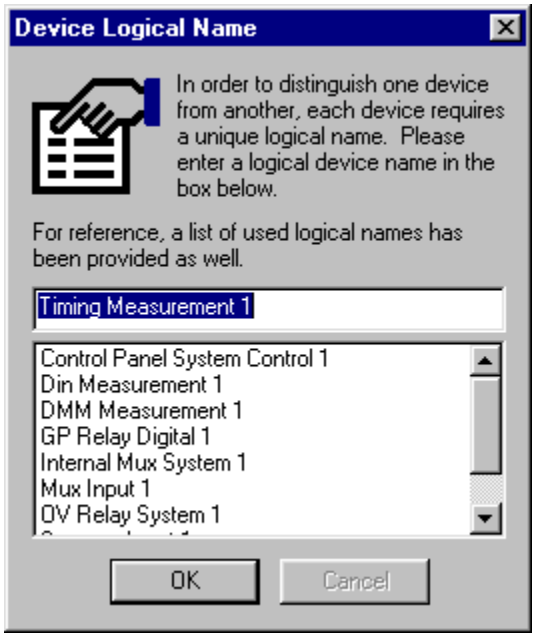
The user is prompted to enter a logical device name for the devices Scanner Input. This is the name that will be used to designate the devices Scanner Input when developing test programs.



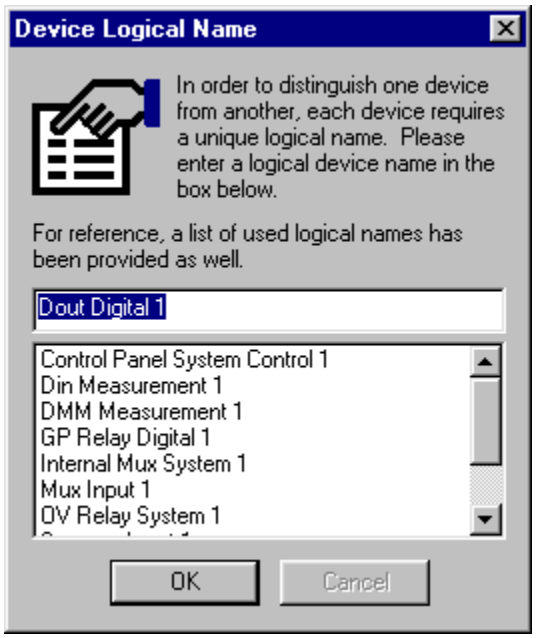
The user is prompted to enter a logical device name for the devices DIN Measurement System. This is the name that will be used to designate the devices DIN Measurement System when developing test programs.



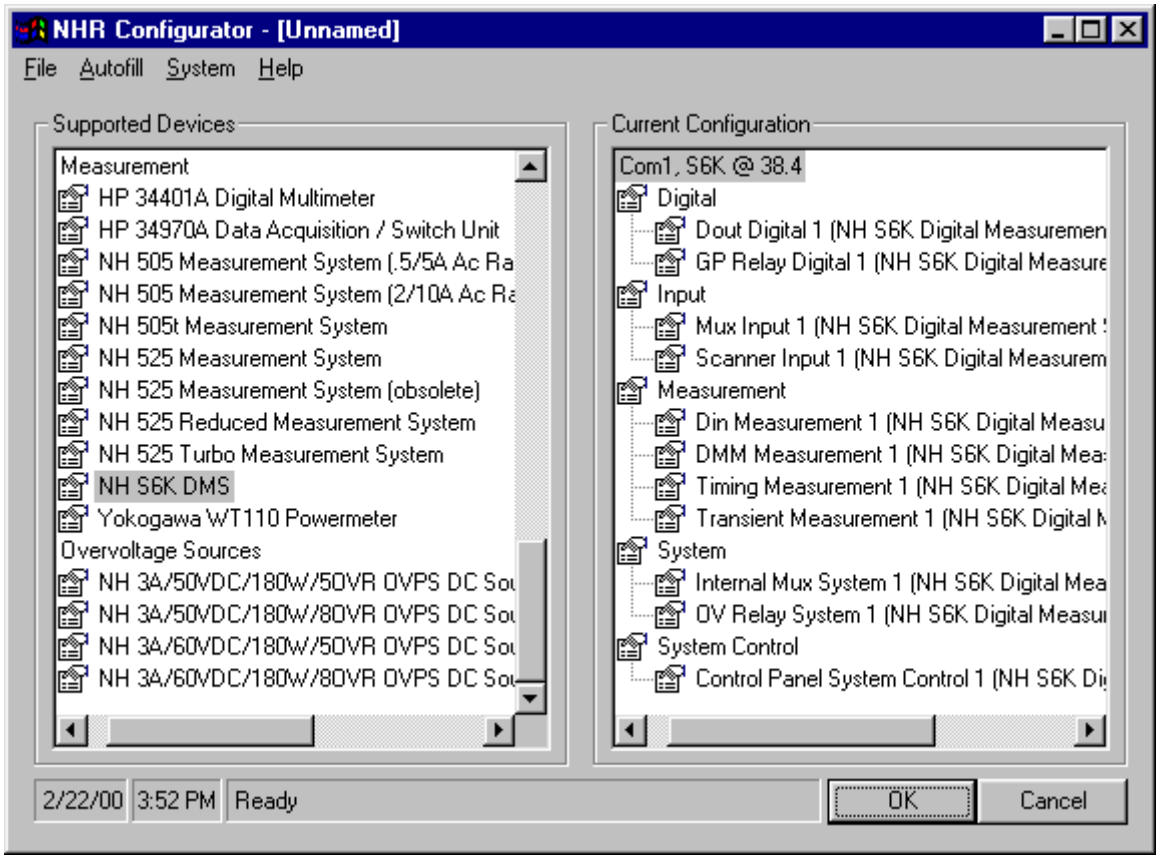
The user is prompted to enter a logical device name for the devices Timing Measurement System. This is the name that will be used to designate the devices Timing Measurement System when developing test programs.



The user is prompted to enter a logical device name for the devices DOUT Digital System. This is the name that will be used to designate the devices DOUT Digital System when developing test programs.



The configuration file contents are displayed with the NHR DMS's eleven logical devices being displayed under the Com1, S6K @ 38.4 Host Description.

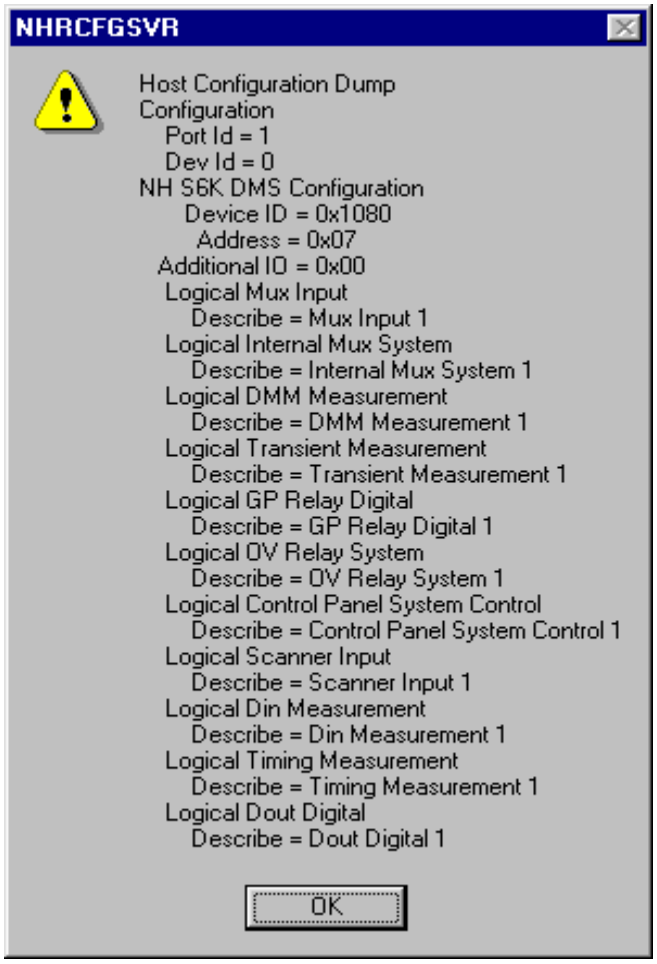


In NHR Configurator click File, then click Save As… to save the configuration file. In NHR Configurator click File, then click Set to Default… to set this configuration as the default configuration for *emPower* ®.

4.1.15 Host Configuration Dump

Diagnostic data regarding the current configuration is available from the context menu on a device in the configured device pane. Launch the NHR Configurator. The configuration manager main window is displayed.

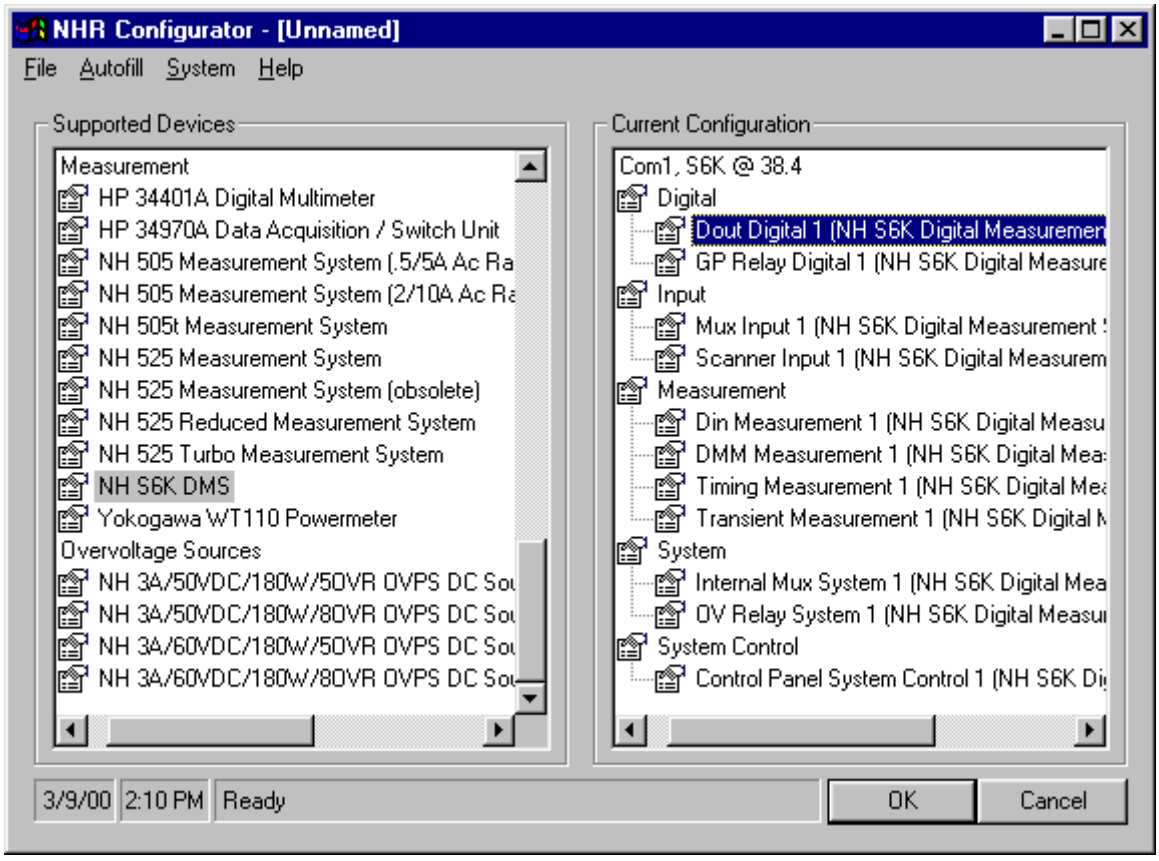
Locate any one of the eleven NH S6K DMS logical devices in the current configuration list. Select an NH S6K DMS logical device and select Dump Configuration… from the context menu to create an informational message with details of the logical device configuration.



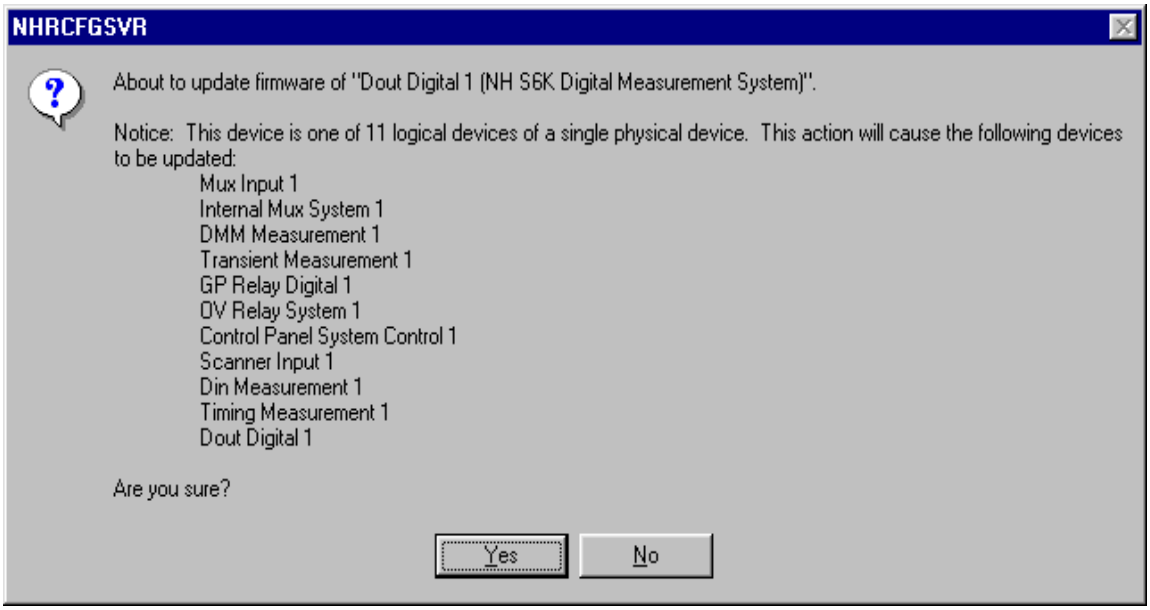
4.1.16 Update Device Firmware

Update the firmware if the NHR DMS *em*Power driver has been received. The latest firmware files are called DmsDspxx.hex, DmsBtxx.hex, DmsMnxx.a03 where xx stands for the latest firmware revision. The number of times that the firmware can be updated is limited, so only perform the update when necessary.

Launch the NHR Configurator. The configuration manager main window displays. Locate any one of the eleven NH S6K DMS logical devices in the current configuration list. Select an NH S6K DMS logical device and select Update Firmware… from the context menu.



An informational dialog is presented to remind the user that this action affects more than just the selected logical device.

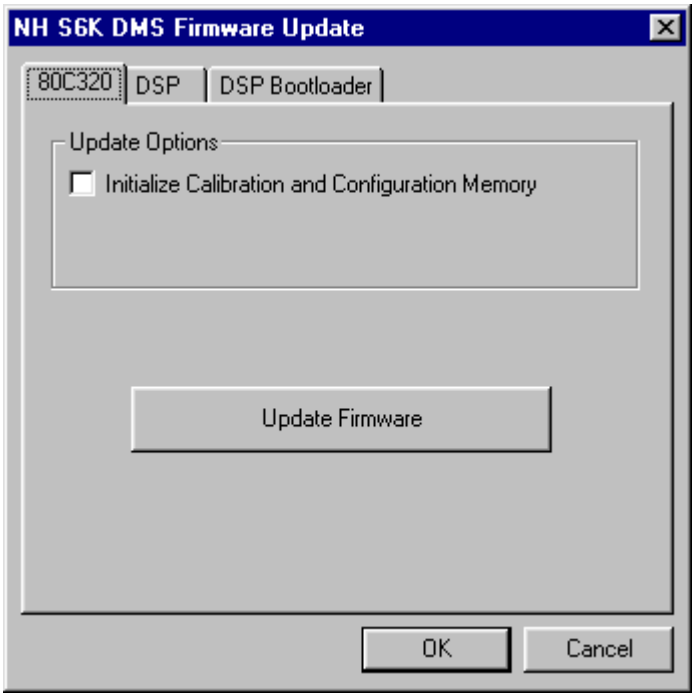


The NHR DMS firmware is partitioned into three modules:

- **80C320 microprocessor**
- **DSP**
- **DSP boot loader**

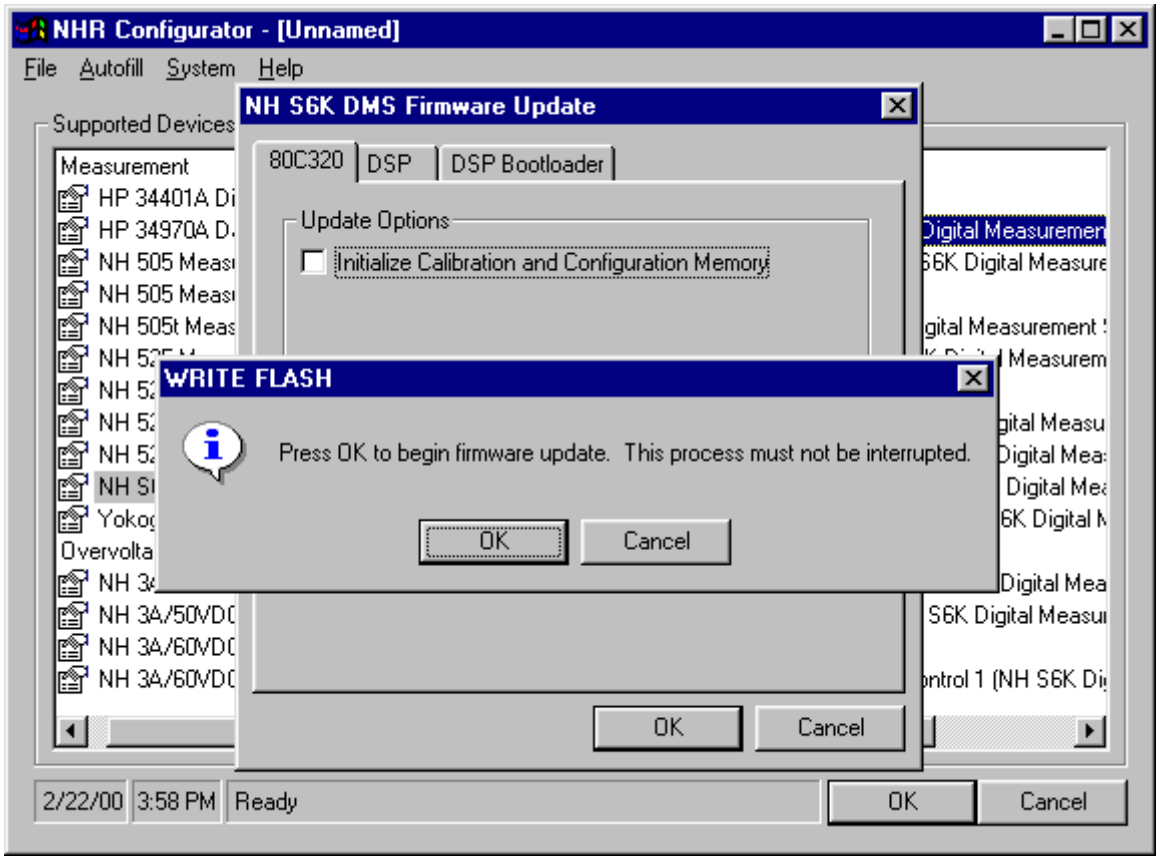
Select the NH S6K DMS Firmware Update tab corresponding to the firmware to be updated. Refer to the NHR Digital Measurement System Hardware Reference Manual for additional information.

Click the large Update Firmware button on the appropriate firmware module page. Select the desired firmware download file at the file selection dialog.

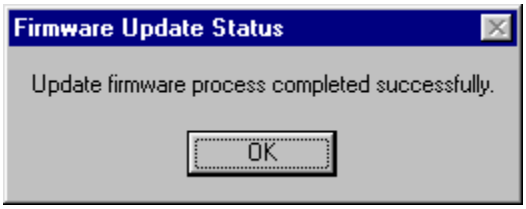


<u>Caution</u> **To prevent loss of EEPROM information, do not attempt to update the firmware when electrical power is unreliable, that is, during a weather storm or similar situation. Once the update process has started, do not switch off power to the NHR DMS until the informational dialog displays, indicating the completion of the update process.**

The firmware update process must not be interrupted. Acknowledge the warning message.



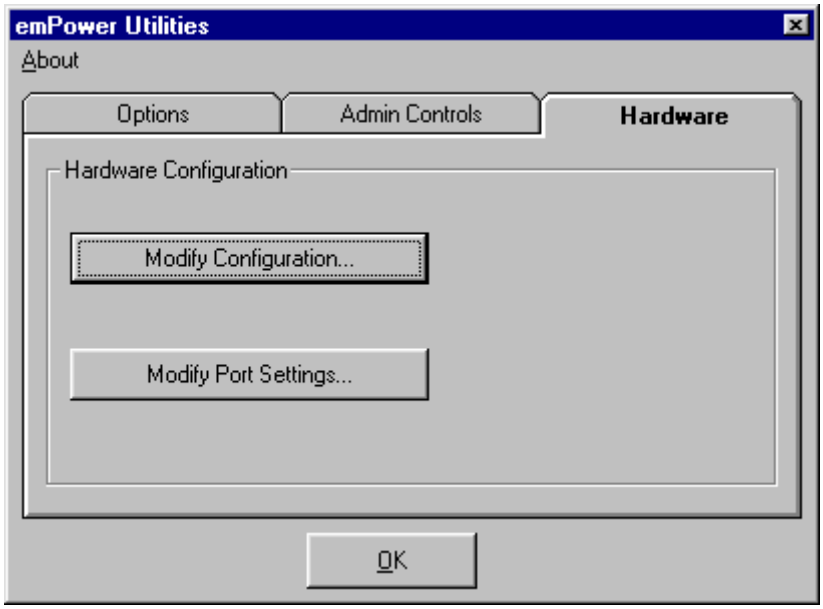
The update process progress will be indicated with a progress bar and when complete an information message will be displayed.



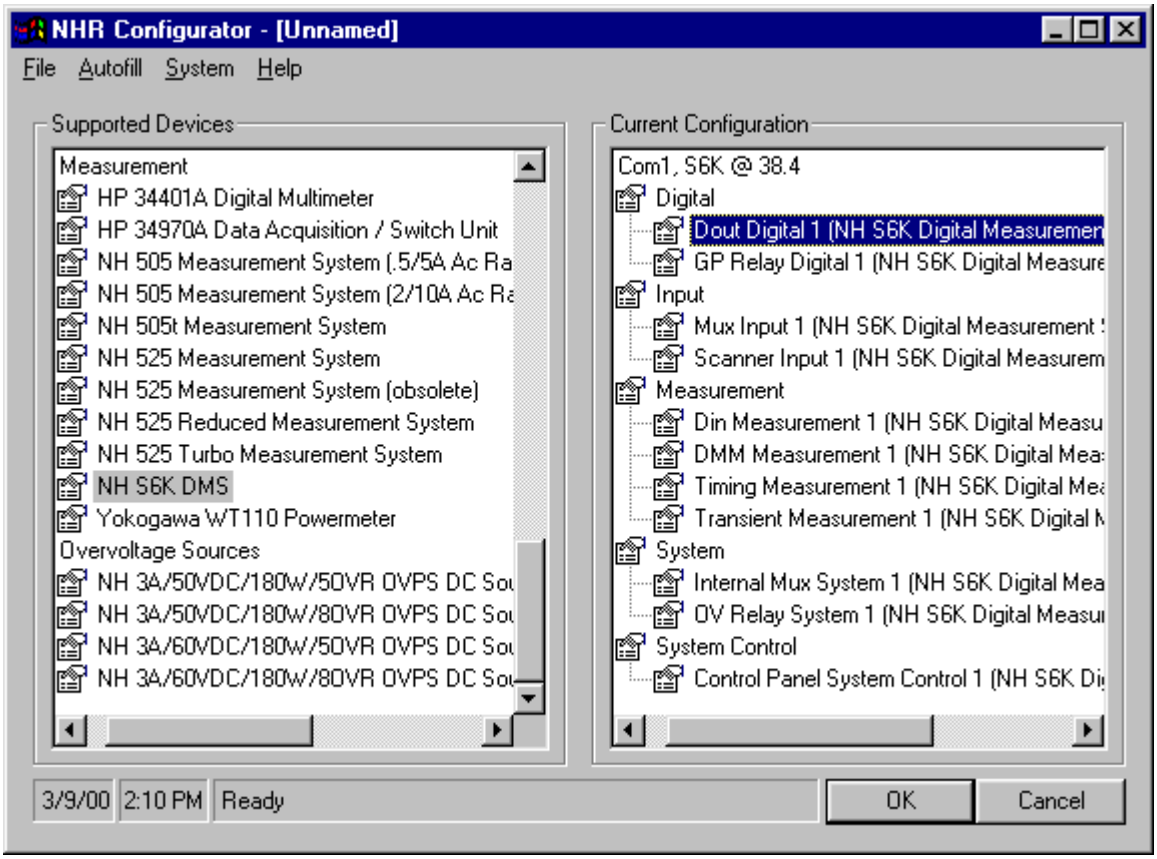
If the process was not successful, please refer to the NHR Digital Measurement System Hardware Reference Manual for troubleshooting help.

4.1.17 Removing the Device from *emPower* ®

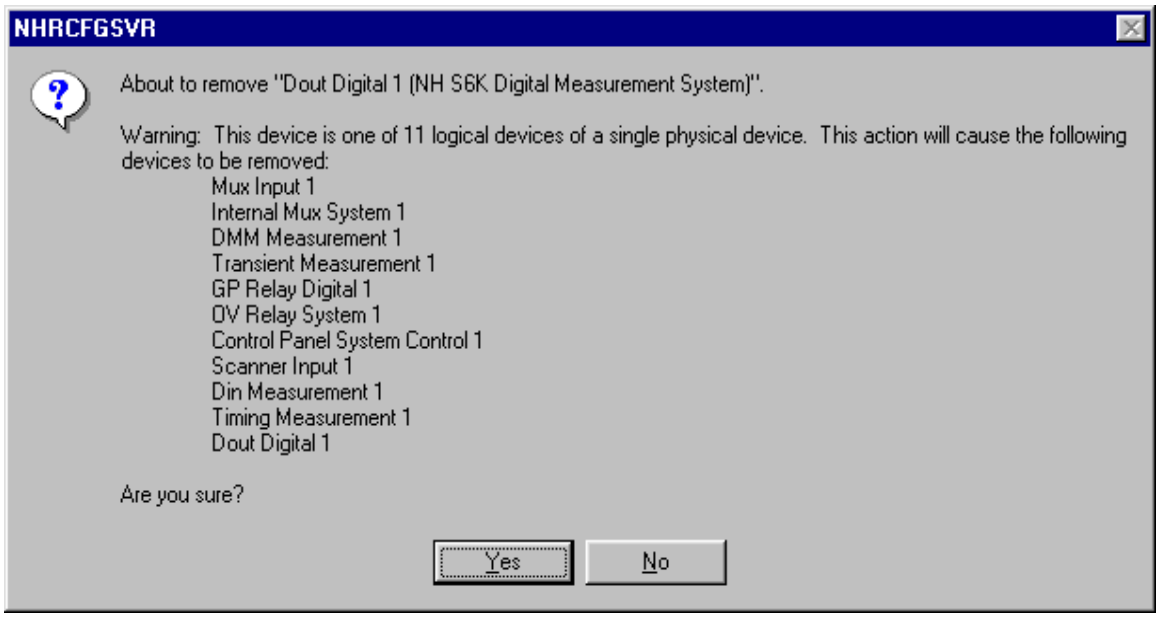
To remove the NHR DMS, logon to *emPower* ® and select Utilities. The *emPower* ® Utilities dialog will be displayed. Select the Hardware tab, then select the Modify Configuration... button.



The configuration manager main window displays. Locate any one of the eleven NH S6K DMS logical devices in the current configuration list. Select an NH S6K DMS logical device and select Remove or from the context menu or press the Delete key.



Since adding the NHR DMS to *emPower* ® placed eleven logical devices into the configuration, removing any of the NH S6K DMS logical devices will remove all NH S6K DMS logical devices. A reminder message is generated and displayed before the devices are removed from the configuration.



After clicking Yes, the NHR DMS devices are removed from the configuration. Click OK to close the NHR Configurator dialog.

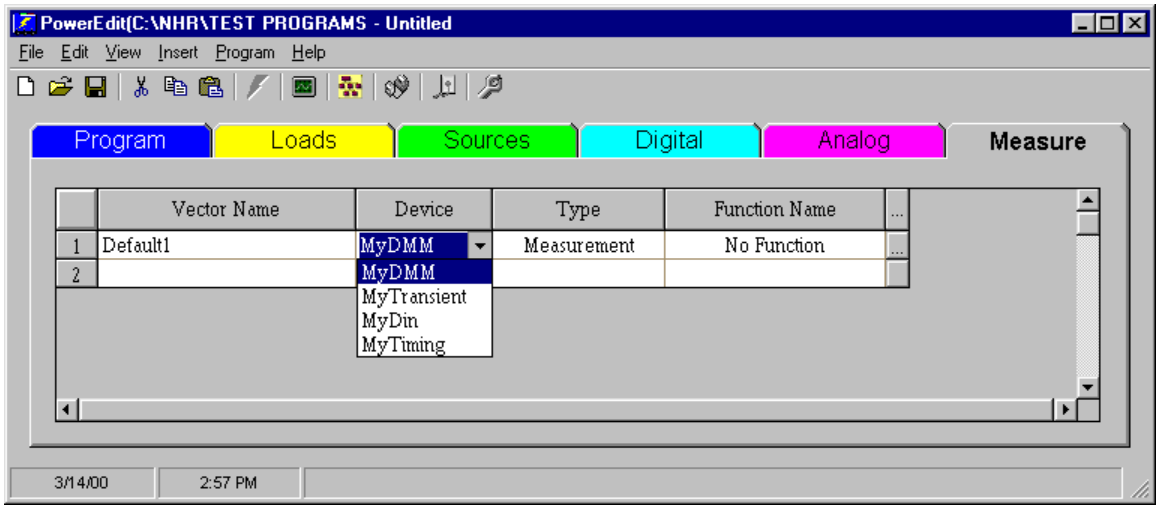
4.2 Operation

4.2.1 Creating Measurement Vectors

After adding the device to the configuration the user is able to start developing test programs. Log onto PowerEDIT and either load or create a test program. From PowerEDIT, select the Measure tab. Select a drop-down on the last row of vectors. This creates a new vector and displays the available measurement devices.

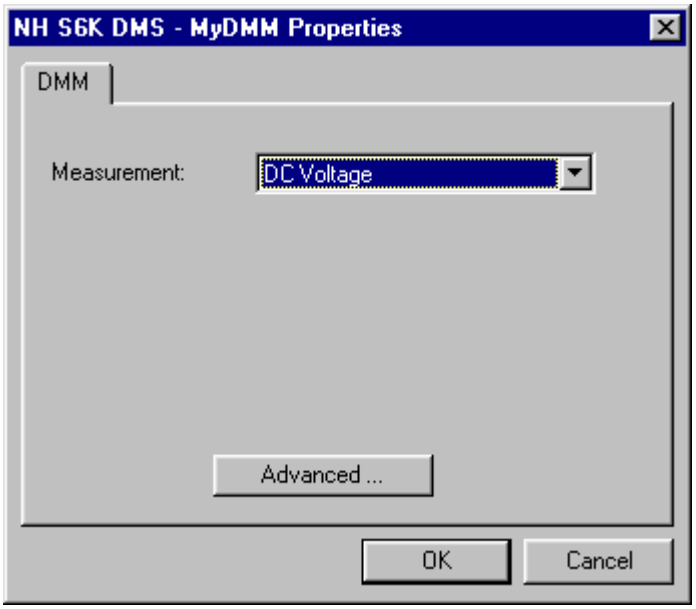
4.2.2 DMM Measurement

Select the item that matches the logical name of the device DMM (MyDMM).



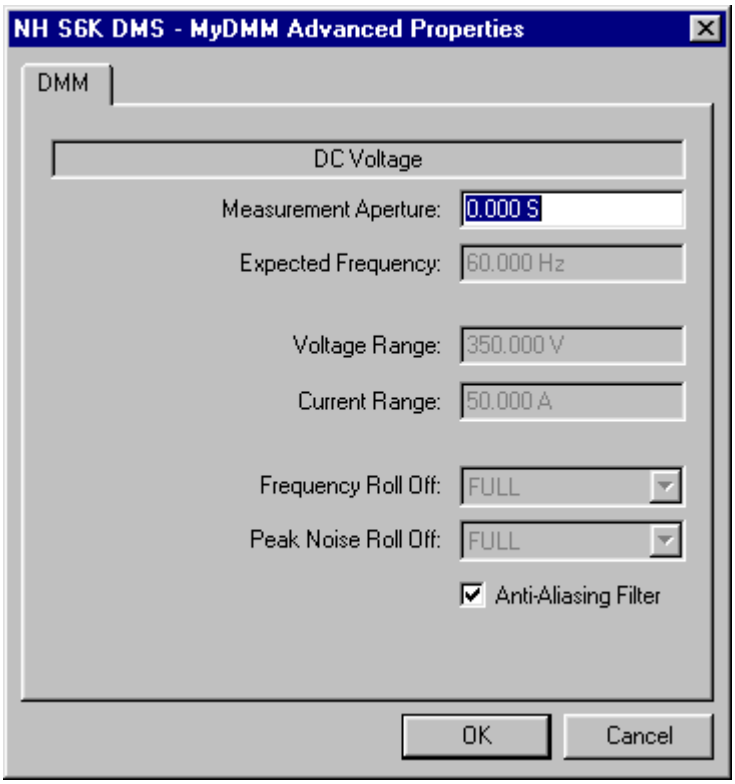
Click the ellipses (...) next to Function Name column that corresponds to the new vector. This displays the measurement properties for the devices DMM. Click Measurement (drop down menu). All of the available measurements display which are:

- **DC Voltage**
- **RMS Noise**
- **AC RMS Voltage**
- **DC + AC RMS Voltage**
- **AC Peak Voltage**
- **Frequency**
- **Total Harmonic Distortion**



4.3 Advanced DMM Measurement Properties

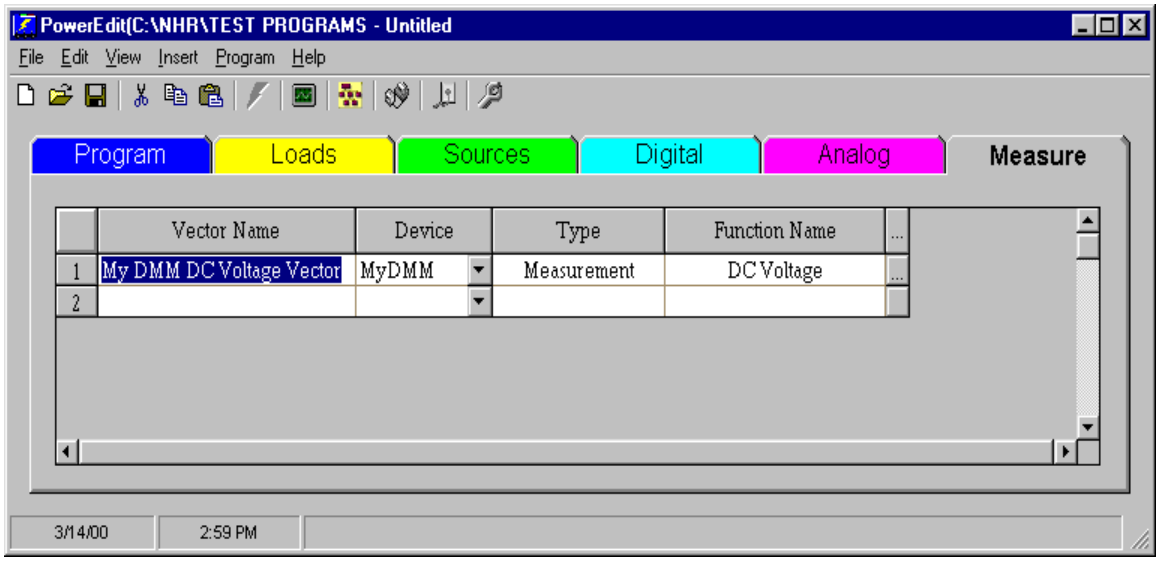
Click the Advanced … button to display advanced measurement properties.



This displays the currently implemented advanced properties of the device. Some properties are not available depending upon the measurement function chosen and are grayed out. Refer to the NHR Digital Measurement System Hardware Reference for additional information about advanced properties of the NHR DMS.

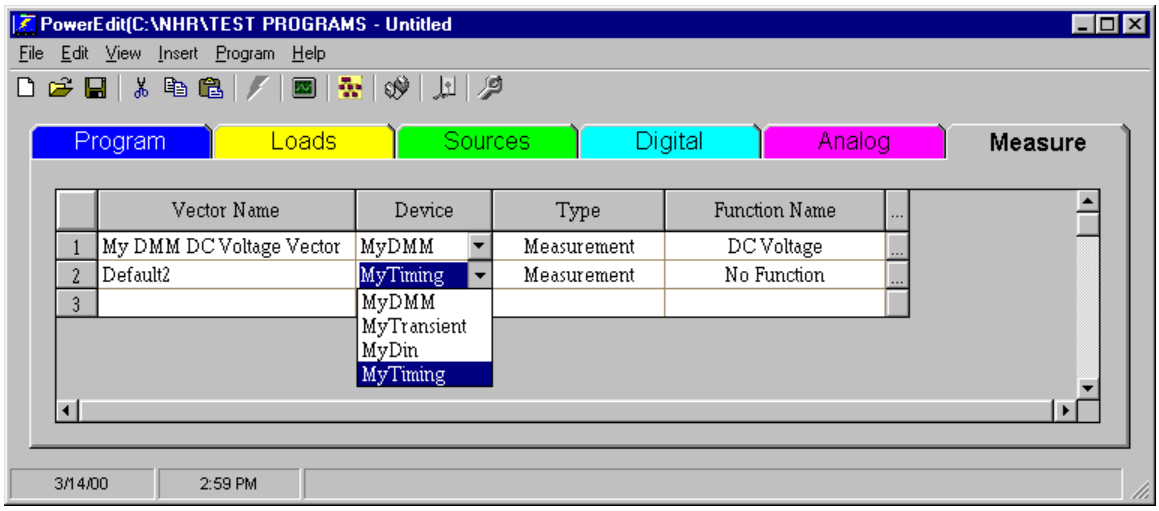
- **Measurement Aperture: sets the amount of time used to make a measurement in seconds. Zero seconds (0.0000 S) will force the NHR DMS to make the desired measurement in as much time as necessary to achieve the documented measurement accuracy.**
- **Expected Frequency: sets the expected frequency of an AC signal. This value provides a starting point for the AC measurement circuit and will decrease the measurement acquisition time if it matches the measured signal frequency. Measurement acquisition time can increase when the expected frequency is not specified correctly.**
- **Voltage Range: sets the voltage range used for power measurements.**
- **Current Range: sets the current range used for power measurements.**
- **Frequency Roll Off: sets the frequency-roll off for peak-to-peak measurements.**
- **Peak Noise Roll Off: sets the peak noise roll off for peak-to-peak measurements.**
- **Anti-Aliasing Filter: enables the anti-aliasing filter.**

Click OK to return to the PowerEDIT measurement pane. Highlight the vector name and give it a descriptive name.

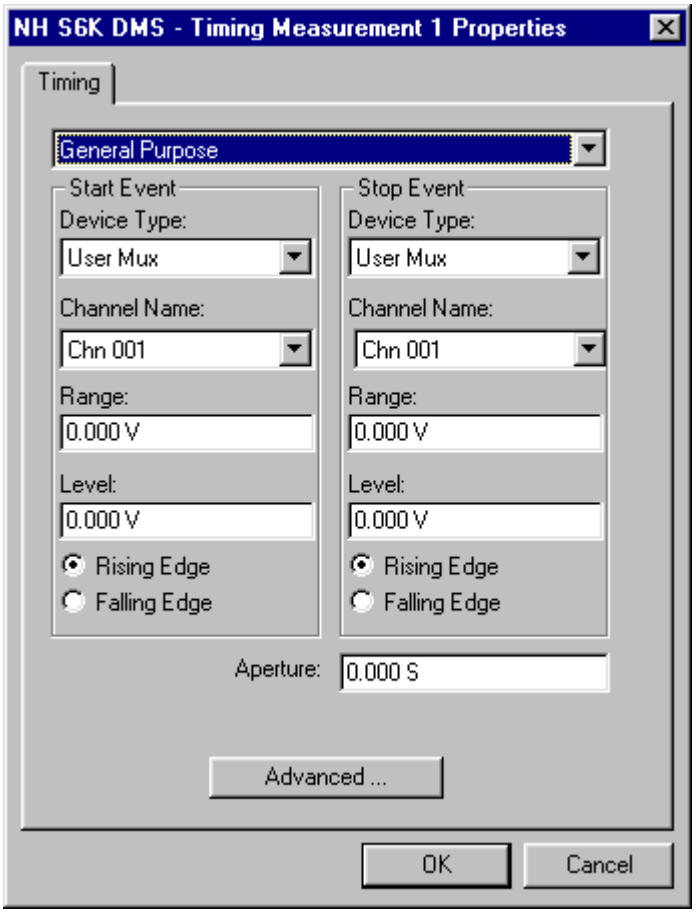


4.3.1.1 Timing Measurement

Select the item that matches the logical name given to the device Timing Measurement System (MyTiming).



Click the ellipses (...) next to the Function Name column that corresponds to the new vector. This will display measurement properties for the devices Timing Measurement System.



General Purpose indicates the predefined timing measurement type. Additional predefined types of timing measurements may be defined by NHR to simplify setup of the timing measurement selections.

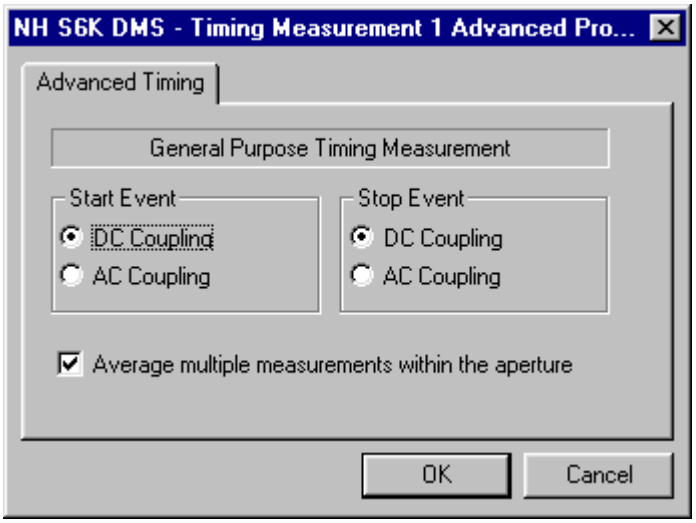
The General Purpose timing measurement enables selection of options on this page and will enable the user to define any timing measurement possible.

- **Start Event Group: defines the start event of a timing measurement.**
- **Stop Event Group: defines the stop event of a timing measurement.**
- **Device Type: selects the type of device for the start or stope event. Devices can be User Mux Channels, Digital Input Signals (DINs), AC Present Signal, DC Present Signal, or an External Trigger.**
- **Channel Name: selects the channel name for the device type selected. For device types that do not require a channel name this field will be disabled.**
- **Range: selects the voltage range for the user mux channel. For device types that do not require a voltage range this field will be disabled.**
- **Level: selects the voltage level trip point. For device types that do not require a voltage level this field will be disabled.**

- **Rising Edge: selects the polarity of the detect level.**
- **Falling Edge: selects the polarity of the detect level.**
- **Aperture: sets the maximum amount of time the measurement should be taken in. After the start event the end event must be sensed before this time elapses or a measurement error will be generated.**

4.3.1.2 Advanced Timing Measurement Properties

Click the Advanced … button to display advanced measurement properties.

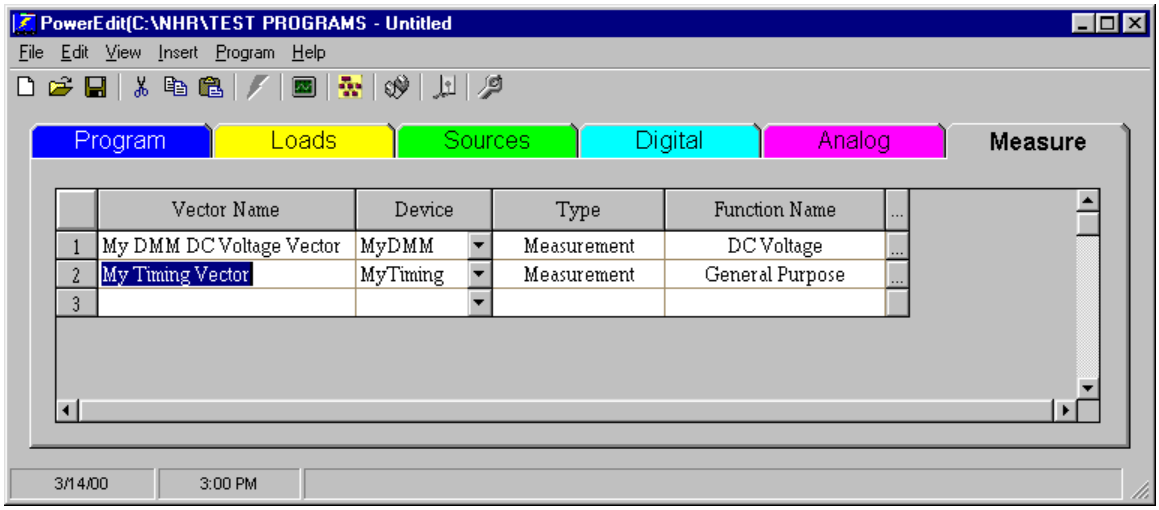


This displays the currently implemented advanced properties of the device, which can be:

- **Start Event Group**
- **Stop Event Group**
- **DC Coupling: selects DC coupling for the timing measurement signal**
- **AC Coupling: selects AC coupling for the timing measurement signal**

Average multiple measurements within the aperture enables multiple measurements detected within the aperture time to be averaged. When disabled, only one measurement is made within the aperture time

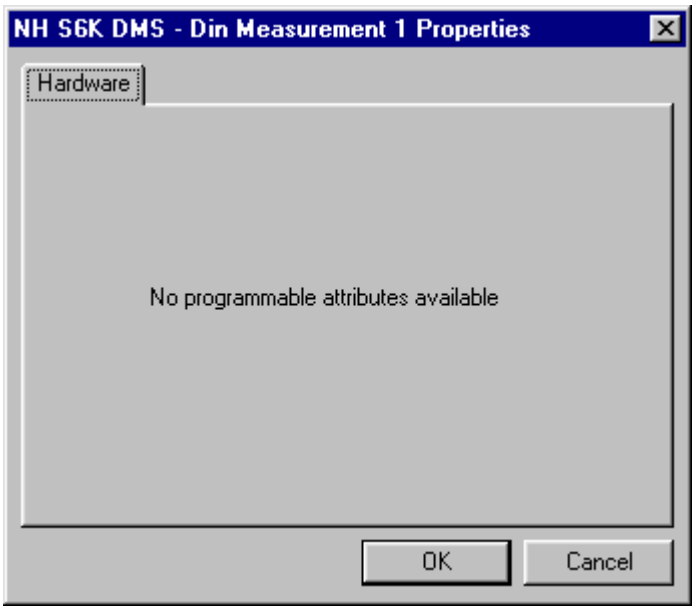
Click OK to get back to the PowerEDIT measurement pane. Highlight the vector name and give it a descriptive name.



4.3.1.3 DIN Measurement

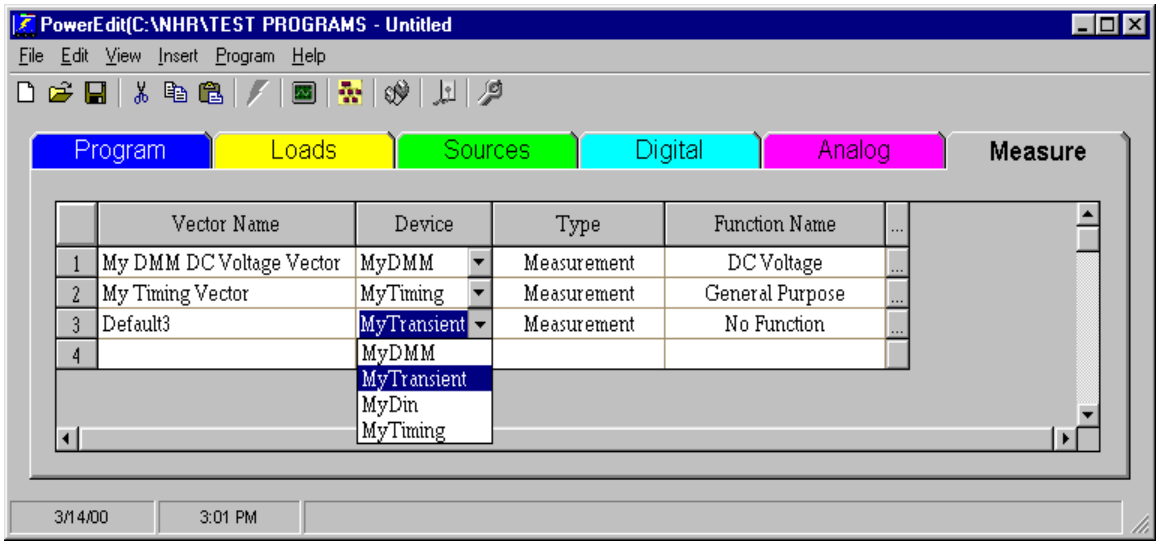
DIN Measurement vectors are not needed to make DIN measurements. Use the standard NHR test routine Digital State in the PowerEDIT program pane to make DIN Measurements.

Refer to Section 4.3.6 DIN Measurements and the NHR Test Routines Users Manual for additional information on standard test routines.

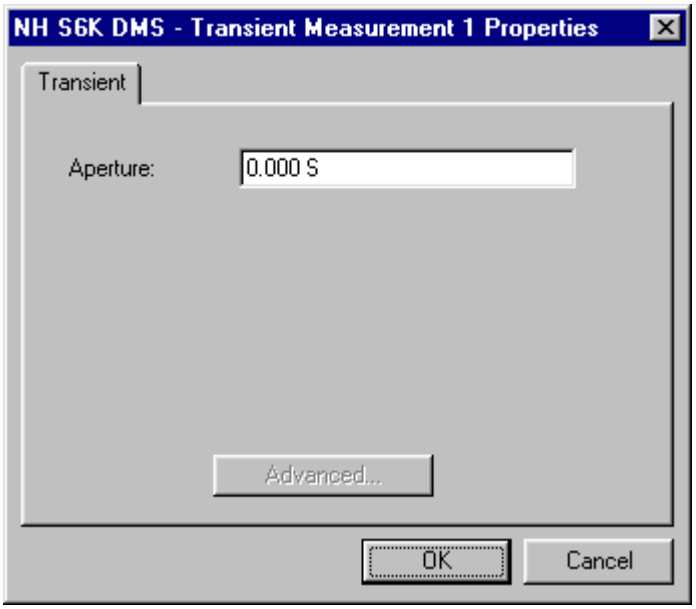


4.3.2 Transient Measurement

Select the item that matches the logical name given the device Transient Measurement System (MyTransient).

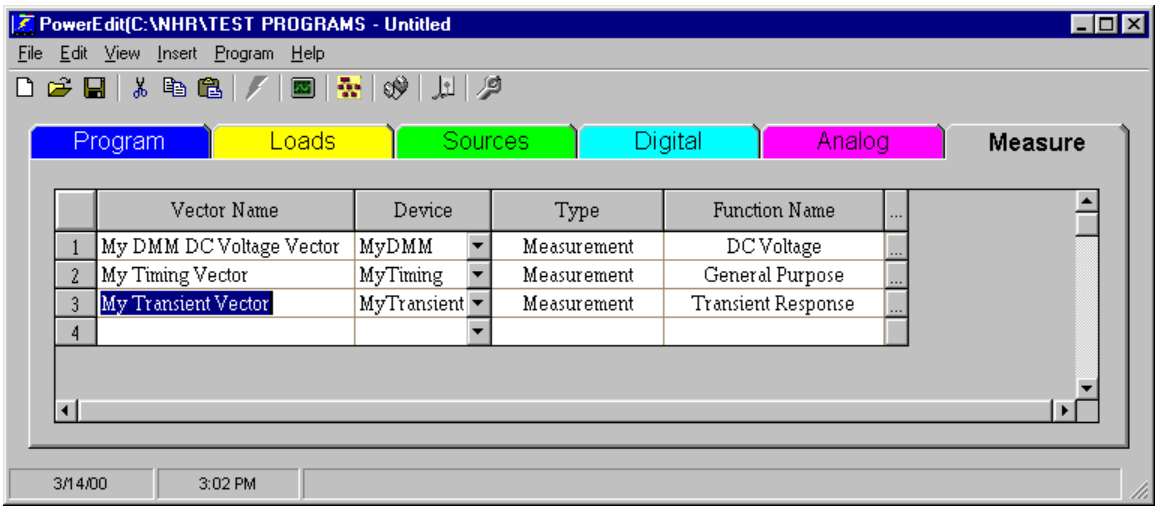


Click the ellipses (...) next to the Function Name column that corresponds to the new vector. This will display measurement properties for the devices Transient Measurement System. Transient measurement vectors require an aperture.



Aperture sets the time in seconds the NHR DMS can use to make the measurement.

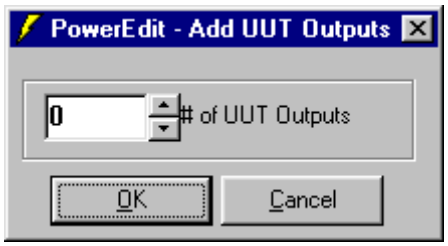
Click OK to get back to the PowerEDIT measurement pane. Highlight the vector name and give it a descriptive name.



4.3.3 Defining the UUT Outputs

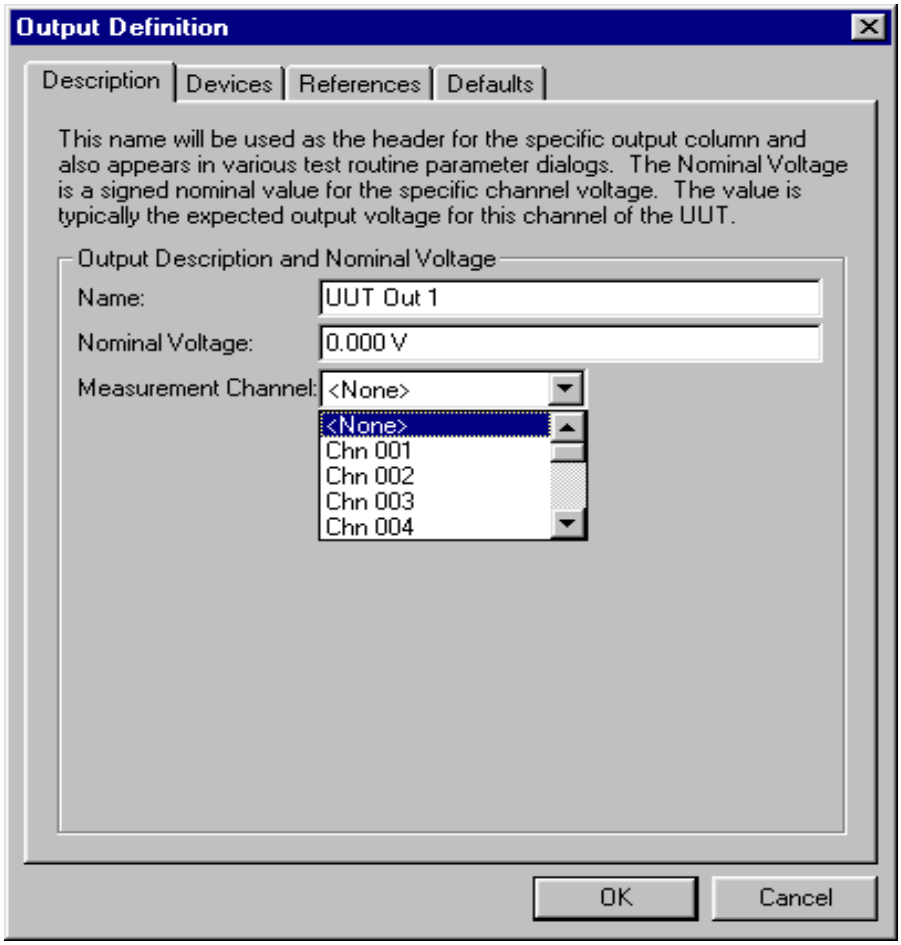
The user can tie the configured MUX channels to the newly created measurement vector. This is accomplished by adding UUT outputs to the program. To add these outputs to the program, select the Loads/Output tab and click the lighting bolt icon.

For this example five outputs are configured. Choose manual set, click the up spinner five times and OK.



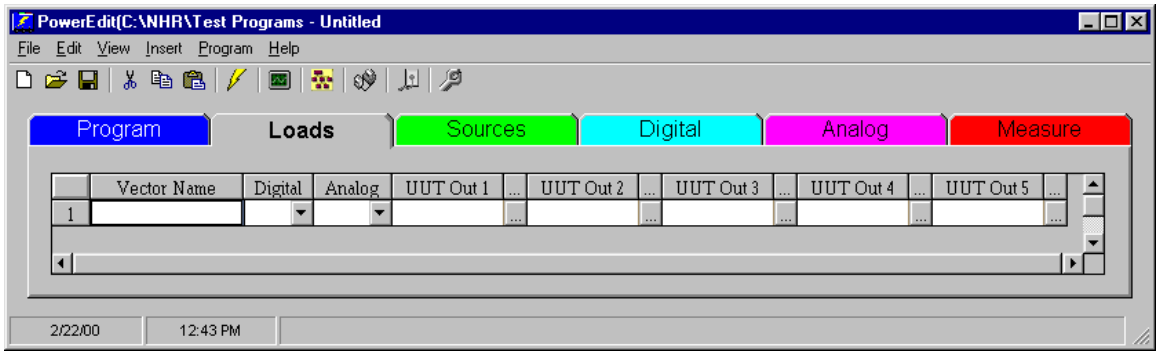
The Output Definition window displays in which the MUX channel is selected. Outputs can manage system loads as well as expose MUX channels. There is no need for outputs to actually have loads in their configuration. They can simply hold onto a MUX channel. There is also no need for the output to have a MUX channel in its configuration. They can simply manage loads.

Outputs are load managers and MUX channel placeholders. However, if both a MUX channel and load/s are present in the UUT output configuration the output will associate the load/s with that MUX channel. This enables the output to describe a portion of the measurement side wiring by assuming that the MUX channel is physically wired to all of the loads in the configuration.



Select the desired measurement channel and give the output a descriptive name. Here the descriptive name has been set to the MUX channel name of Chn 101. Click OK and repeat for the next four outputs.

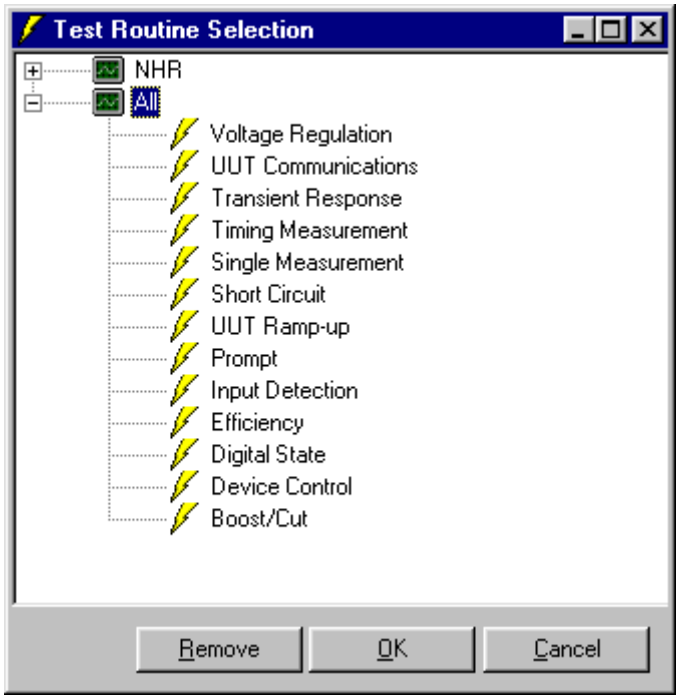
The Output/Load tab should now reflect the newly created outputs.



4.3.4 Making Measurements

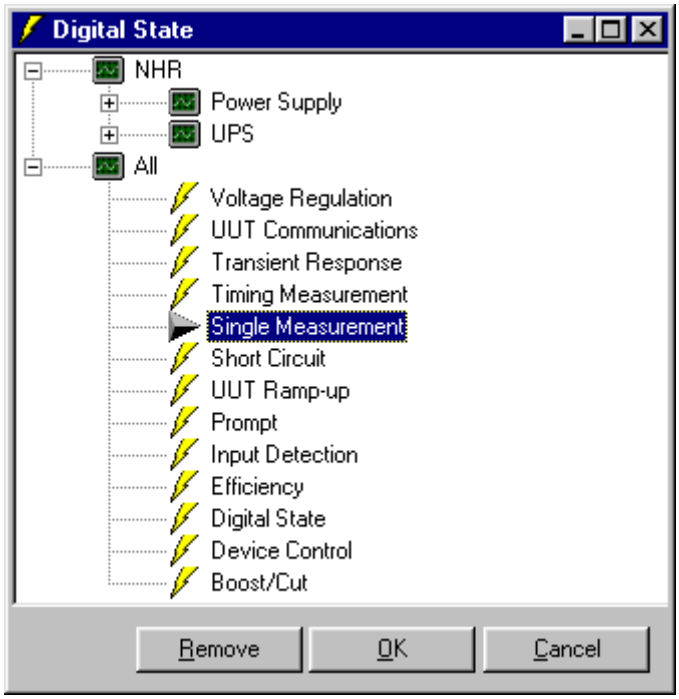
The program is ready to configure a test routine that will test the newly created outputs that contain the measurement channels. Select the program tab and click on the empty cell in the test routine column of the last row. This will create a new program vector and the Test Routine Selection window will be displayed.

For additional information on the *emPower*® test routines, refer to the NHR Standard Test Routine Library Users Manual.



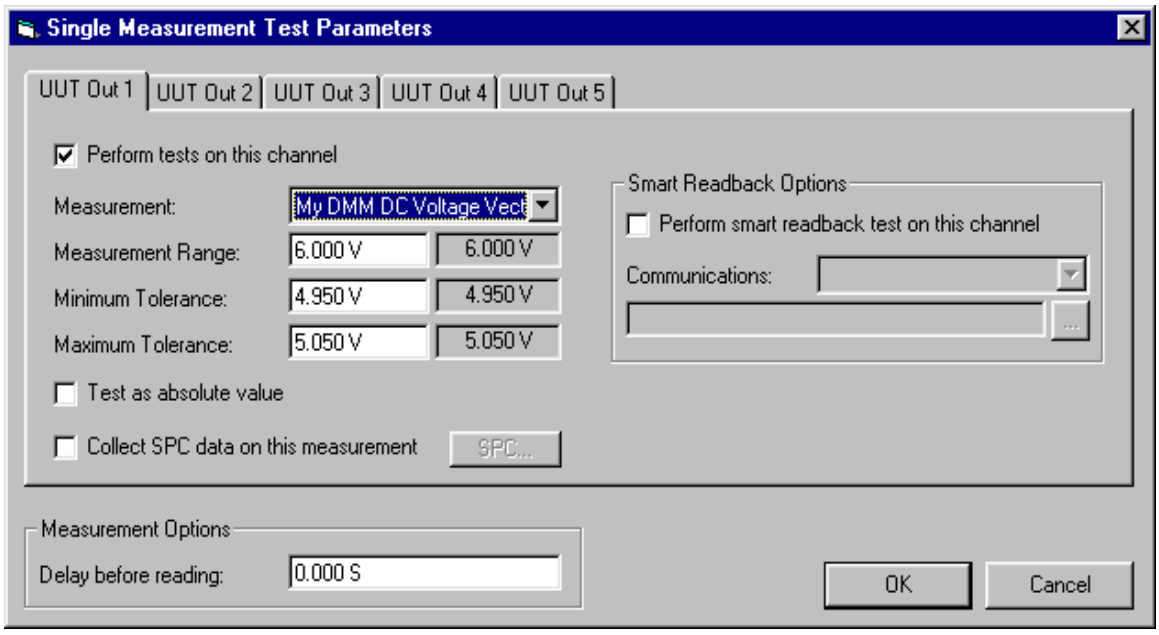
4.3.5 DMM Measurements

For this example, select the Single Measurement test and click OK.



The Single Measurement Test Parameters window display: Notice the newly created outputs are now available as tabs. On each tab check the Perform tests on this channel box and set up the desired measurement parameters.

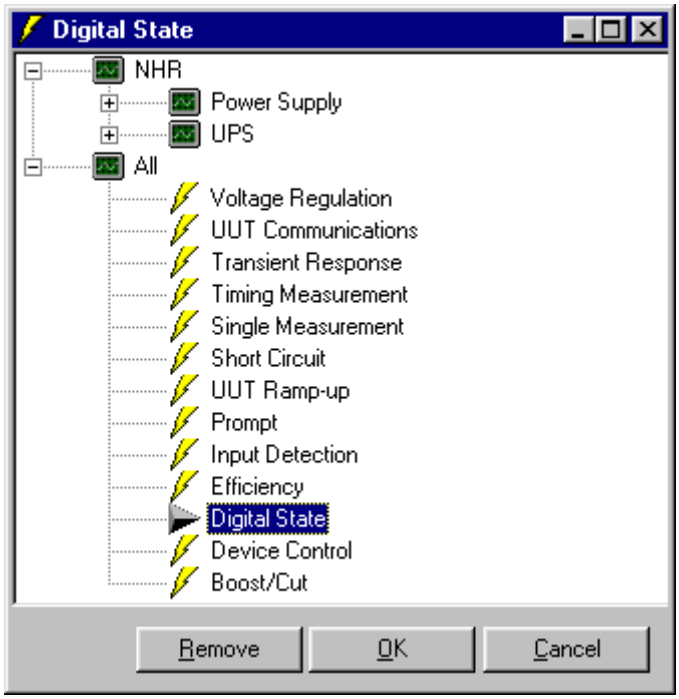
Select the desired measurement vector in the Measurement drop-down menu. This is where the final connection is made between the measurement vector and the MUX channels that the user desires to take measurements on. By selecting a vector that has been configured to use the device as a measurement device the MUX channels are tied directly to the devices internal DMM.



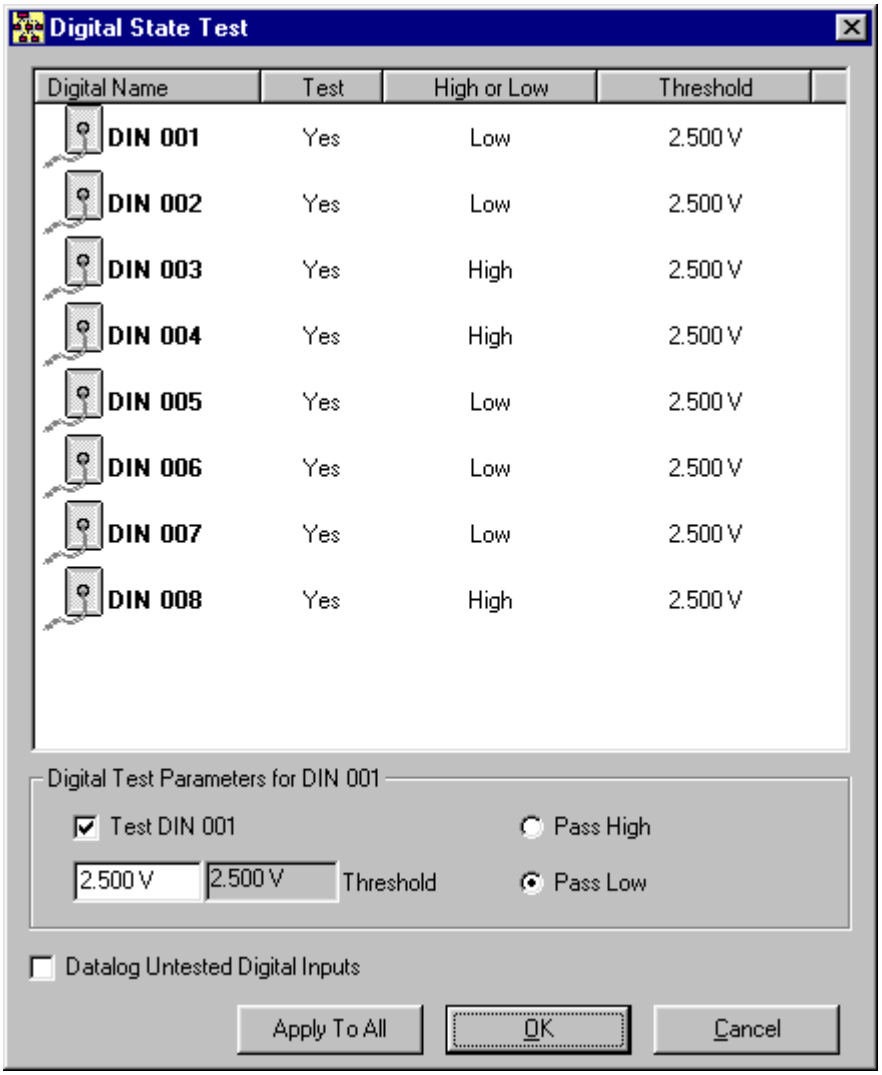
By swapping vectors that have been configured to use the device the user can quickly and easily modify which measurements are taken on the devices multiplexer modules.

4.3.6 DIN Measurements

For this example select the digital state test and click OK.

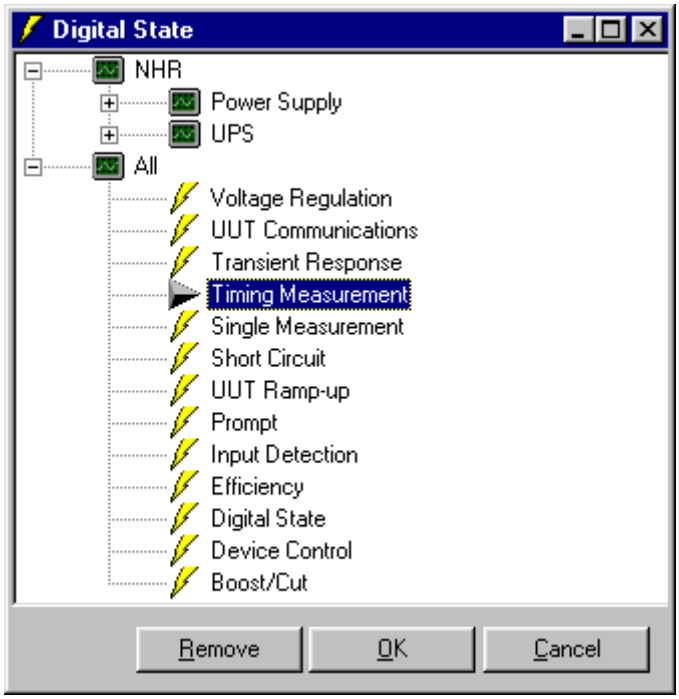


The digital state test dialog displays. Any number of digital input signals can be configured to be measured and tested with this dialog. Select the desired digital input signals and select the threshold and pass levels. When complete, click OK.

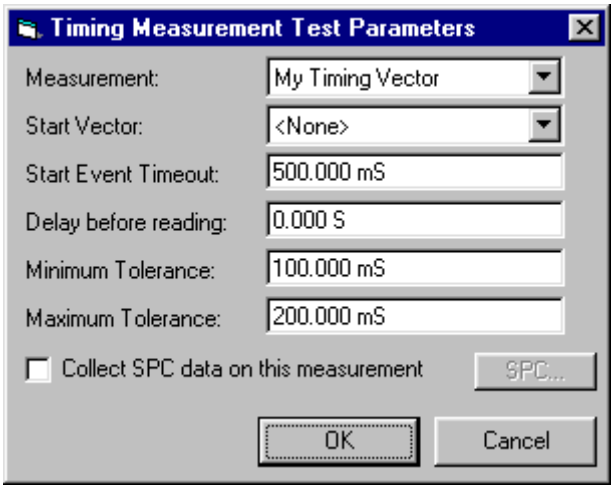


4.3.7 Timing Measurements

For this example, select the Timing Measurement test and click OK.

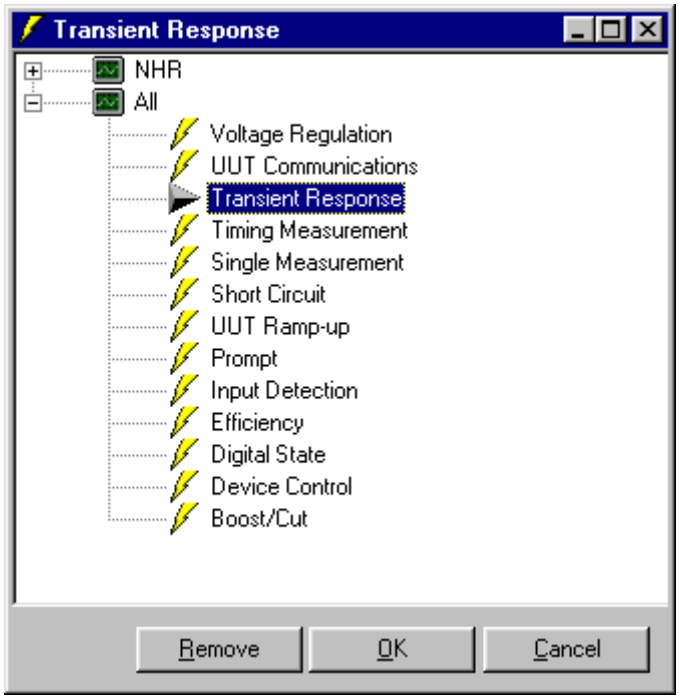


The Timing Measurement Test Parameters dialog displays. Select a measurement vector, optional start vector and set the timeouts and tolerances. Click OK to continue.

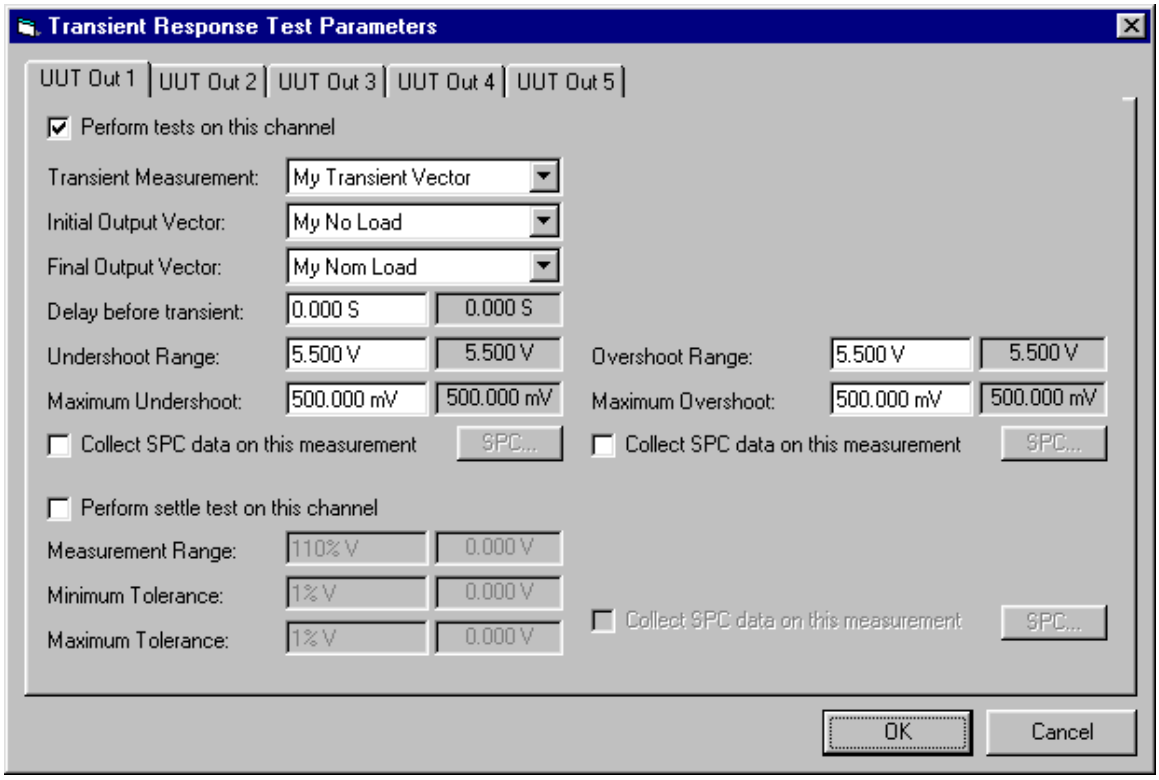


4.3.8 Transient Measurements

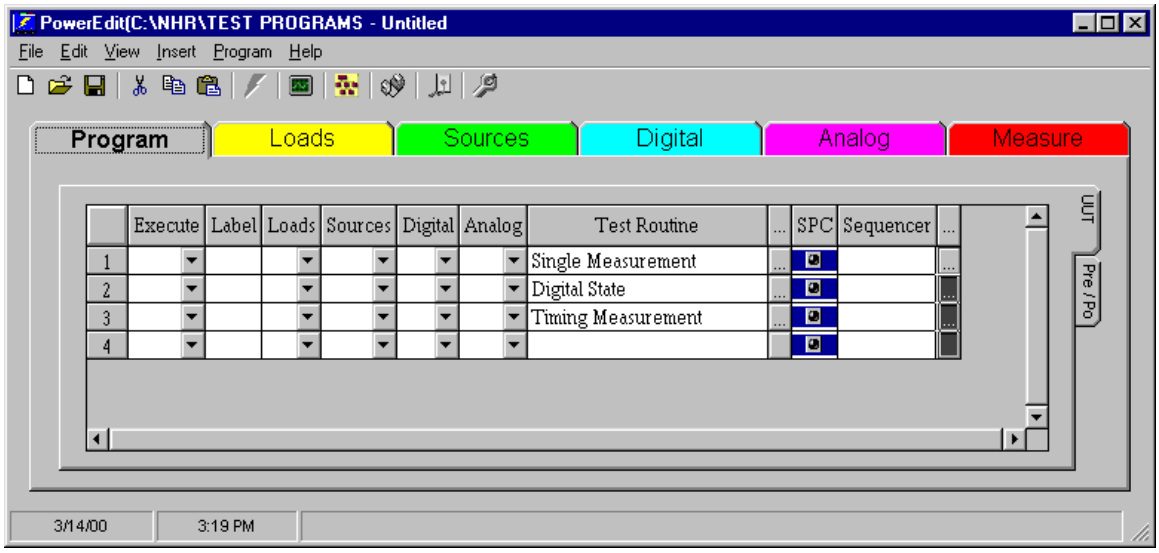
For this example, select the Transient Response test and click OK.



The transient Response Test Parameters dialog display: Select the transient parameters and click OK.

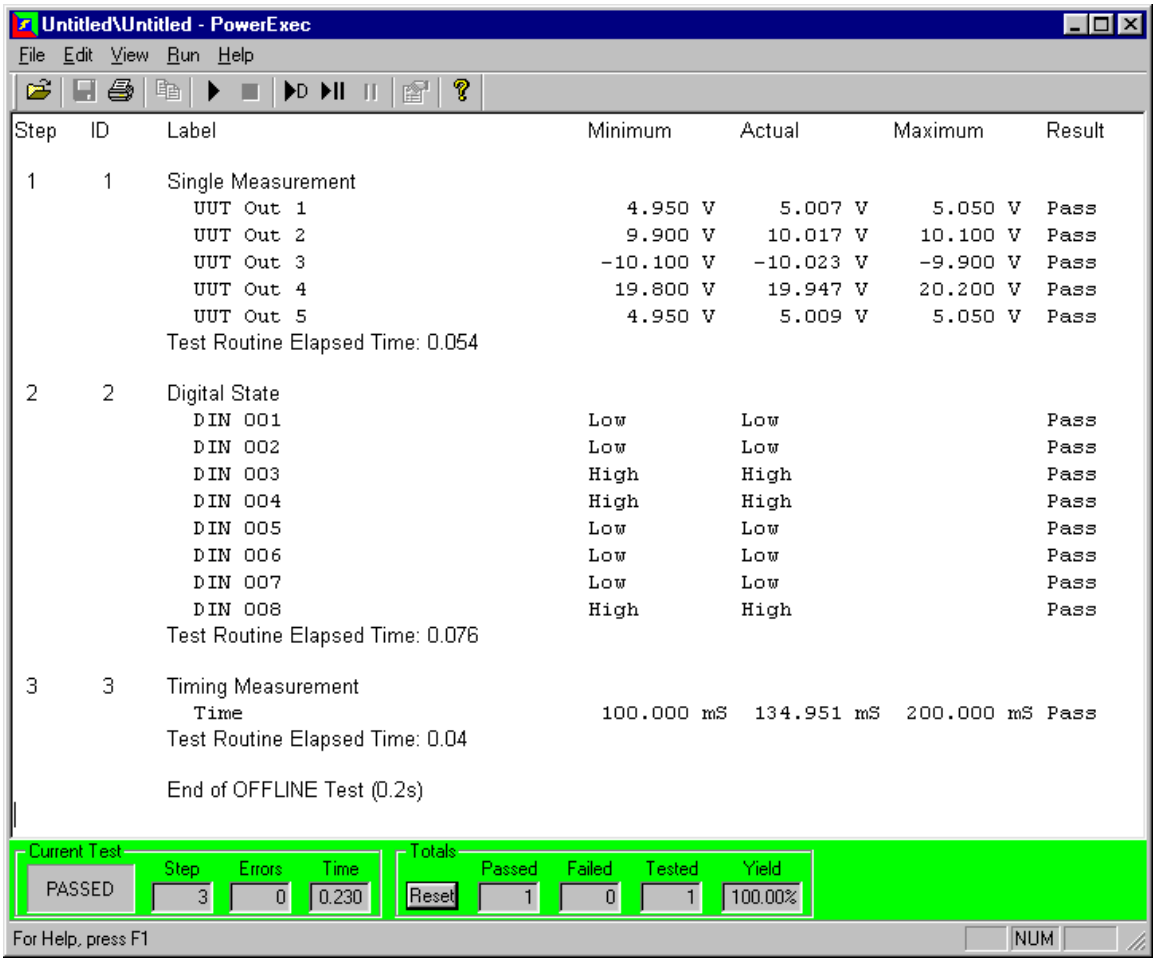


The PowerEDIT program pane now shows the test routines selected.



4.4 Running the Tests

Launch PowerEXEC and run the program. The standard screen driver will show the following:

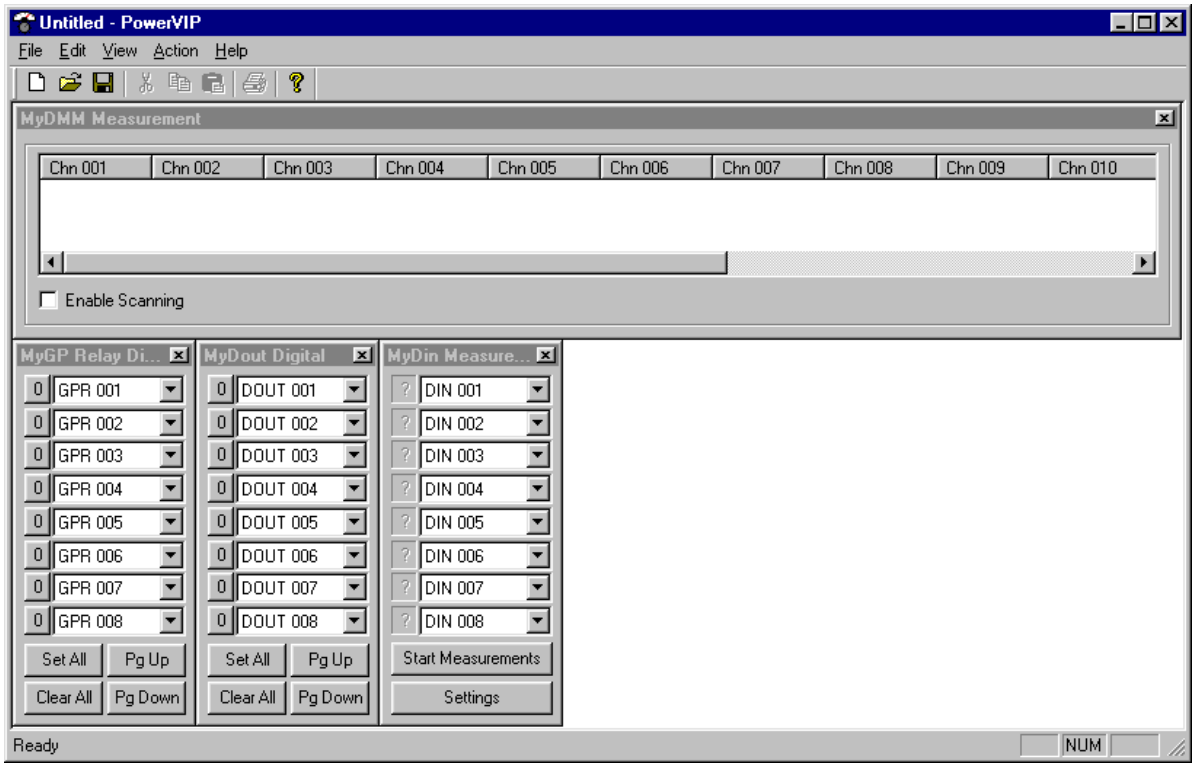


4.5 Hardware Performance Considerations

When configuring a test routine to take multiple DMM measurements on a group of channels all similar measurements will be packaged up and put into the devices scan list. Measurements of different type or range will be put into their perspective scan list. Therefore, one test depending on how it is developed could take several measurement scans to complete.

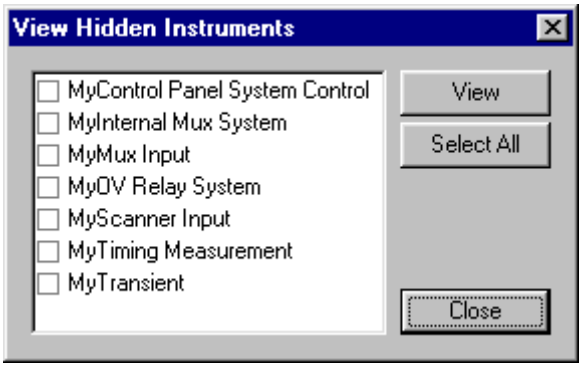
The measurement vector, on any of the outputs that are configured to use the one of the devices MUX channels, must employ the device as its measurement device or a run time error will occur. The opposite also holds that choosing a channel supported only by the device and trying to apply a measurement using any device other than the device will also cause a run time error.

4.6 PowerVIP



PowerVIP creates a virtual instrument panel window for each logical device found in the current configuration. A single NHR DMS provides eleven logical devices within *emPower* ®.

Several of the NHR DMS logical devices do not expose a VIP window and will be absent from the grid. PowerVIP places logical devices that do not expose a VIP window on the hidden instruments dialog. From the PowerVIP menu, select View Instruments to show the View Hidden Instruments dialog. Refer to the PowerVIP Reference Manual for more information on hidden instruments.



The DMM Measurement (MyDMM) logical device will present a DMM VIP for the user in PowerVIP.

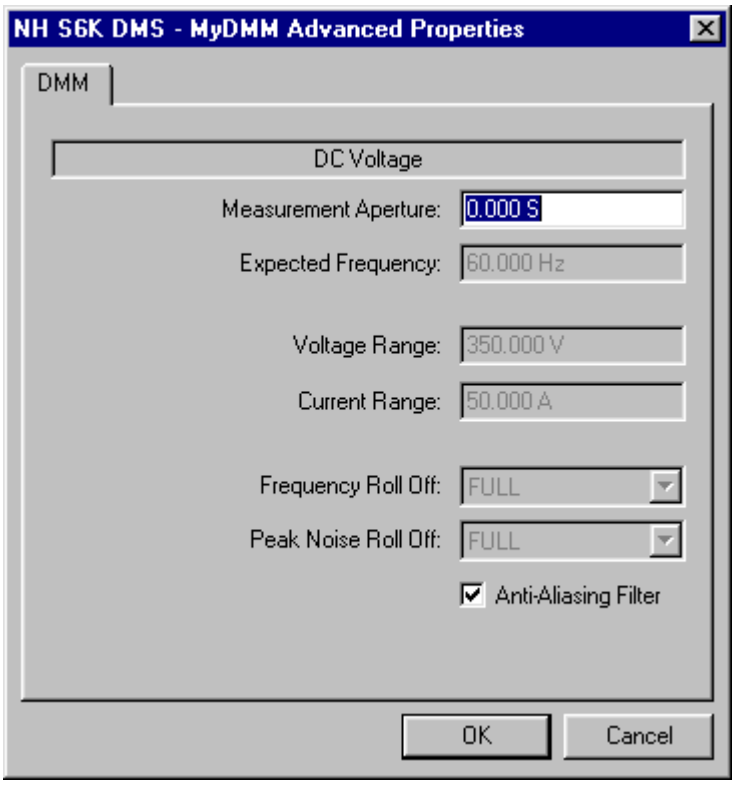
The digital GPRs (MyGPR Digital) and the digital outputs (MyDout Digital) logical devices will each present a digital VIP for the user in PowerVIP.

The Din Measurement (MyDIN logical device will present a DIN VIP for the user in PowerVIP.

4.6.1 Configure Measurements

4.6.2 Advanced VIP Measurement Setup

The NHR DMS supports several advanced measurement options. These are selected from the advanced measurement setup dialog. Select the Advanced … button shown on the VIP Measurement Setup dialog described in Section 4.6.1.



For details on advanced DMM measurement properties, see Section 4.3.1.2 Advanced DMM Measurement Properties.

4.6.2.1 Taking Measurements

Note: Enabling DMM measurements will cause an increase in PowerEXEC test program run time if the test program is run concurrently with PowerVIP measurements. To minimize PowerEXEC test time performance degradation, uncheck the Enable Scanning checkbox when PowerVIP measurements are not needed.

4.6.2.2 Saving and Restoring Configuration

4.6.3 Digital VIP

The Digital VIP window enables the user to monitor and modify the state of digital outputs (GPRs, relay drivers, or DOUTs). The logical device name of the digital device is shown in the title bar of the Digital VIP window. The current state of up to eight digital signals is displayed along with the digital signal name.

4.6.3.1 GPRs

The name of the digital signal selected is shown in each of eight combo boxes. Use the standard combo box controls to select a digital signal. A toggle button immediately in front of the combo box indicates the current state of the selected digital signal, which can be:

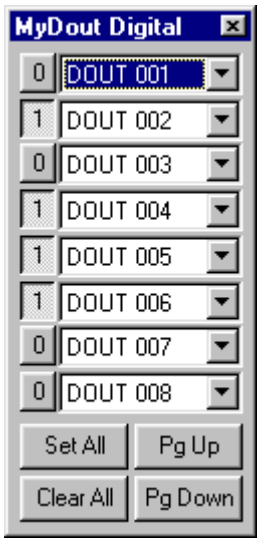
- **Zero (button up) indicates an open contact state**
- **One (button down) indicates a closed contact state**

In the above VIP windows, GPR 001, GPR 002, GPR 003 and GPR 004 are shown in the open contact state and GPR 005, GPR 006, GPR 007 and GPR 008 are shown in the closed contact state. To change a single digital signal press the state indicator button to toggle the digital between the open and closed contact states.

All eight of the currently selected digital signals can be set or cleared using the Set All or Clear All buttons. Only the currently selected digital signals shown in the VIP window are set or cleared using these buttons.

To select the next or previous eight digital signals use the Pg Up or Pg Down buttons. If additional digital signals are found in the configuration, all eight combo boxes will be updated with the next or previous eight signal names found.

4.6.3.2 DOUT



The name of the digital signal selected is shown in each of eight combo boxes. Use the standard combo box controls to select a digital signal. A toggle button immediately in front of the combo box indicates the current state of the selected digital signal, which can be:

- **Zero (button up) indicates a non-conducting state**
- **One (button down) indicates a conducting state**

In the above VIP windows, DOUT 001, DOUT 003, DOUT 007 and DOUT 008 are shown in the non-conducting state and DOUT 002, DOUT 004, DOUT 005 and DOUT 006 are shown in the conducting state. To change a single digital signal press the state indicator button to toggle the digital between the open and closed contact states.

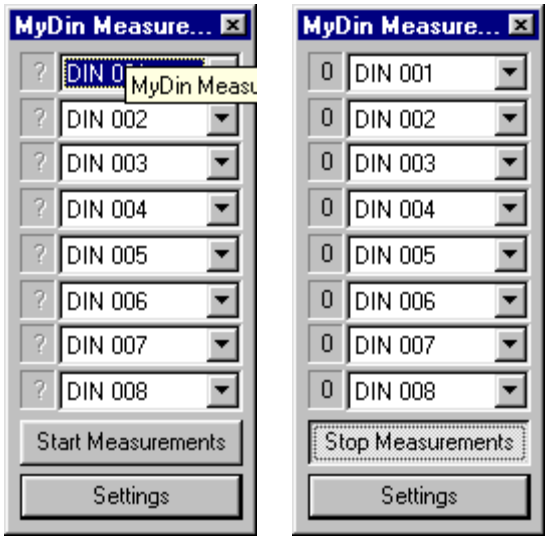
All eight of the currently selected digital signals can be set or cleared using the Set All or Clear All buttons. Only the currently selected digital signals shown in the VIP window are set or cleared using these buttons.

To select the next or previous eight digital signals use the Pg Up or Pg Down buttons. If additional digital signals are found in the configuration, all eight (8) combo boxes will be updated with the next or previous eight signal names found.

4.6.4 DIN VIP

Note: Enabling DIN measurements will cause an increase in PowerEXEC test program run time if the test program is run concurrently with PowerVIP measurements. To minimize PowerEXEC test time performance degradation, select Stop Measurements when PowerVIP measurements are not needed.

The DIN VIP window enables the user to measure the current state of digital inputs (DINs). The logical device name of the DIN device is shown in the title bar of the DIN VIP window. Results of measurements of up to eight digital input signals are displayed along with the corresponding DIN name.

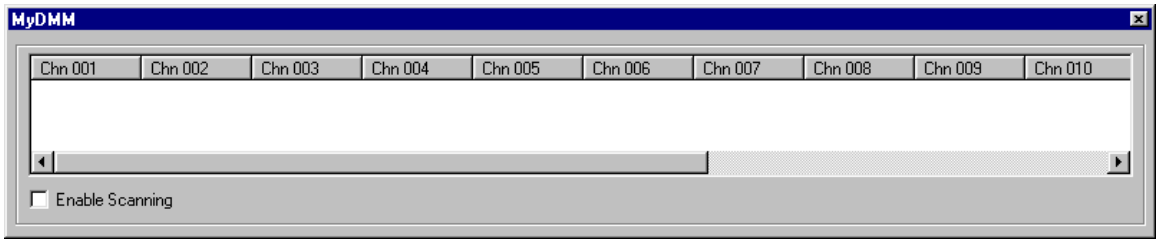


The name of the digital input selected for measurement is shown in each of eight combo boxes. Use the standard combo box controls to select a digital input signal. An indicator immediately in front of the combo box indicates the measured state of the selected digital input signal, which can be:

- **Zero indicates a measured low signal (below threshold level)**
- **One indicates a measured high signal (above threshold level)**
- **Grayed question mark indicates an unknown state when measurement data is unavailable or has not been started**

To select thresholds for the DIN measurements, select the Settings button. To enable measurements of the selected DIN signals, select Start Measurements. The button will depress and rename itself to Stop Measurements. Measurements of the selected digital input signals will be continually updated to the DIN VIP window. When measurement data is not required, select Stop Measurements to halt all DIN measurements in progress.

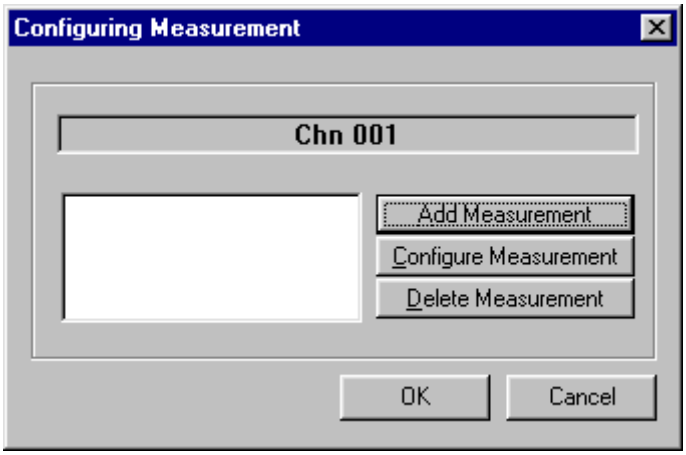
The logical device name of the DMM (MyDMM) is shown in the title bar of the DMM VIP.



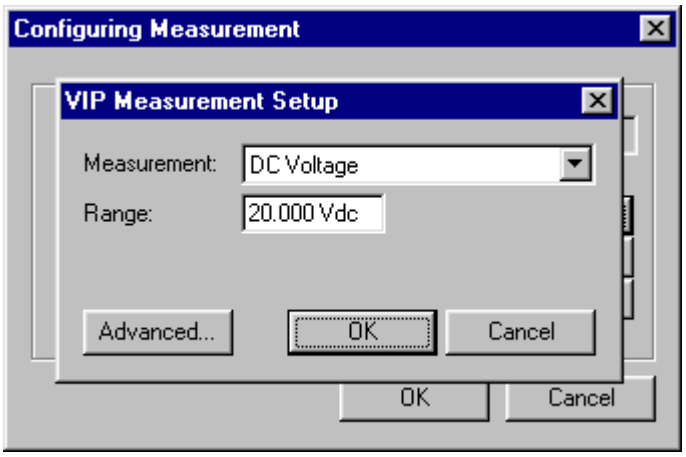
All of the configured measurement channels are represented across the top of the DMM VIP.

4.6.5 Configuration

To configure a channel to take a measurement, simply click on the column header. The user is presented with the Configuring Measurement dialog window. The measurement configuration options available are: Add Measurement, Configure Measurement, and Delete Measurement.

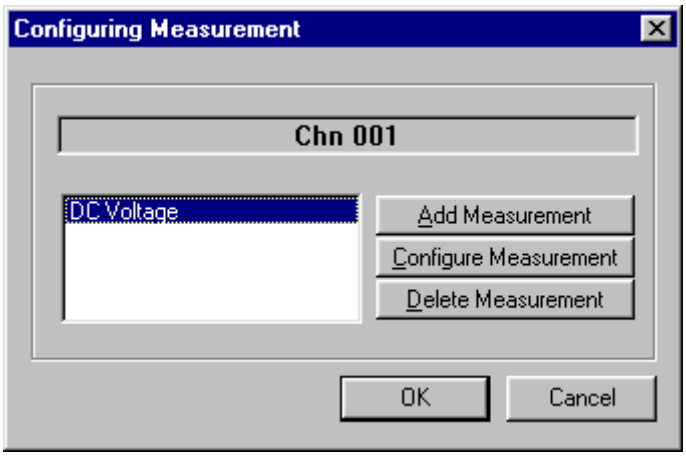


To add a new measurement to the DMM VIP, click on the Add Measurement button.



The VIP Measurement Setup dialog is displayed. Select the desired measurement and range, and then click on the Ok button.

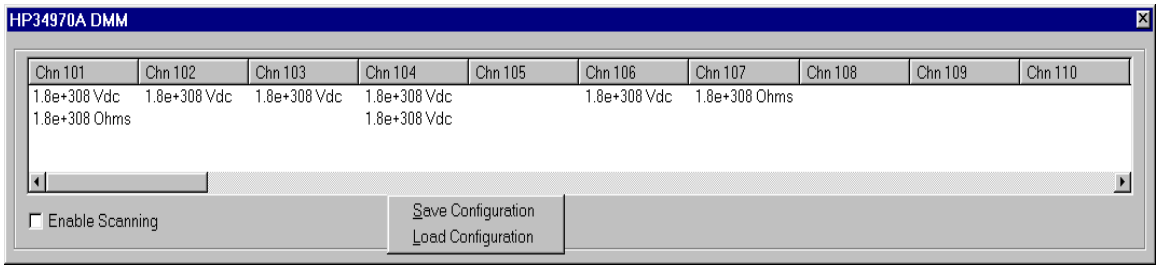
The newly configured measurement is now displayed on the left.



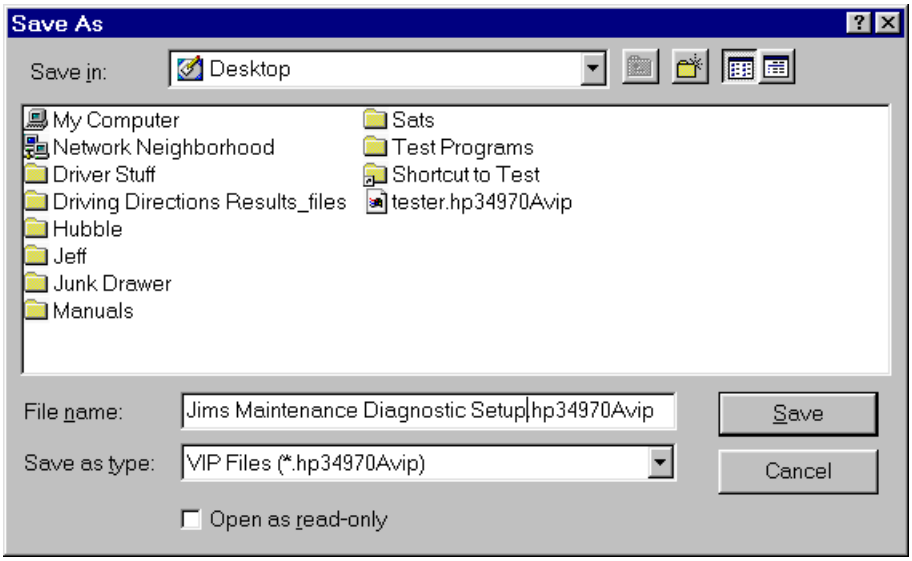
In order to modify or delete a measurement listed here select it and click on the Configure Measurement or Delete Measurement buttons respectively. Multiple measurements can be configured here as well.

4.6.6 Saving and Restoring Configuration

Once the DMM VIP panel is configured the measurement settings can be saved away to a data file named *.hp34970Avip. Simply right click anywhere in the blank area surrounding the measurement window to display the save/load menu. Select Save Configuration.

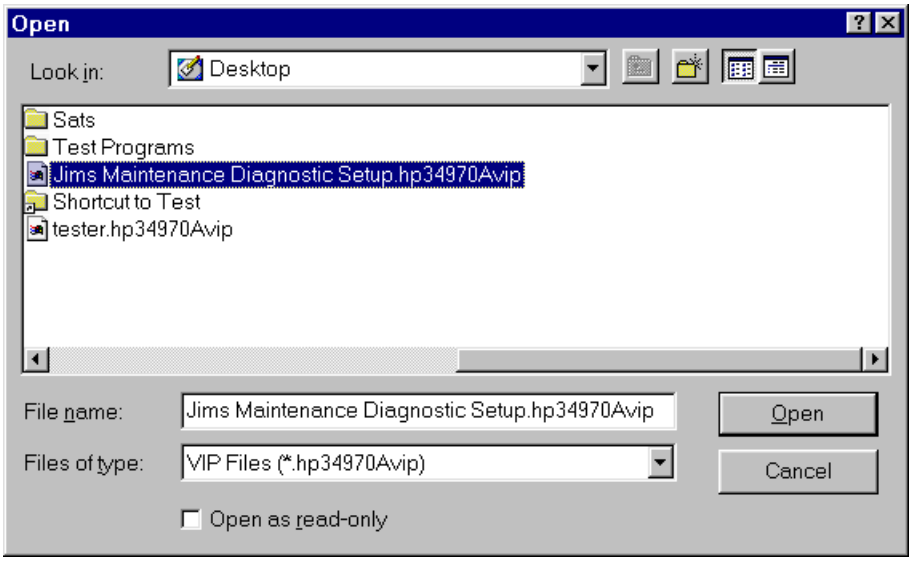


Give the configuration a descriptive name and select Save.



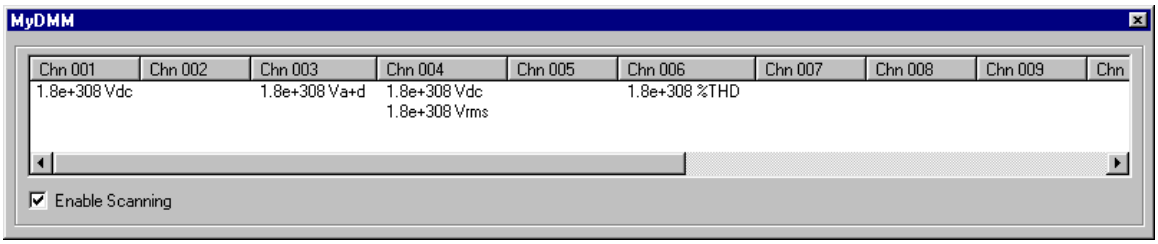
To load the configuration simply select Load Configuration, then select the desired file and click Open.

Note: Currently these files are loaded into whatever current measurements are visible. To reset the measurements, close and reopen the devices VIP panel.



4.6.6.1 Taking Measurements

To start taking measurements the user must enable scanning by checking the Enable Scanning checkbox. Moreover, it is recommended that the Enable Scanning checkbox be unchecked before modifications are made to the measurements otherwise toggling the Enable Scanning checkbox is required to refresh any changes made in the configuration of the measurements.



5. PWM GENERATOR

Note: For information on the features and capabilities of the NHR PWM Generator, refer to the NHR Hardware Reference Manual.

5.1 Installation

5.1.1 Initial Setup

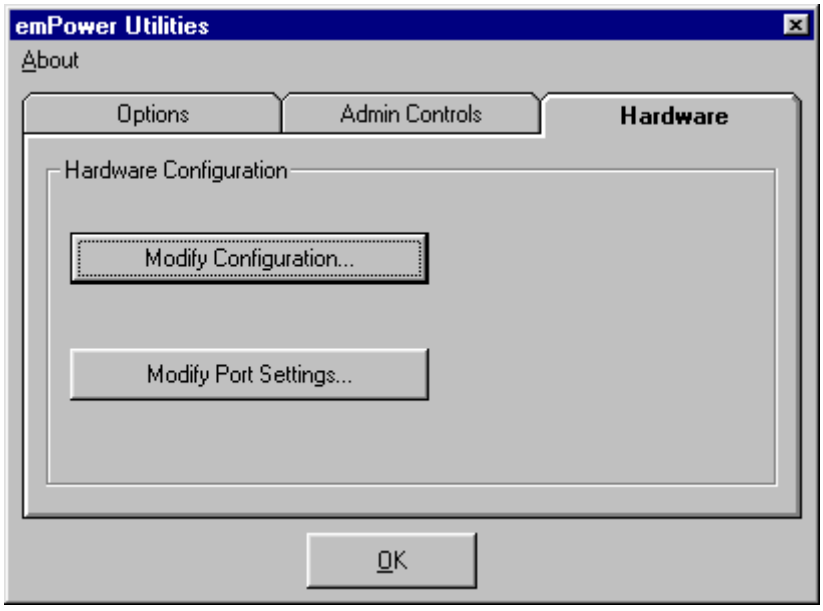
Install the communications port interface card and its driver. Refer to the manufacturer's documentation for assistance.

Connect the NHR PWM Generator to the desired communications port with an appropriate cable. Refer to the NHR PWM Generator Hardware Reference Manual for assistance.

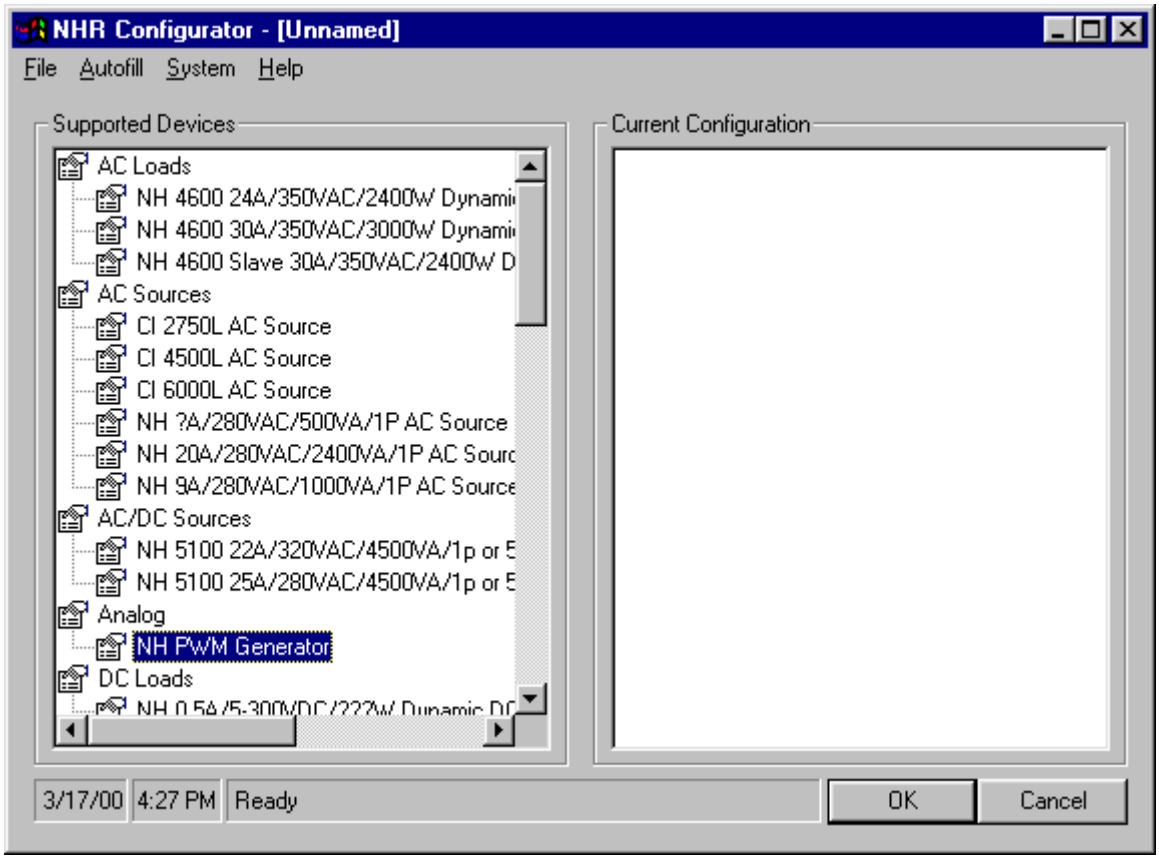
Run the Setup program to install the device driver on your system. The device driver will need to be installed on each system that will be using it. Follow the on-screen instructions presented by the setup program to complete installation.

Add the Device to *emPower* ®

After the device driver is installed launch *emPower* ® and logon. Select Utilities. The *emPower* ® Utilities dialog will be displayed. Select the Hardware tab, then select the Modify Configuration... button.



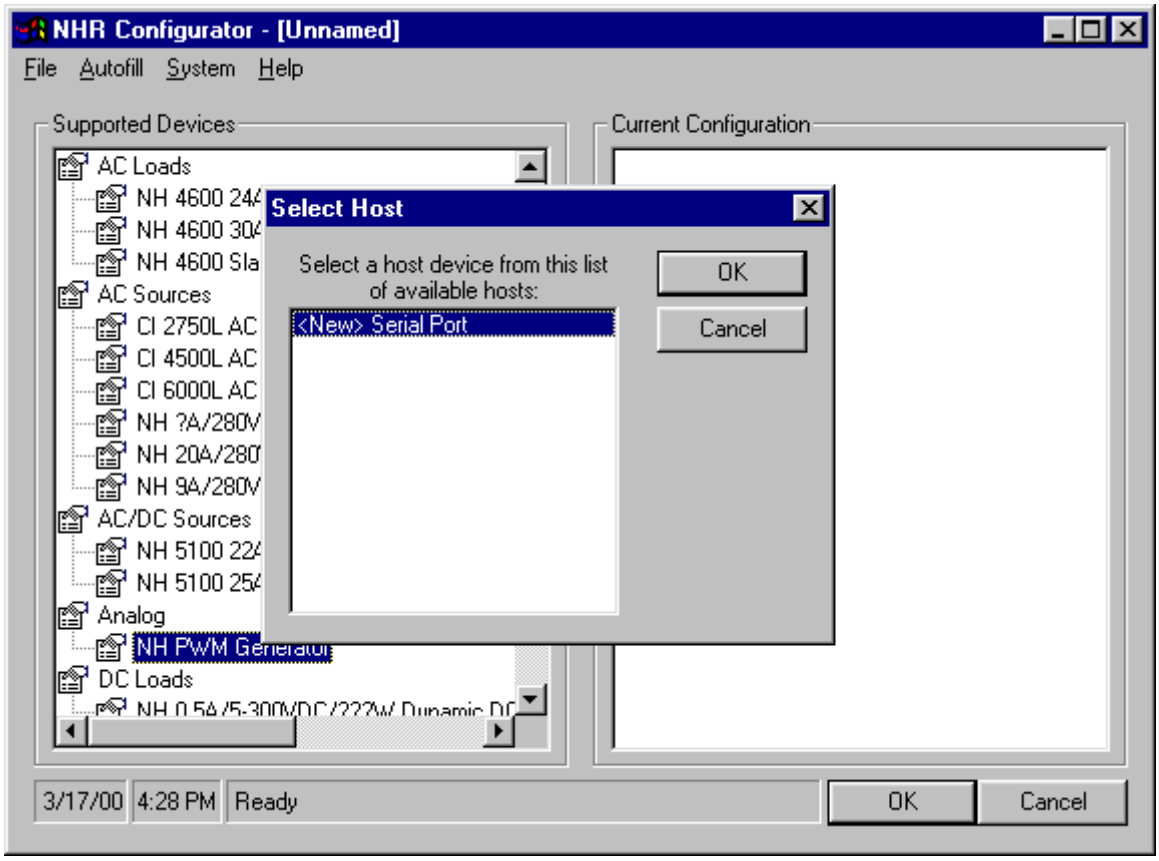
The NHR Configurator is launched. For additional information regarding the NHR Configurator please see the NHR Configurator Users Manual.



5.1.2 Select the Communications Port and Protocol

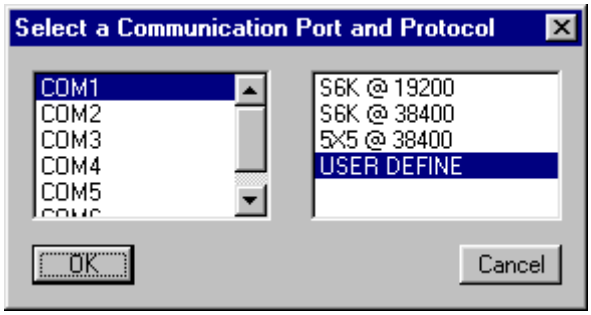
Note: The NHR PWM Generator requires a configured communications port. Refer to the NHR Port Configuration Utility Users Manual for important information regarding configuring communications ports for *emPower* ® software.

When the device is added to the system configuration the user is prompted to select a host device. Select an existing communications port if the hardware is connected to an existing port, or select <new> Serial Port to configure a new communications port.



Use the Select a Communication Port and Protocol dialog to select both the serial communication port that the hardware is connected to and the protocol. The NHR PWM Generator requires a user defined serial port. Choose USER DEFINE as the protocol.

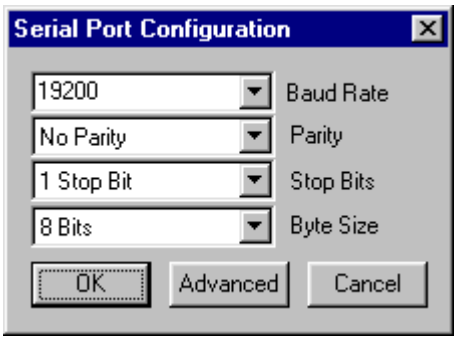
Refer to the NHR PWM Generator Hardware Reference Manual for additional information on user defined protocol parameters.

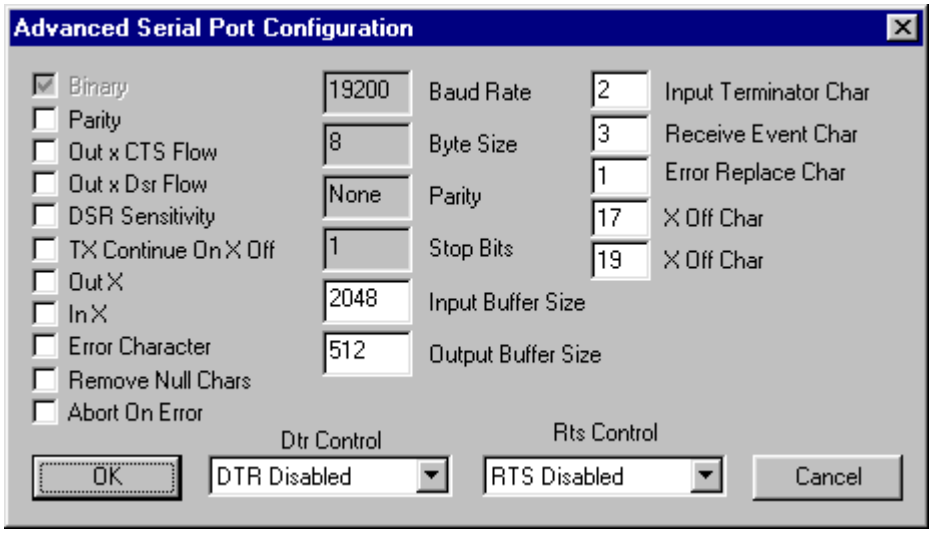


The basic parameters for the USER DEFINE protocol are now displayed for selection. The NHR PWM Generator requires a 19200 Baud rate, No Parity, 1 Stop Bit and 8 bit data (19.2 Kbaud 8N1).

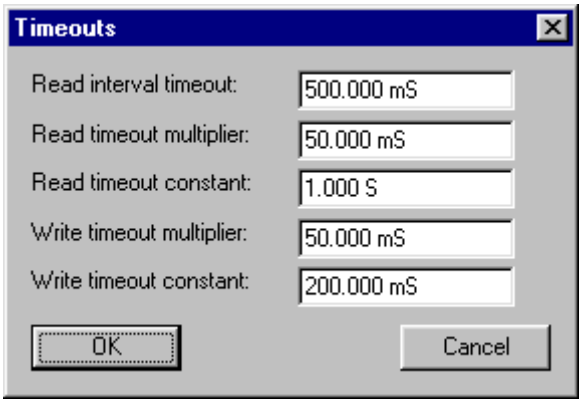
Choose the desired parameters from the combo boxes and click OK. Additional communications parameters are available on an advanced dialog, but the default values are appropriate for the NHR PWM Generator. The advanced dialog is shown below with the default values that the NHR PWM Generator requires.

The Advanced Serial Port Configuration dialog is displayed when the user selects Advanced on the Serial Port Configuration dialog.





The Timeouts dialog is presented. Default values are appropriate for the NHR PWM Generator. Click OK to continue.

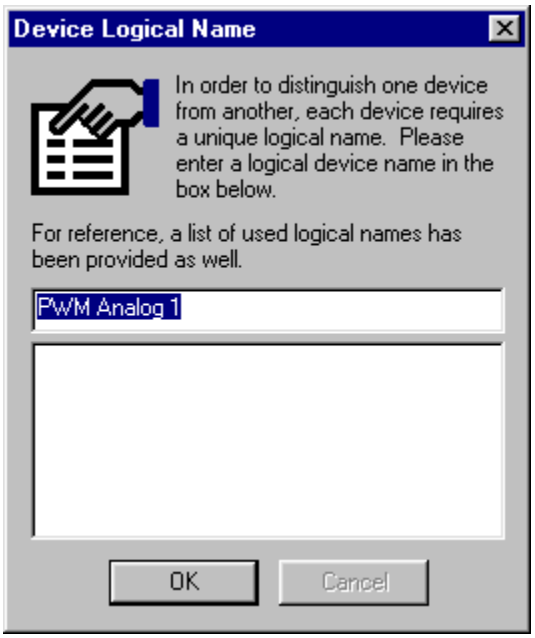


5.1.3 Configure the Device

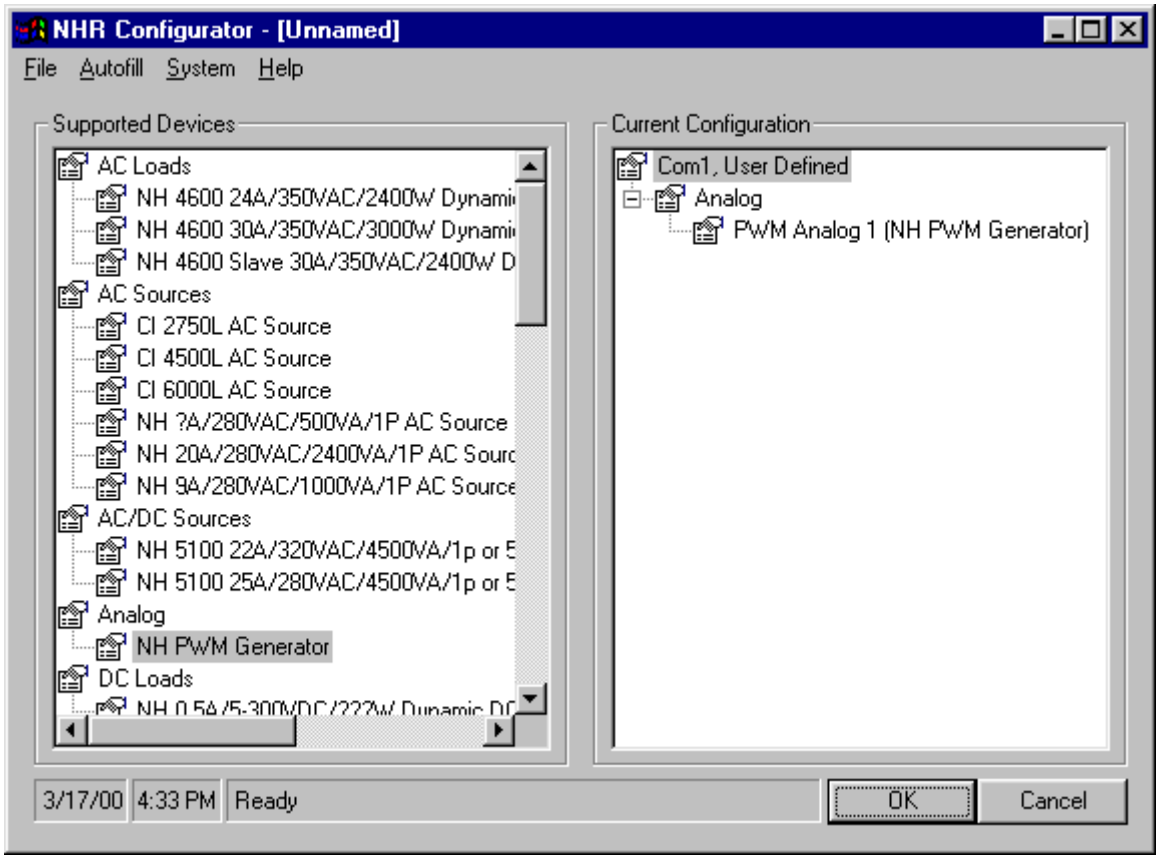
The NHR PWM Generator does not require any additional user configuration. A completion message is displayed indicating the NHR PWM is configured. Click OK to continue.

5.1.4 Logical Device Names

Next the user is prompted to enter a logical device name for the analog device. This is the name that will be used to designate the analog device when developing test programs.



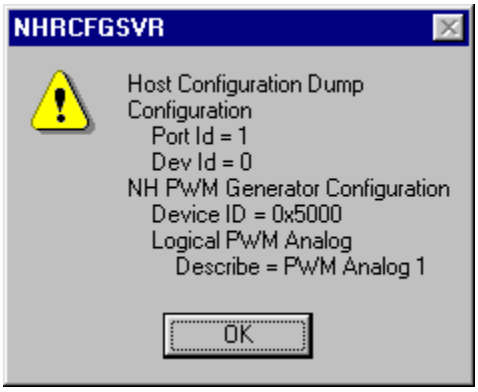
The configuration file contents are displayed with the NHR PWM Generator logical device being displayed under the COM1, User Defined Host Description.



In NHR Configurator click File, then click Save As… to save the configuration file. In NHR Configurator click File, then click Set to Default… to set this configuration as the default configuration for *emPower*®.

5.1.5 Host Configuration Dump

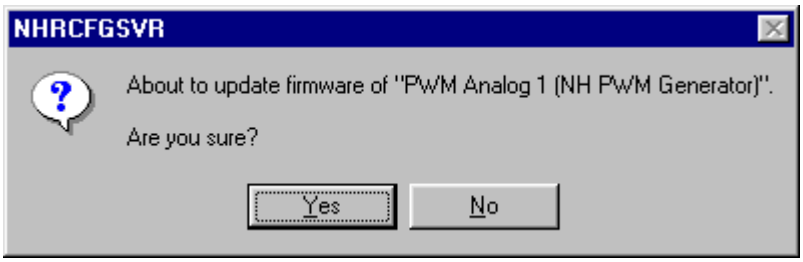
Diagnostic data regarding the current configuration is available from the context menu on a device in the configured device pane. Launch the NHR Configurator. The configuration manager main window is displayed. Now locate the NH PWM Generator logical device in the current configuration list. Select the NH PWM Generator logical device and select Dump Configuration… from the context menu to create an informational message with details of the logical device's configuration.



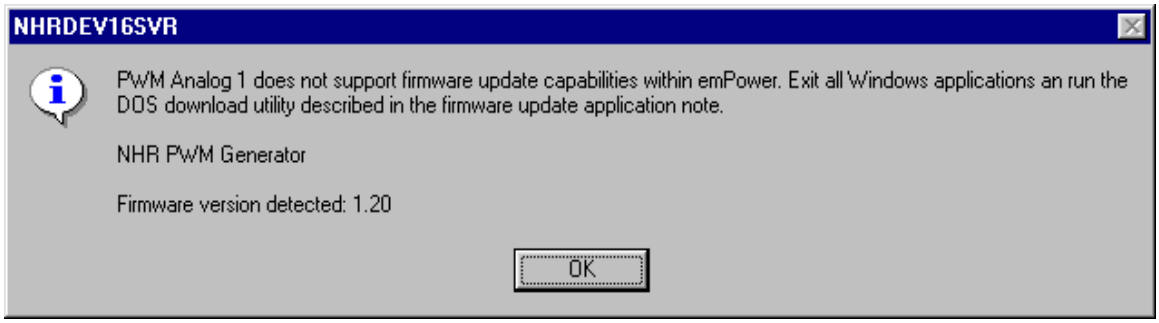
5.1.6 Update Device Firmware

Update the firmware if the NHR PWM Generator *emPower* ® Driver was received as an update to the current NHR PWM Generator. The latest firmware files are located in the update directory. The number of times that the firmware can be updated is limited, so perform the update only when necessary.

Launch the NHR Configurator. The configuration manager main window is displayed. Now locate the NH S6K PWM Generator logical devices in the current configuration list. Select the NH PWM Generator logical device and select Update Firmware… from the context menu.



An informational dialog is presented to remind you that you have selected a firmware update function. Select Yes to continue.



The NHR PWM Generator reports the current version detected in the hardware, but instructs the user to use the DOS download utility. Select Ok to continue.

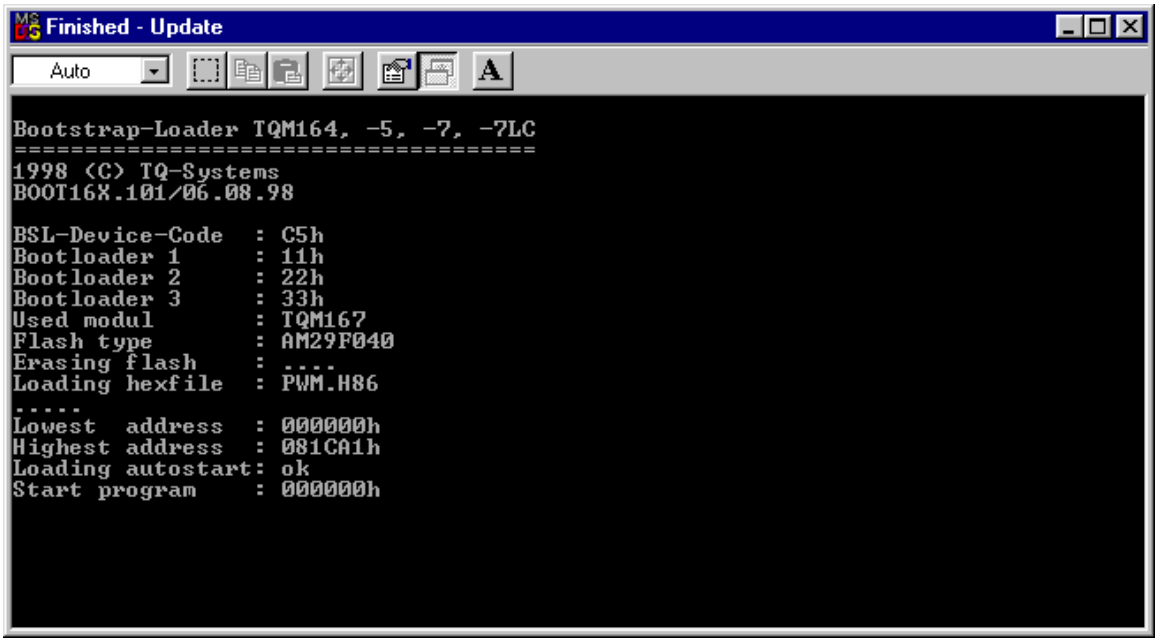
5.1.7 DOS Download Utility

To update firmware 1905348 in NHR ASSY, perform the following tasks:

- **Use the Update Firmare option in the configuration menu to verify the current PWM hardware firmware revision level.**
- **Exit all *emPower* ® programs.**
- **PowerEXEC, PowerEDIT, PowerVIP, *emPower* ®, etc. NHRCommDrv must not be running.**
- **Ensure that the NHR ASSY is connected to the host computer serial port COM1.**

  This firmware update is limited to COM1 or COM2 only. Temporary changes to the hardware communications cabling may be necessary. To use COM2, edit update.bat referring to the comments within the batch file.
- **Locate the firmware update files (c:\src\shrike\dev16\pwm\update*.*).**
- **Execute the batch file named update.bat.**
- **Verify the finished DOS task window looks similar to the following sample.**

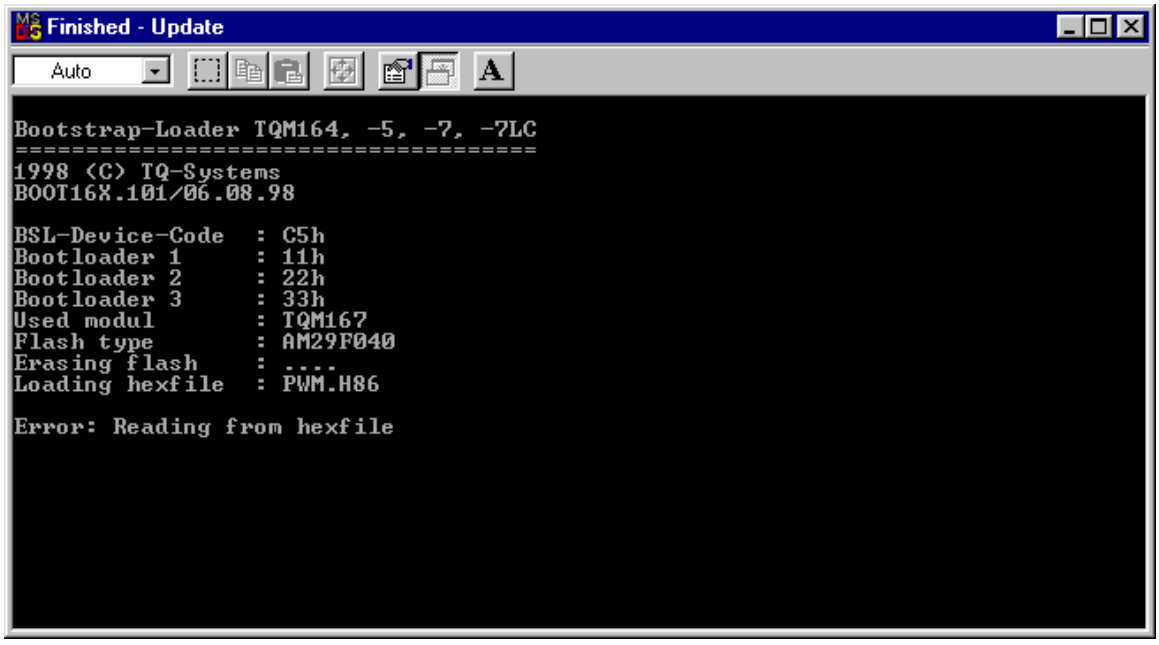
DOS Task window after successful firmware update:



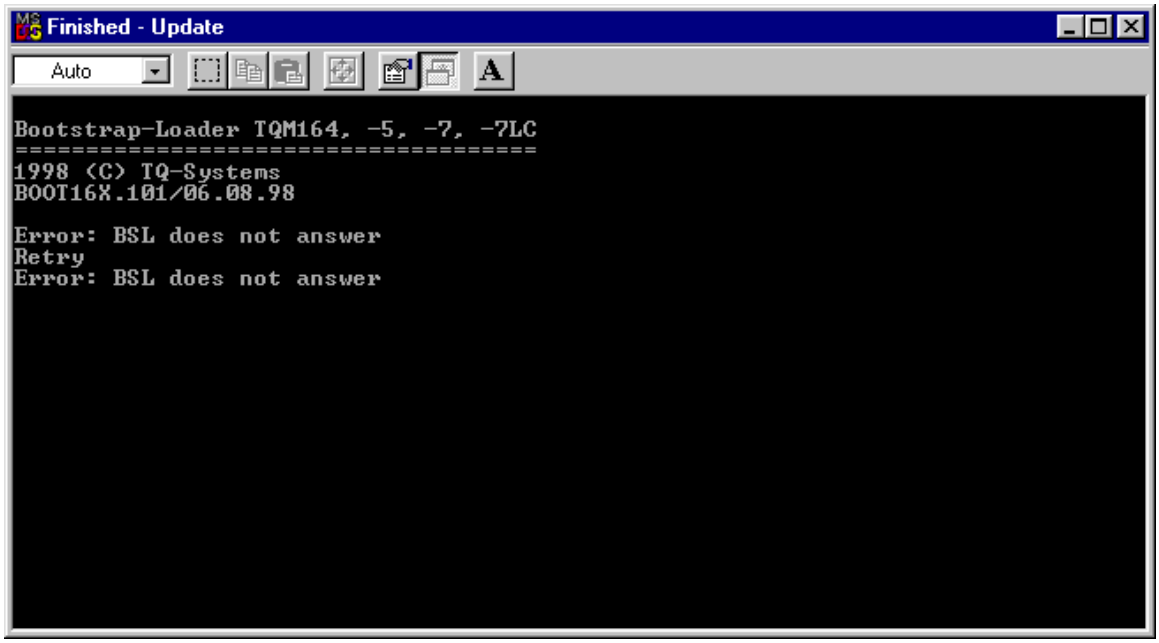
Firmware has been updated. Close DOS Task and start *emPower* ®. Use the UpdateFirmware option in the configuration menu to verify hardware firmware revision level.

5.1.7.1 Troubleshooting DOS Download Utility Message

Ensure that firmware update file is available and in the correct directory.



Ensure that the PWM hardware is powered up and connected to COM1 or COM2.

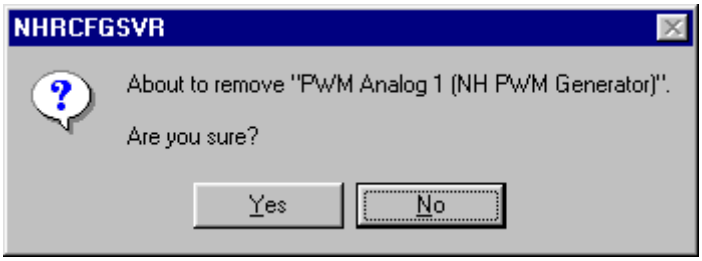


5.1.8 Removing the Device from *emPower* ®

To remove the NHR DMS, logon to *emPower* ® and select Utilities. The *emPower* ® Utilities dialog will be displayed. Select the Hardware tab, then select the Modify Configuration... button.

The configuration manager main window is displayed. Now locate the NHR PWM Generator logical device in the current configuration. Select it then select Remove from the context menu or press the Delete key.

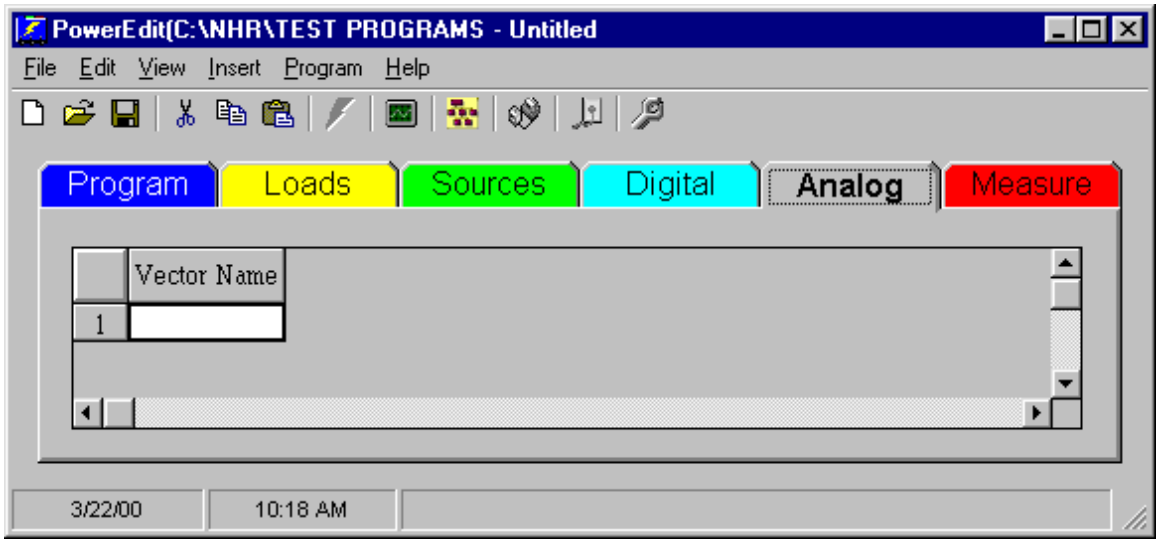
An informational dialog box is displayed to confirm the removal of the device.



After responding Yes to the confirmation message, the NHR PWM Generator device is removed from the configuration. Click OK to close the NHR Configurator dialog.

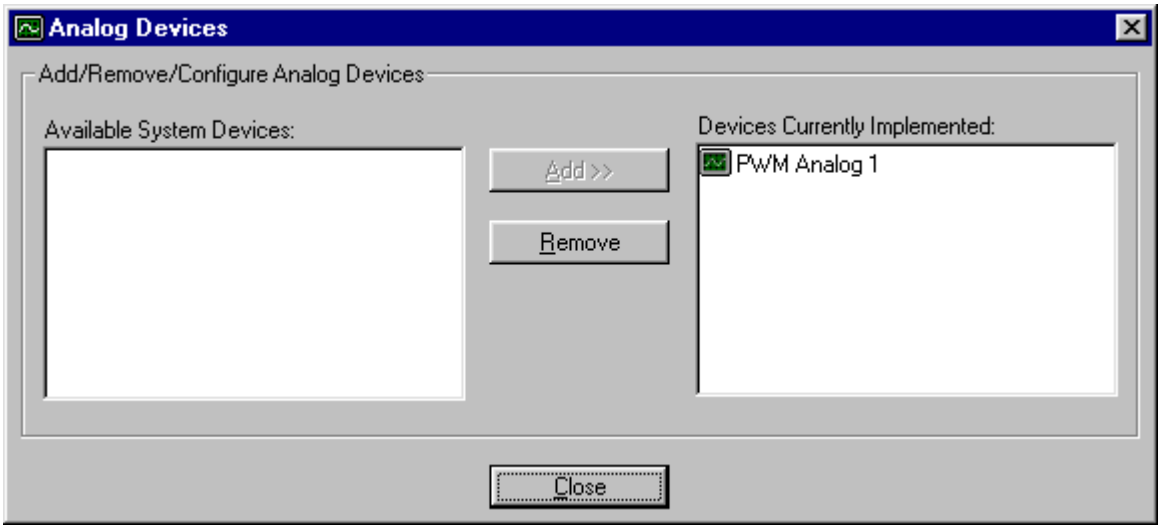
5.2 Operation

After adding the device to the configuration the user is able to start developing test programs. Log onto PowerEDIT and either load or create a test program. From PowerEDIT, select the Analog tab.

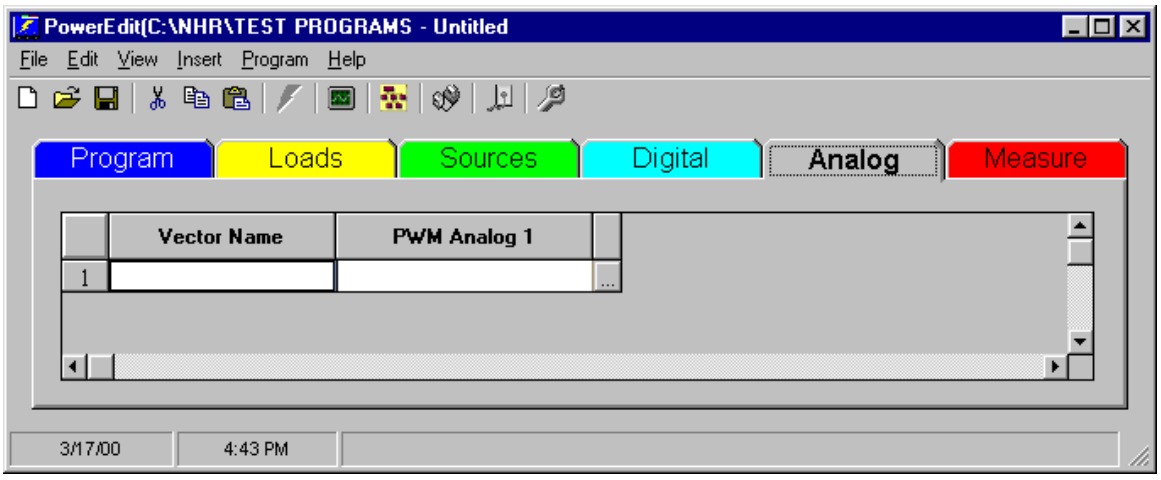


5.2.1 Adding Analog Devices

Select Insert then select Analog Devices… to add an analog device to the test program. Select the desired analog device from the Available System Devices pane and select Add>> to place them in the Devices Currently Implemented. Only these devices will be available in the test program panes. Select Close to return to PowerEDIT.

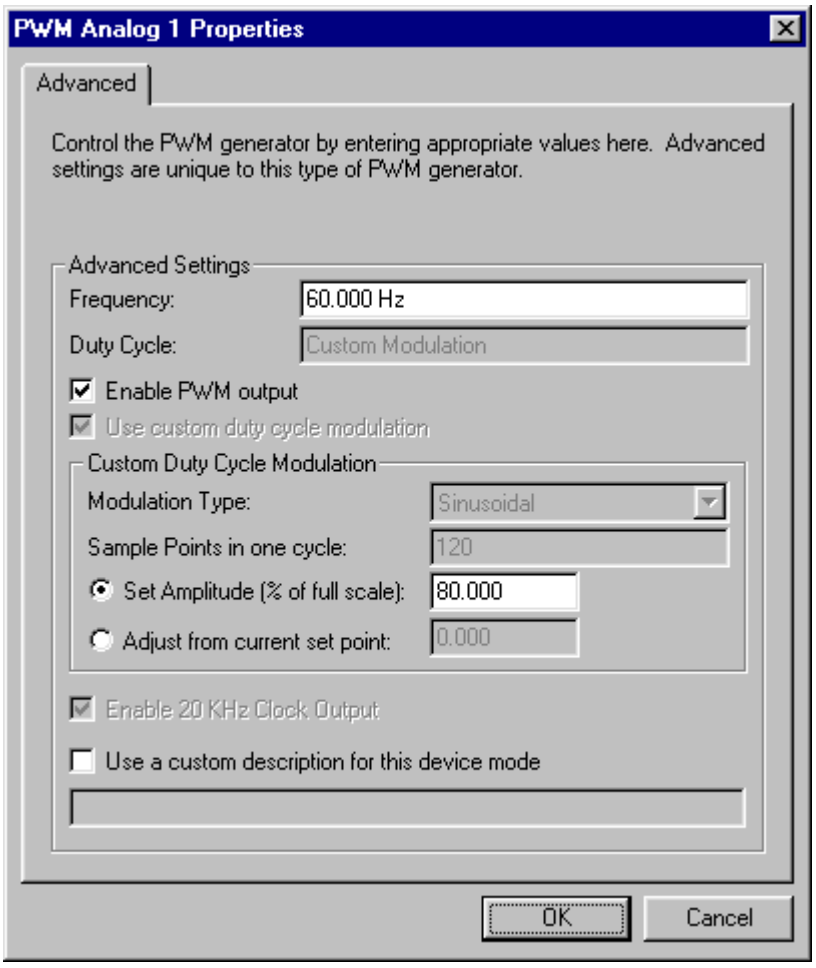


After adding the analog device, a new column is shown in the analog vectors pane of PowerEDIT with a column header that names the analog device.



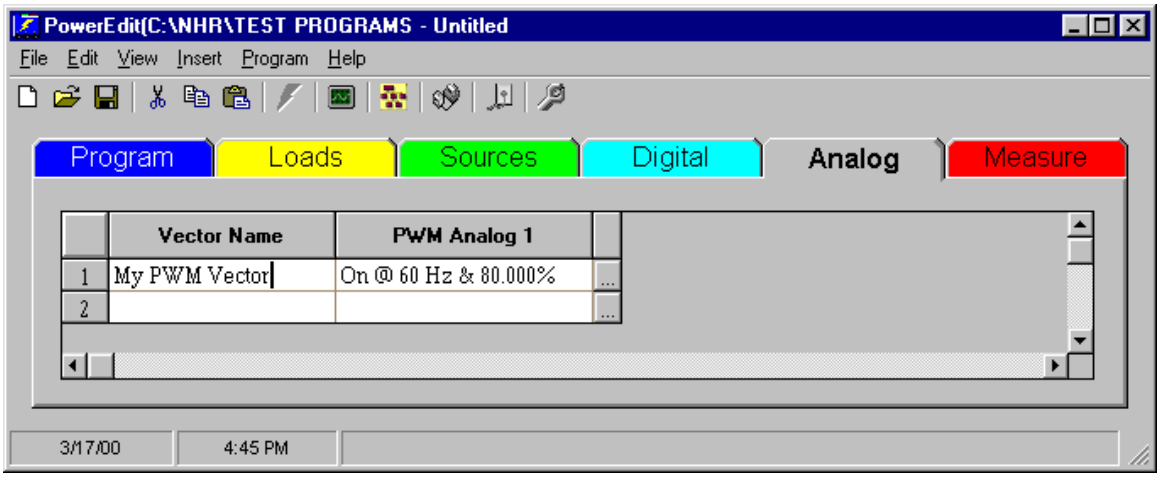
5.2.2 Creating Analog Vectors

Click the ellipses button (…) next to the analog device column (PWM Analog 1) that corresponds to a new vector. This will display the analog device properties page.



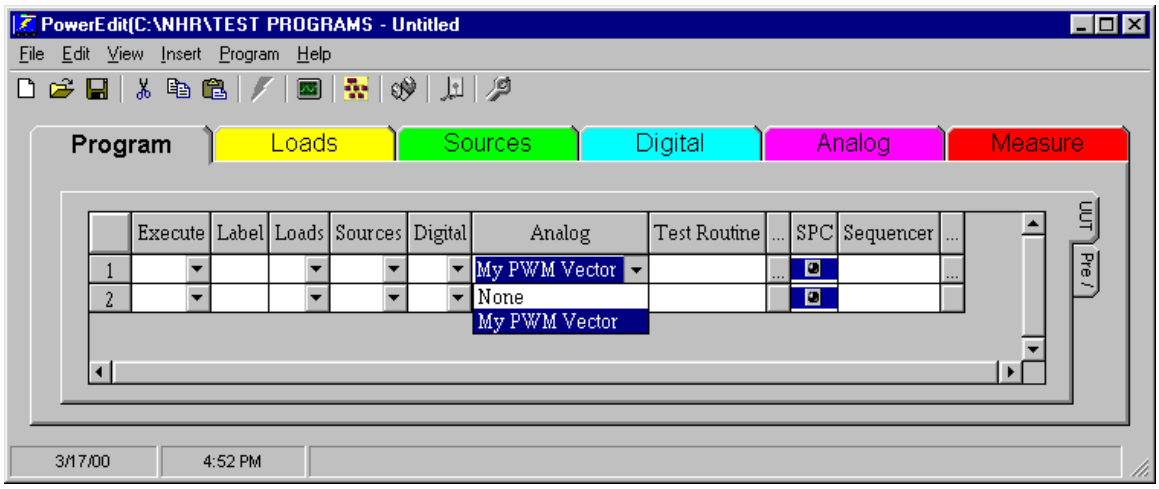
- **Frequency: select the frequency of the output signal in Hz.**
- **Duty Cycle: when custom duty cycle modulation is enabled, this field will show Custom Modulation and may not be changed.**
- **Enable PWM output: select the checkbox to turn ON the PWM output. Unselect the checkbox to turn OFF the PWM output.**
- **Use custom duty cycle modulation: select the checkbox to enable custom duty cycle modulation. This option is currently selected and will not enable changes.**
- **Modulation Type: select the modulation type from the combo box drop down list. Available types are: Sinusoidal. This selection may not be changed.**
- **Sample Points in one cycle: select the number of sample points in one cycle. This selection may not be changed.**

- **Set Amplitude (% of full scale): select the amplitude of the PWM output as a percentage of full scale (0 – 100).**
- **Adjust from current set point: select an adjustment of the amplitude from the current set point. This is also entered as a percentage of full scale (0 – 100).**
- **Enable 20KHz Clock Output: select the checkbox to turn ON the 20KHz clock output. This option is currently selected and may not be changed.**
- **Use custom description for this device mode: select the checkbox to enable the custom description text to be used in the analog vector description of this set of properties. If not enabled, the device driver will create a descriptive string to describe the vector (e.g. On @ 60 Hz & 80.000%) shown in the analog device column.**

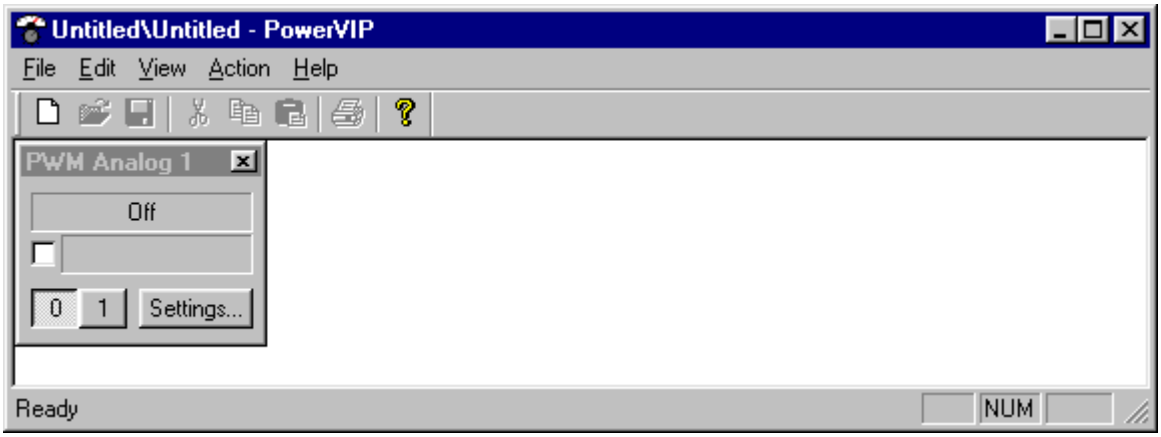


5.3 Using Analog Vectors

To use an analog vector in a test program, select the Program tab of PowerEDIT and then select the Analog drop down on a desired test step row. The drop down will show the vectors defined on the Analog tab and any one may be selected to execute on the current test step. Analog vectors are executed after the digital vectors, but before the test routine.



5.4 PowerVIP



PowerVIP creates a virtual instrument panel window for each logical device found in the current configuration. The Analog Device VIP window represents the NHR PWM Generator.

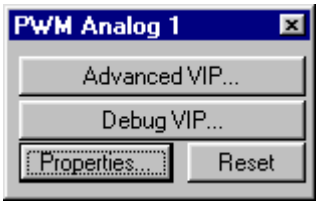
5.4.1 Analog Device VIP

The initial Analog Device VIP window has four main areas:

- **The topmost text box is reserved for a description of the current hardware state. Descriptive text here always represents the current state of the hardware and will be text like: Off or On @ 60 Hz_80.000% or the custom description enabled in the properties page.**
- **The text box immediately below indicates the state of the synchronization circuitry in the PWM Generator. The PWM Output may be synchronized to an external signal.**
- **Enable the viewing of this status measurement by selecting the enable box in front of the text window. The text here always represents the current state of the hardware and the text will be: <not available> or No Sync or Synchronized.**
- **The On/Off control is located at the lower left corner of the VIP window. The button marked 0 turns the PWM Generator Off. The Button marked 1 turns the PWM Generator On.**
- **The Settings… button displays the analog device settings dialog.**

5.4.1.1 Analog Device Settings Dialog

If the Settings… button is selected, an additional window is added to the collection of VIP dialogs. The controls on the settings dialog enable additional control of the PWM Hardware.



5.4.1.2 Advanced VIP

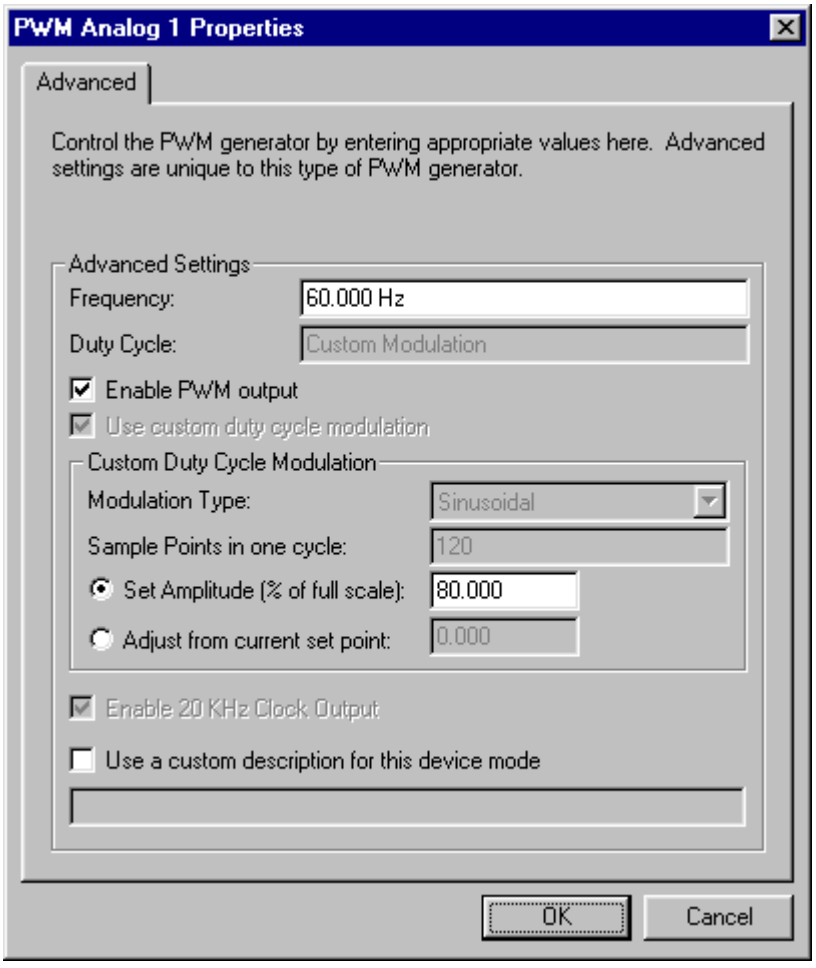
The Advanced VIP… button displays the Advanced PWM VIP dialog. This dialog is not currently supported.

5.4.1.3 Debug VIP

The Debug VIP… button displays the Debug PWM VIP dialog. This dialog is not currently supported.

5.4.1.4 Properties

The Properties… button displays the PWM Properties dialog. This dialog is the same dialog used in creating Analog vectors in PowerEDIT. Refer to section 5.2.2 for detailed information on selecting analog device properties.



5.4.1.5 Reset

Selecting this button will reset the PWM Hardware. Refer to the NHR PWM Hardware Reference Manual for additional information regarding reset of the PWM hardware.

6. S6K DC LOAD

6.1 Installation

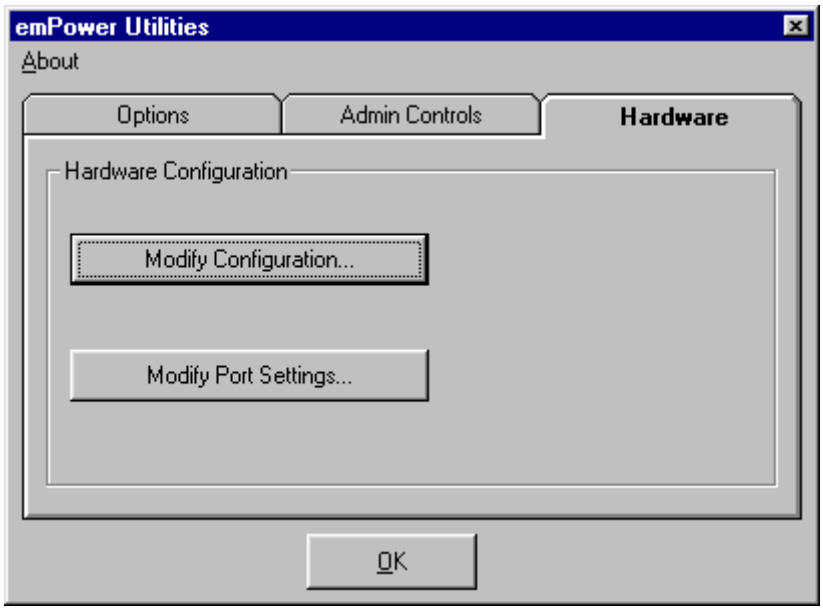
6.1.1 Initial Setup

6.1.2 Adding the Device to *emPower* ®

6.1.3 Online

6.1.4 Offline

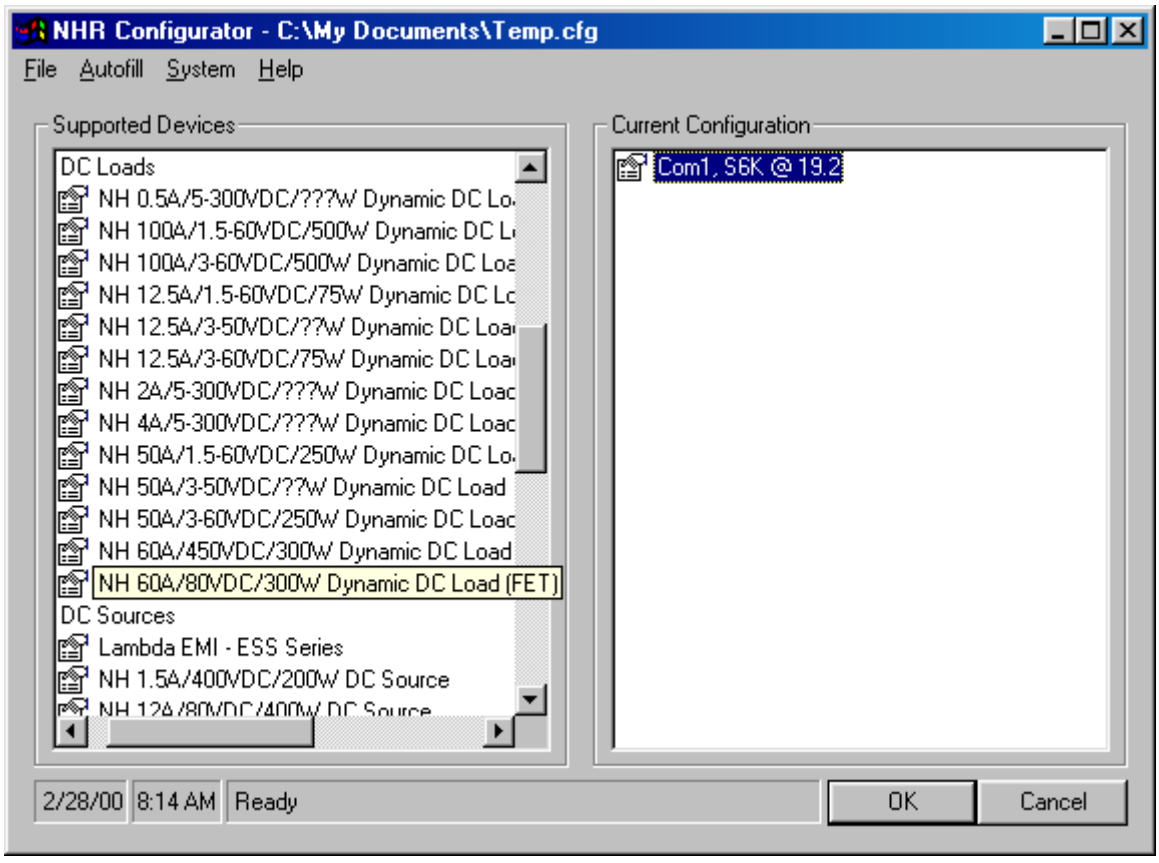
Refer to the S6K DC Load Users Manual. After the device driver is installed, logon to *emPower* ® and select Utilities. The *emPower* ® Utilities dialog will be displayed. Select the Hardware tab, then select the Modify Configuration... button.



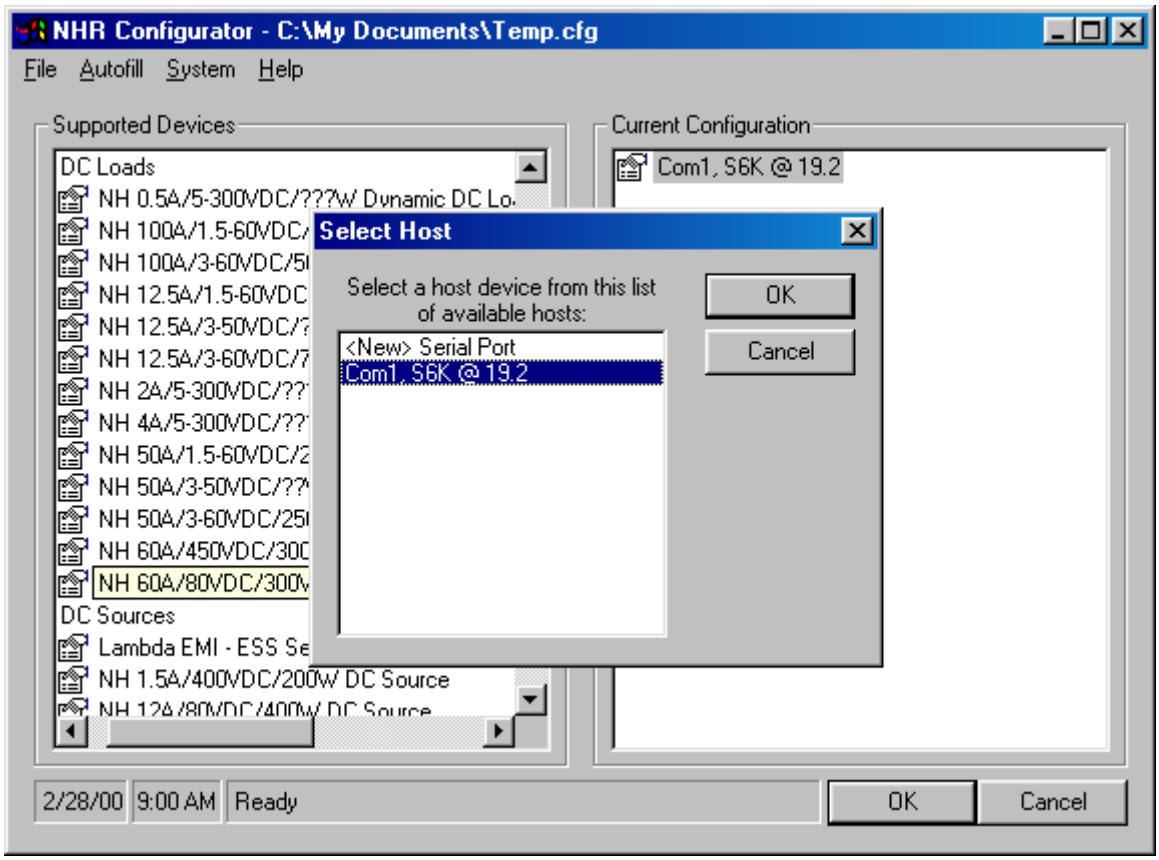
This device driver supports two DC loads:

- **NH 60A/450VDC/300W Dynamic DC Load (FET)**
- **NH 60A/80VDC/300W Dynamic DC Load (FET)**

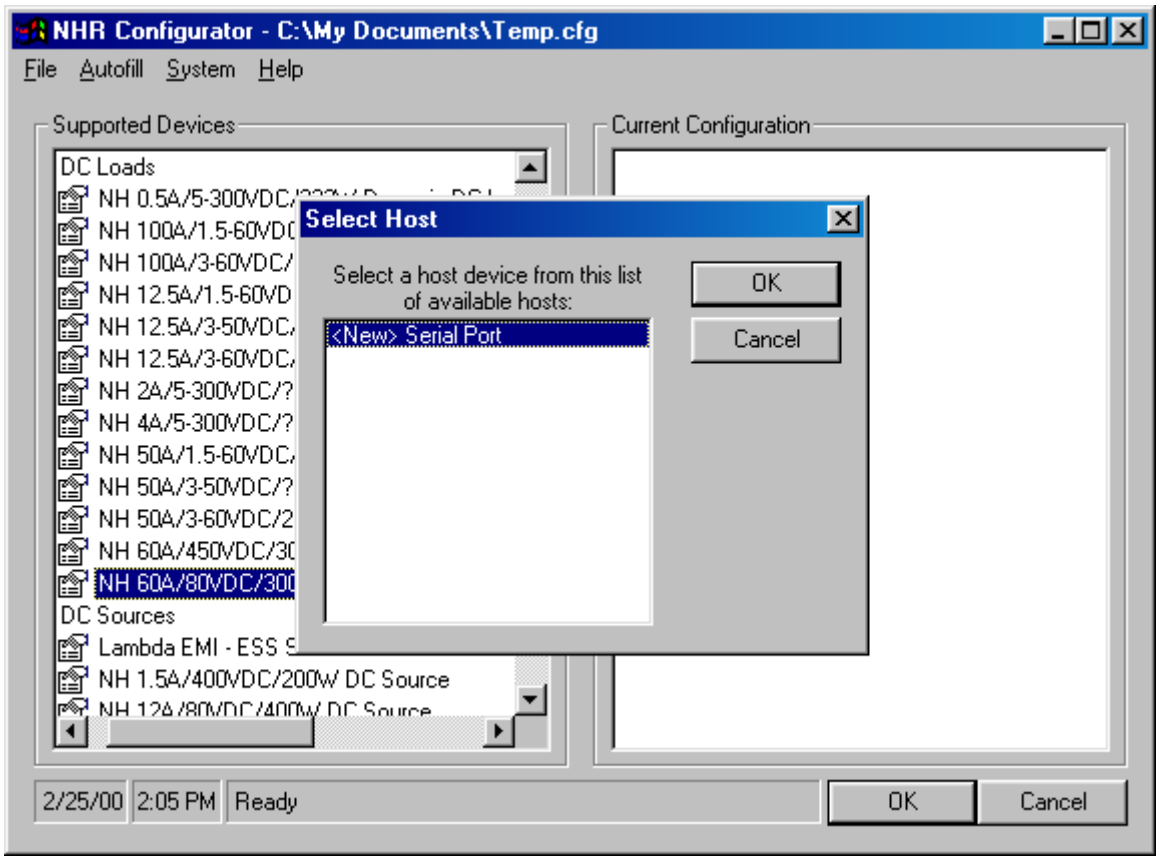
Find the load to be configured in the Supported Devices list. If the host serial port is in the Current Configuration, drag and drop the load onto the port.



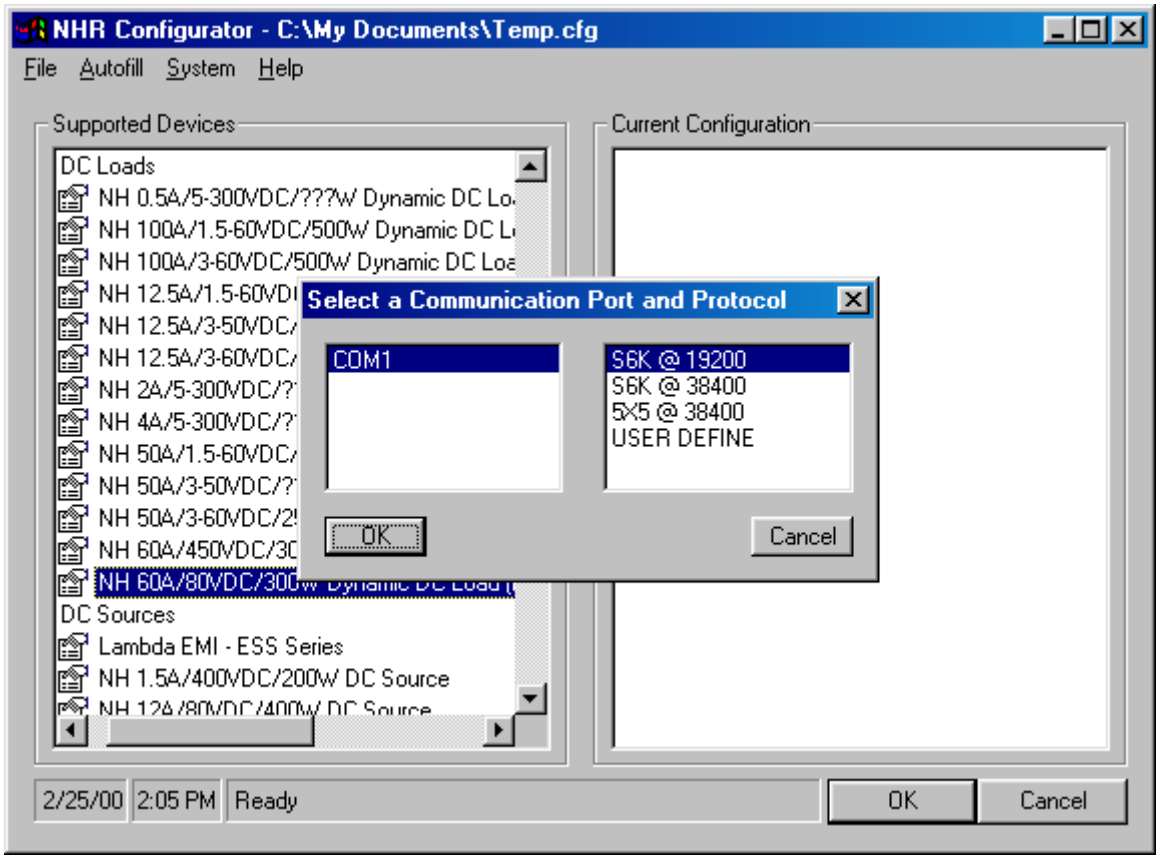
Double-click the load and select the host from the list of available hosts.

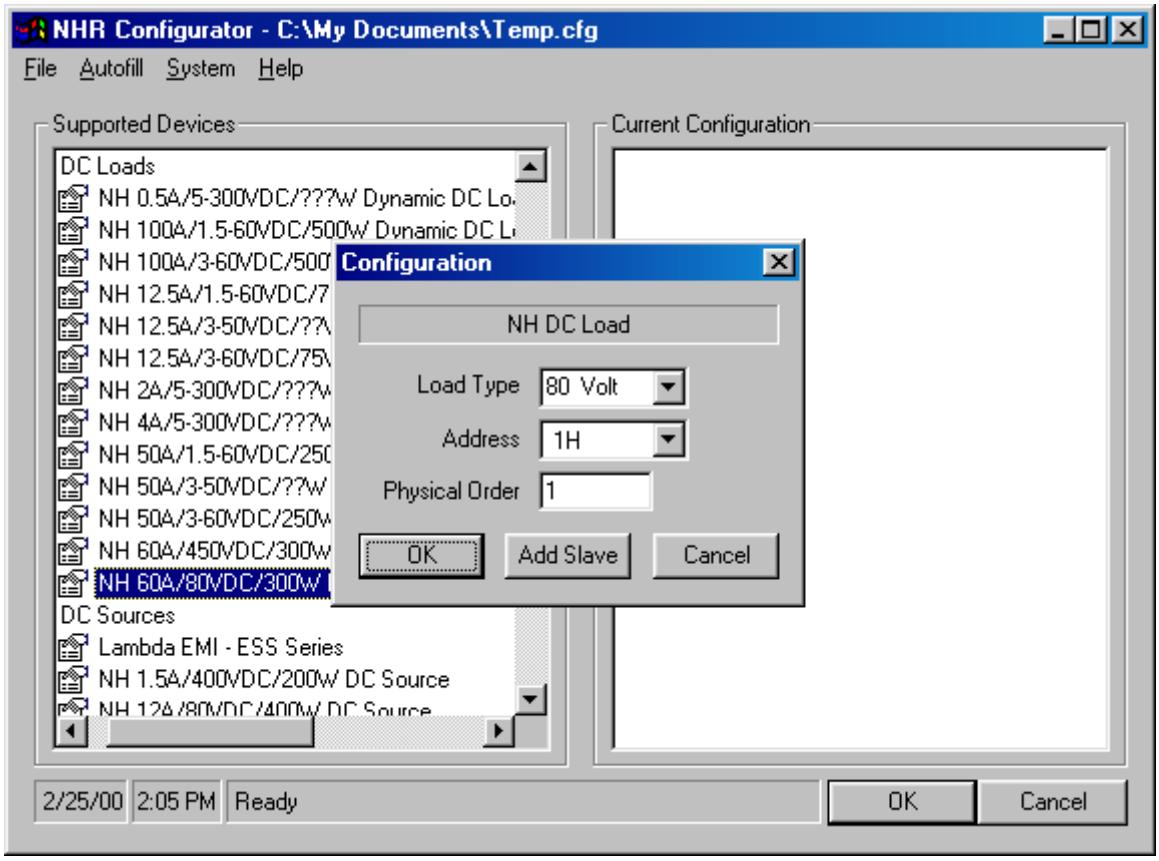


If the host serial port is not in the Current Configuration, drag and drop the load onto the Current Configuration side or double click on the load and select <New> Serial Port from the list of available hosts.



These loads require a serial port configured for S6K protocol at a baud rate of 19200. If the COM port is not in the list, refer to PortConfig documentation to configure the port.

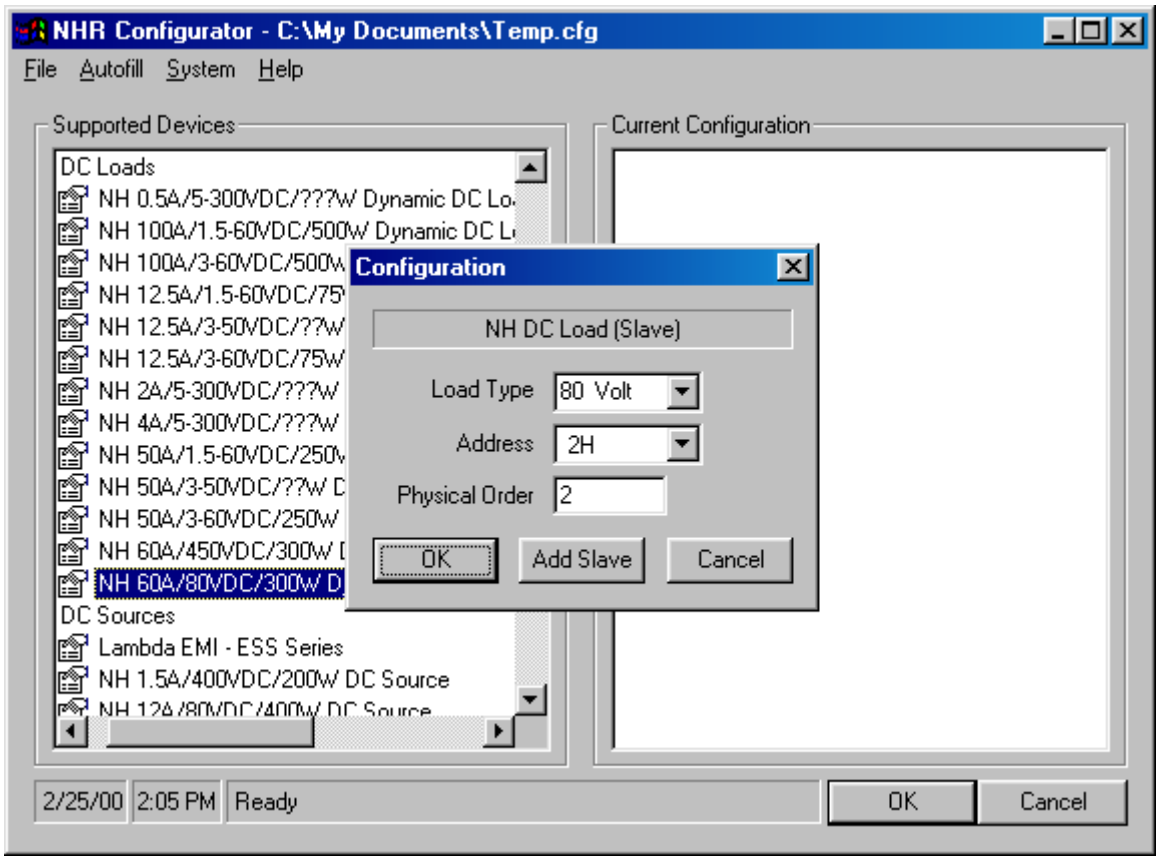




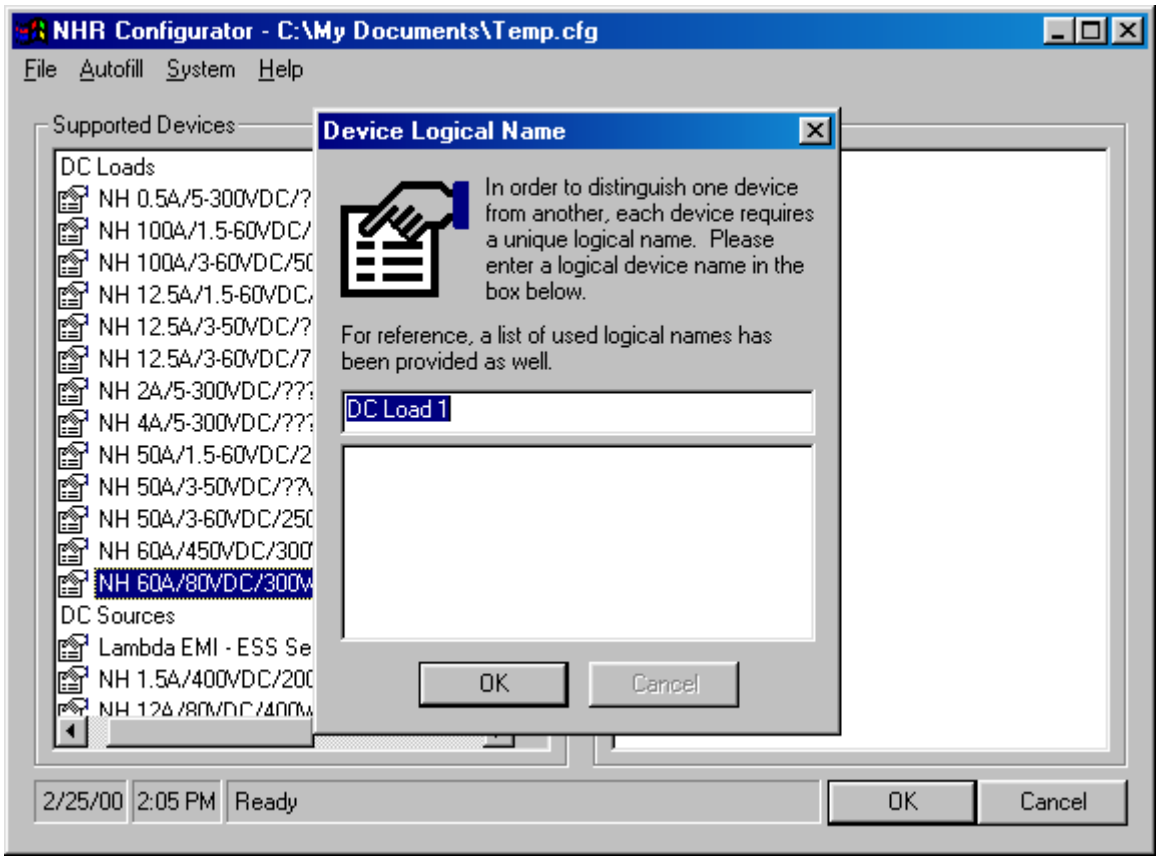
- **Load Type distinguishes between the 80.0 and 450.0 volt loads.**
- **Address is the serial communication address of the load itself. The address is set by dip switches on the underside of the load. For more information on the address, refer to the Load User's Manual.**
- **Physical Order is the zero based index of this load in the daisy chain of serial devices from the serial port. These loads support being paralleled. In order for the paralleling to work, the driver needs to know the order each load found from the serial port.**

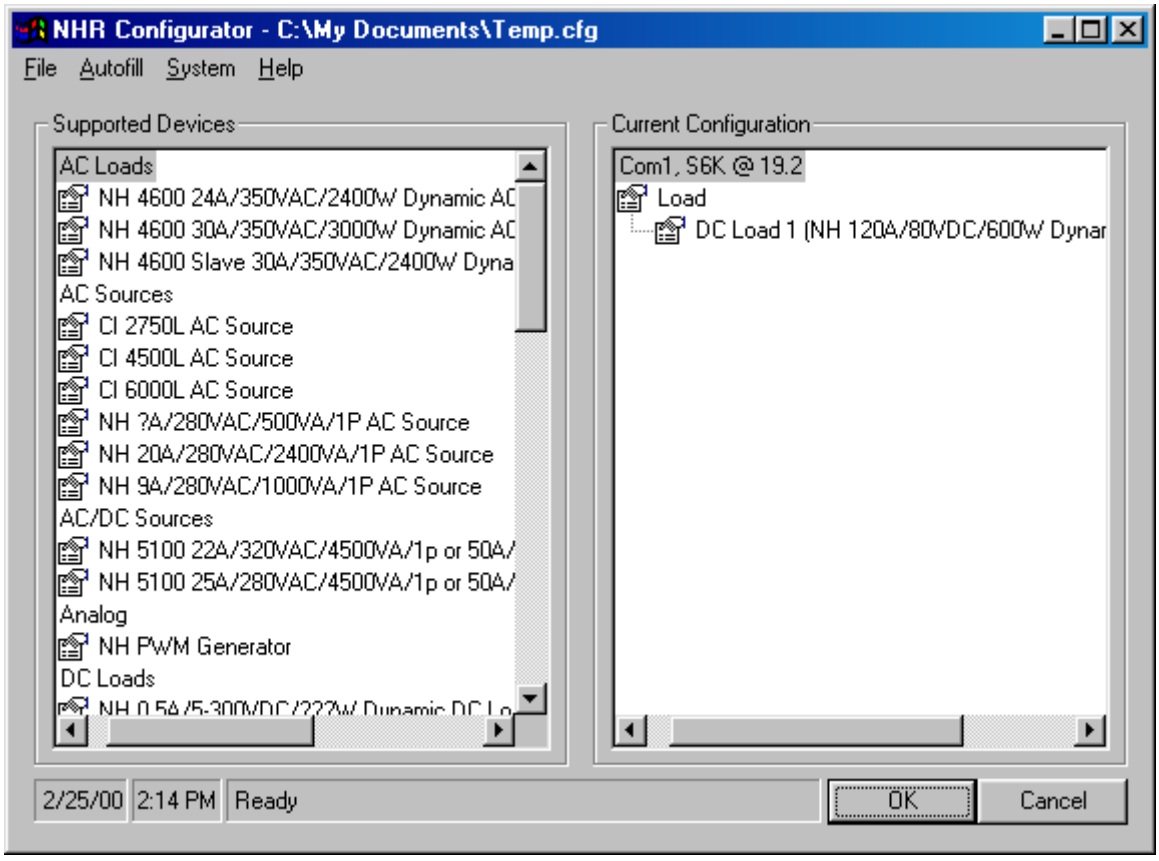
  For example, an RS232 cable comes from COM1 in the PC and connects to an AC Load. The physical order of the AC Load is 0 (the index starts at 0). An IEEE 485 cable goes from the AC Load to an S300 chassis. The chassis has a DC Source and two DC Loads in that order. The physical order of the first DC Load is two.

- **Add Slave button adds single loads to a list of loads that all act as one. Paralleling loads this way makes them paralleled for all programs that use this configuration. Loads can also be programmed as paralleled by PowerEDIT on a program by program basics. Refer to the PowerEDIT users manual for more information.**



The load is now configured and needs a name.





DC Load 1, in this example, is two loads paralleled as one. That is why the description is (NH 120A/80/600W Dynamic DC Load (FET)) rather than (NH 60A/80/300W Dynamic DC Load (FET)).

6.2 Operation

6.2.1 Creating the Measurement Vectors

6.2.2 Defining the UUT Outputs

6.2.3 Making Measurements

6.2.4 Running the Test

6.2.5 Other Considerations

6.3 PowerVIP

6.3.1 Configure Measurements

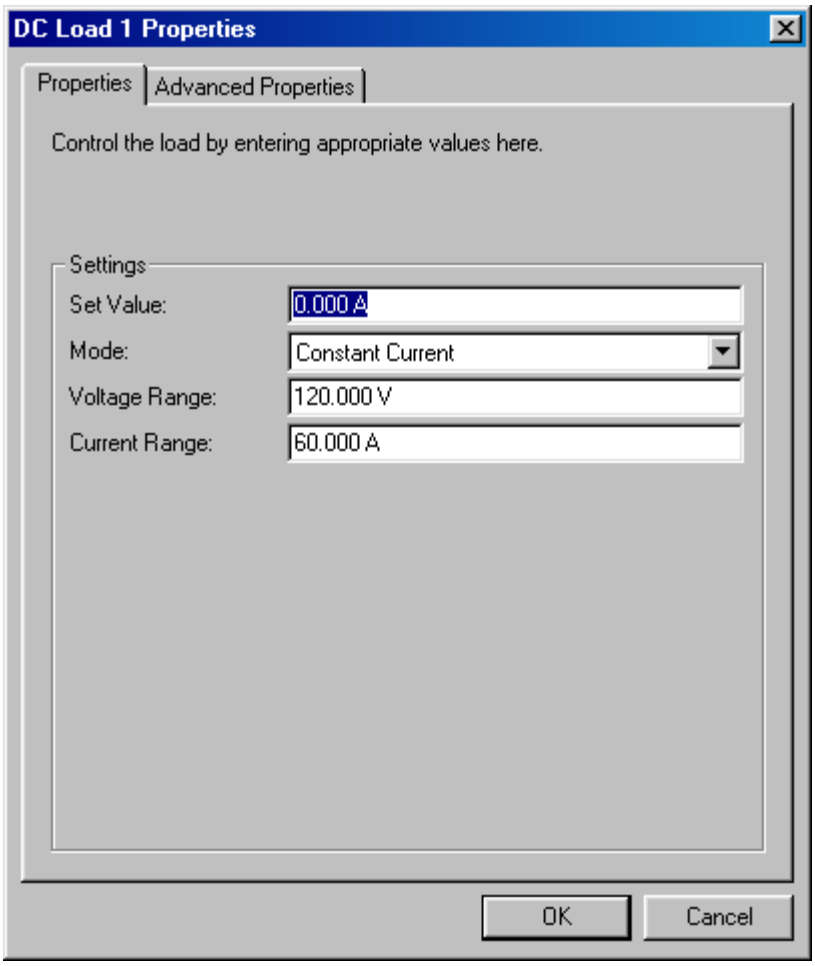
6.3.2 Taking Measurements

6.3.3 Saving and Restoring Configuration

6.4 Programming

Note: See the *emPower* ® Programming Manual for a description of the standard device driver interface functions.

All NHR loads support these four commands: set value, mode, voltage range, and current range.

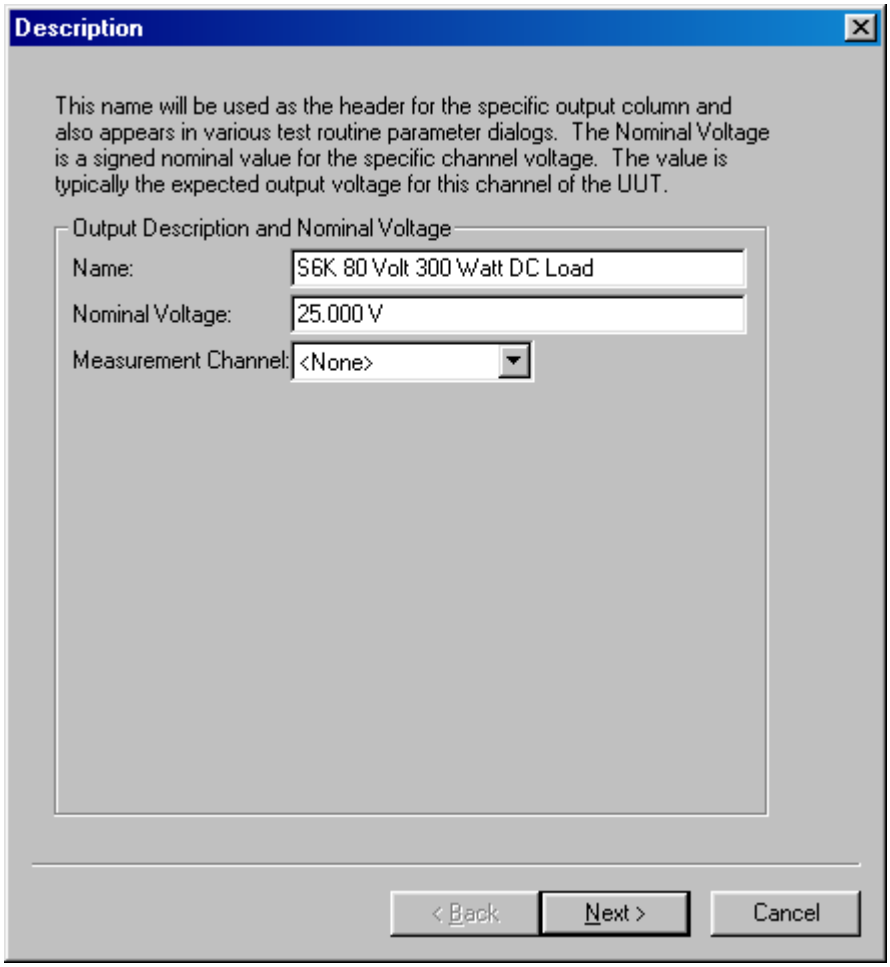


- **Set Value depends on the load operation mode. A value or 10.0 with the Constant Current selected for the mode the load will draw 10.0 amps of current. If the mode is Constant Power, load will draw 10.0 watts. Set Value is not used when the mode is Off or Short Circuit.**
- **Mode is the load's operation mode. This load supports: Constant Current, Constant Power, Constant Voltage, Constant Resistance, Short Circuit, and Off. In Constant Current mode the load will draw the Set Value amps without regard to the voltage. In Constant Power mode to load will draw the current required for the Set Value watts. In Constant Voltage mode the load will draw the current required to lower the voltage to the Set Value volts. In Constant Resistance mode to load will draw a current proportional to the voltage as long as the voltage is less than the programmed Nominal Voltage. When the voltage goes above Nominal Voltage, the load draws a constant current. Nominal Voltage is described later.**
- **Voltage Range is used to set the operating range of the load. This driver supports two loads, a high voltage load and a low voltage load. Both loads have two voltage ranges. The high voltage load's ranges are 450.0 volts and 120.0 volts. The low voltage load ranges are 80.0 and 8.0 volts.**

- **Current Range is used to set the operating range of the load. These loads have three current ranges. The ranges are 60.0, 6.0, and 0.66 amps.**

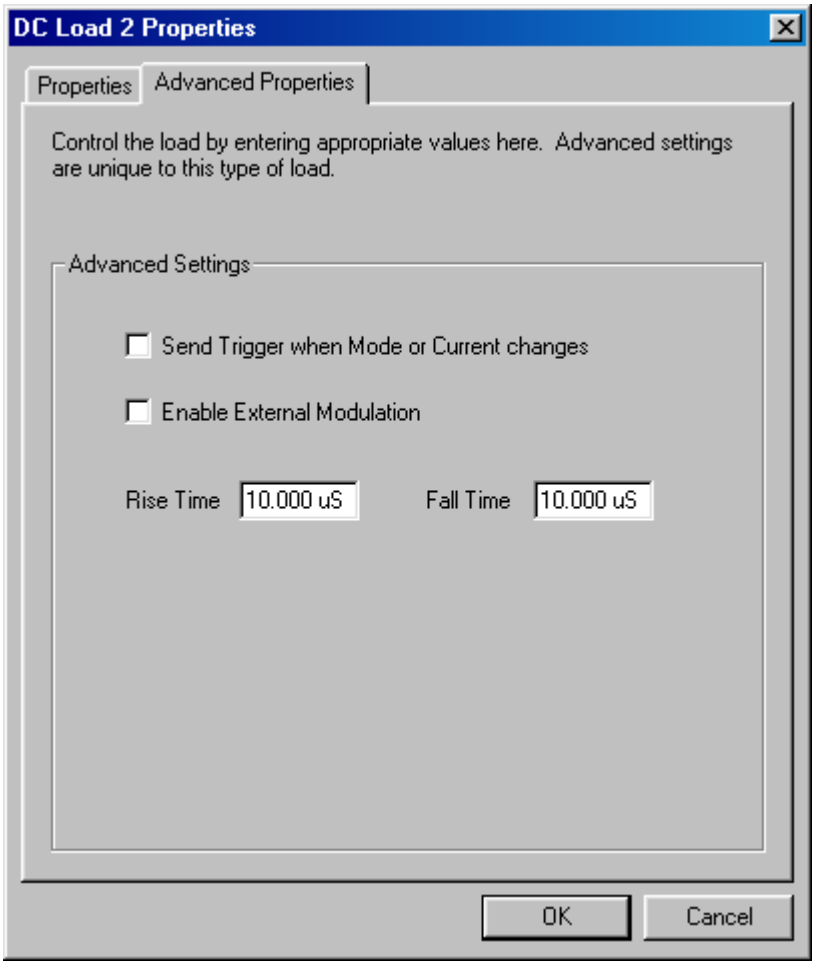
Note: The high voltage load does not enable the 450.0 volts range and the 60.0 amp current range at the same time. Also, the low voltage load does not support the 8.0 volts range and the 0.66 amps range at the same time.

All NHR loads also support Nominal Voltage.

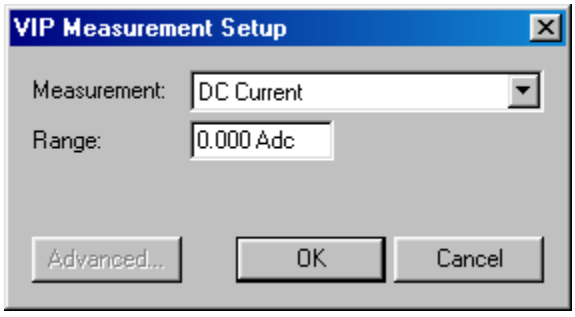


The NHR S6K DC Load uses Nominal Voltage to calculate a maximum current while in constant resistance mode. The load will draw the maximum current if the actual voltage exceeds the Nominal Voltage.

NHR S6K DC Load device specific functions are:



NHR AC Load's measurements are:



Measurements supported: DC Voltage, DC Current, DC Power, and Temperature.

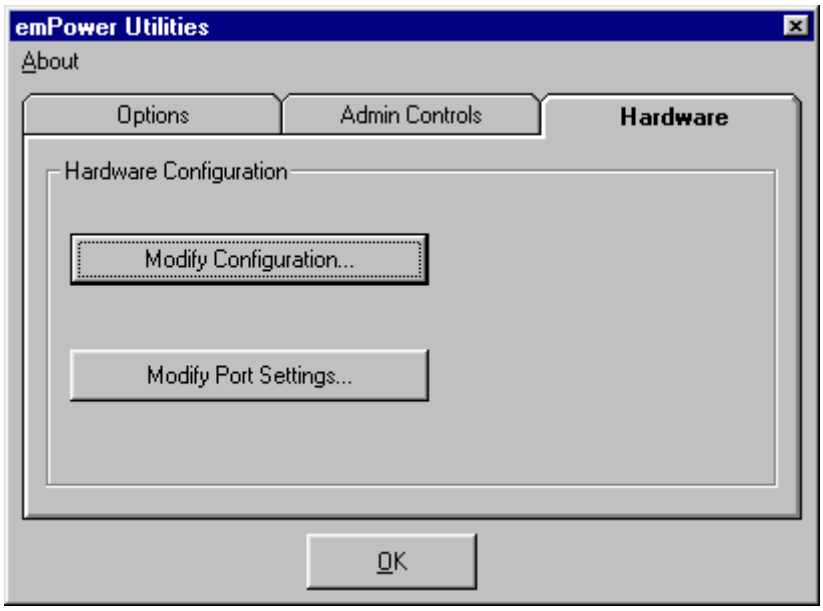
Measurement commands include a measurement range. The NHR S6K DC Load measurement range is not used. For more information, refer to the Load User's Manual.

7. S6K DC SOURCE

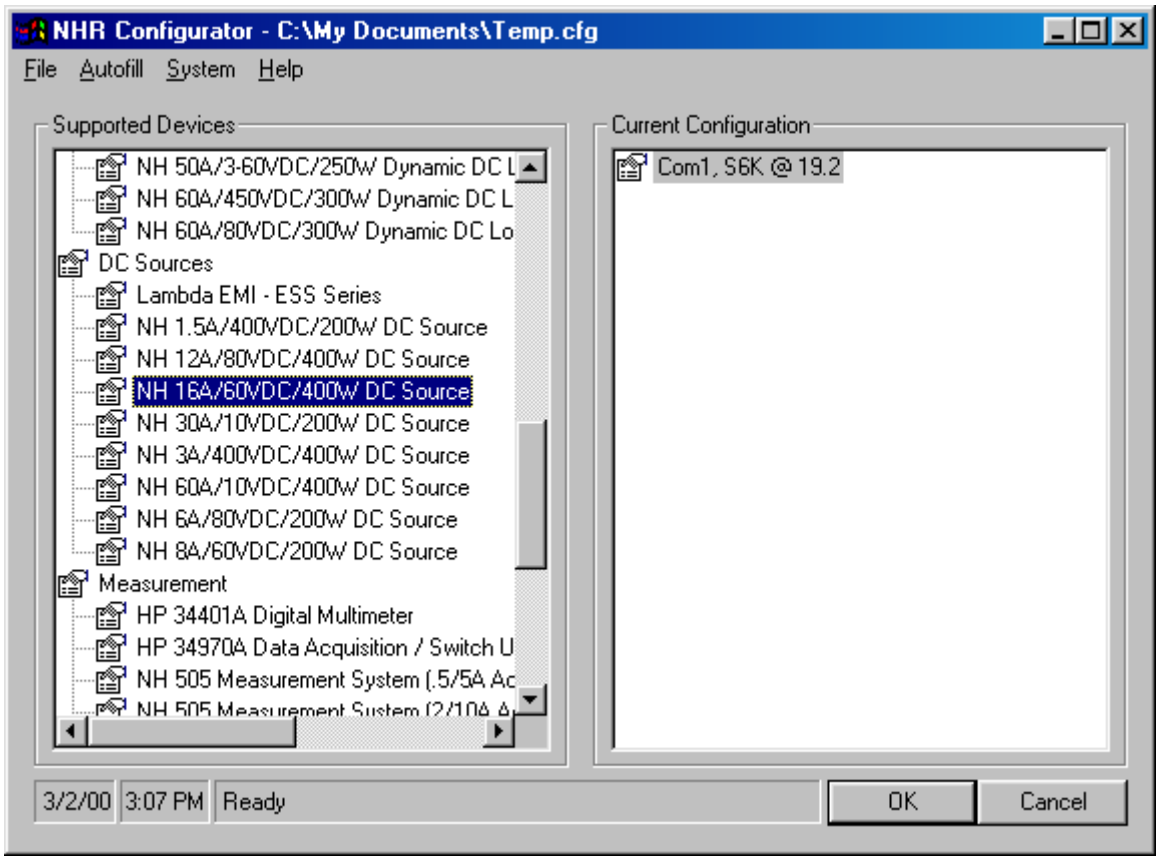
7.1 Installation

7.1.1 Initial Setup

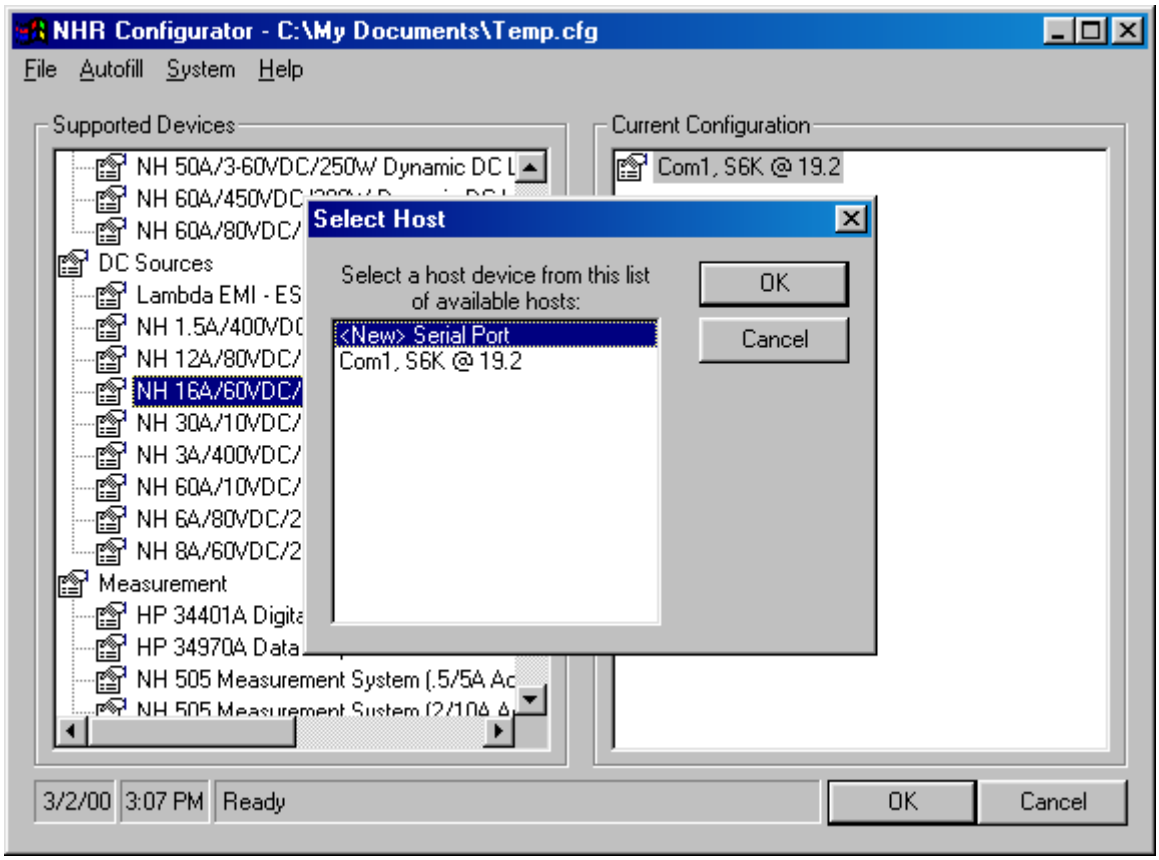
7.1.2 Adding the Device to *emPower* ®



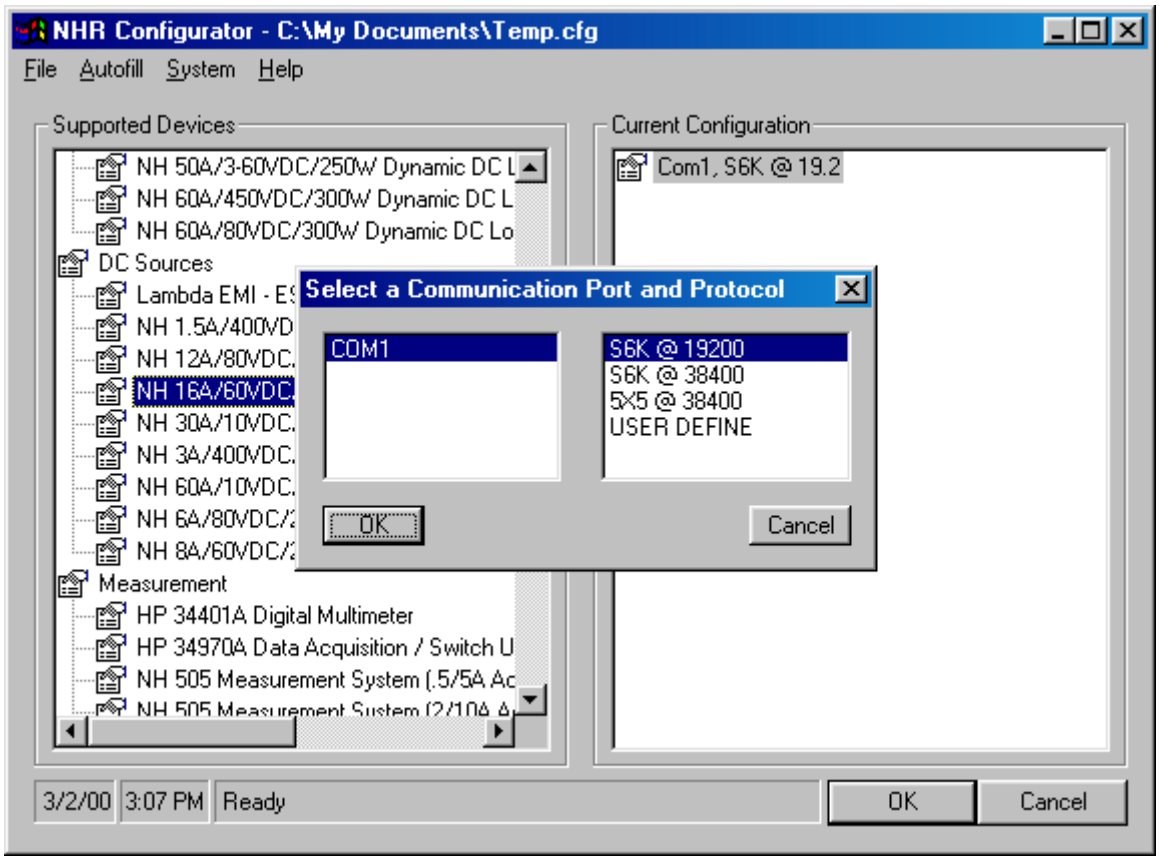
This device driver supports eight different DC sources. Select the source from the Supported Devices list. If the host serial port is in the Current Configuration, drag and drop the load onto the port.



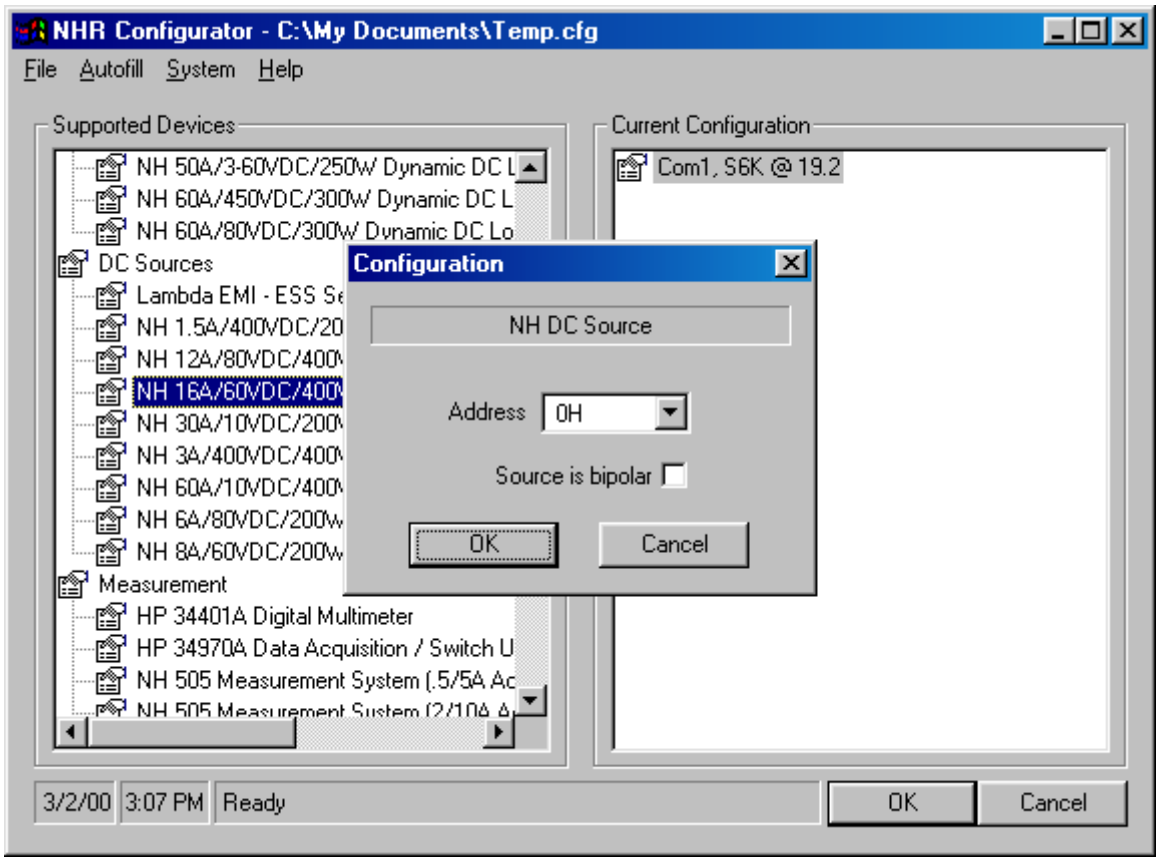
Double-click on the load and select the host from the list of available hosts.



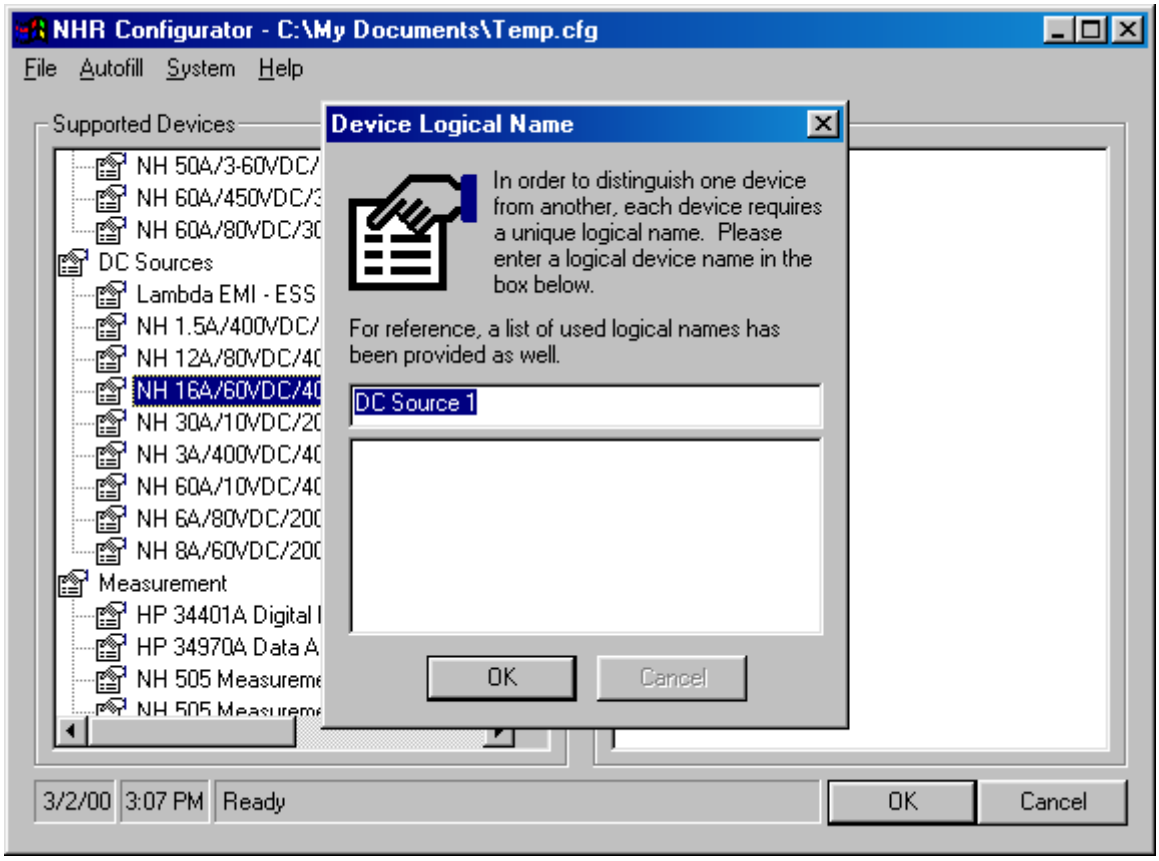
If the host serial port is not in the Current Configuration, drag and drop the load onto the Current Configuration side or double click on the load and select <New> Serial Port from the list of available hosts.



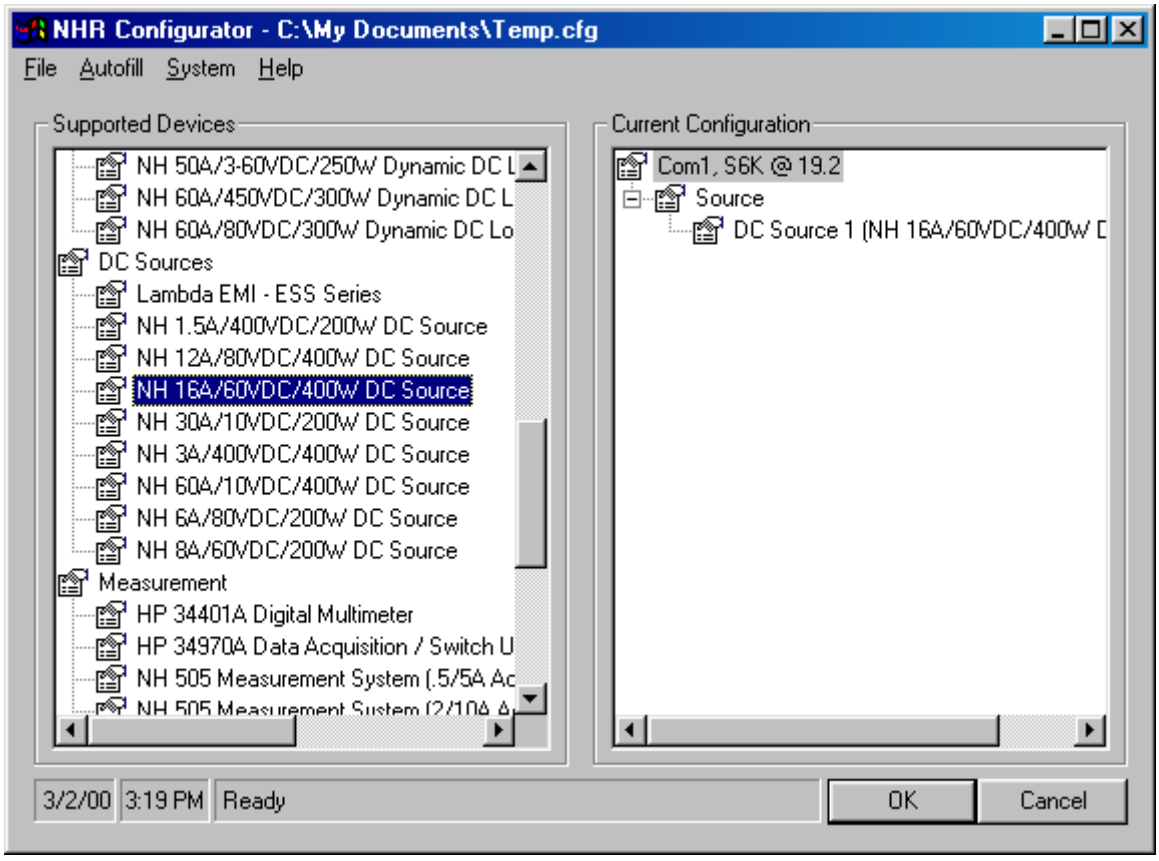
These loads require a serial port configured for S6K protocol at a baud rate of 19200. If the COM port is not in the list, refer to PortConfig documentation to configure the port.



Set the address and if the load supports negative voltages, check the Source is bipolar box.



Enter a logical name.



7.2 Operation

7.2.1 Creating the Measurement Vectors

7.2.2 Defining the UUT Outputs

7.2.3 Making Measurements

7.2.4 Running the Test

7.2.5 Other Considerations

7.3 PowerVIP

7.3.1 Configure Measurements

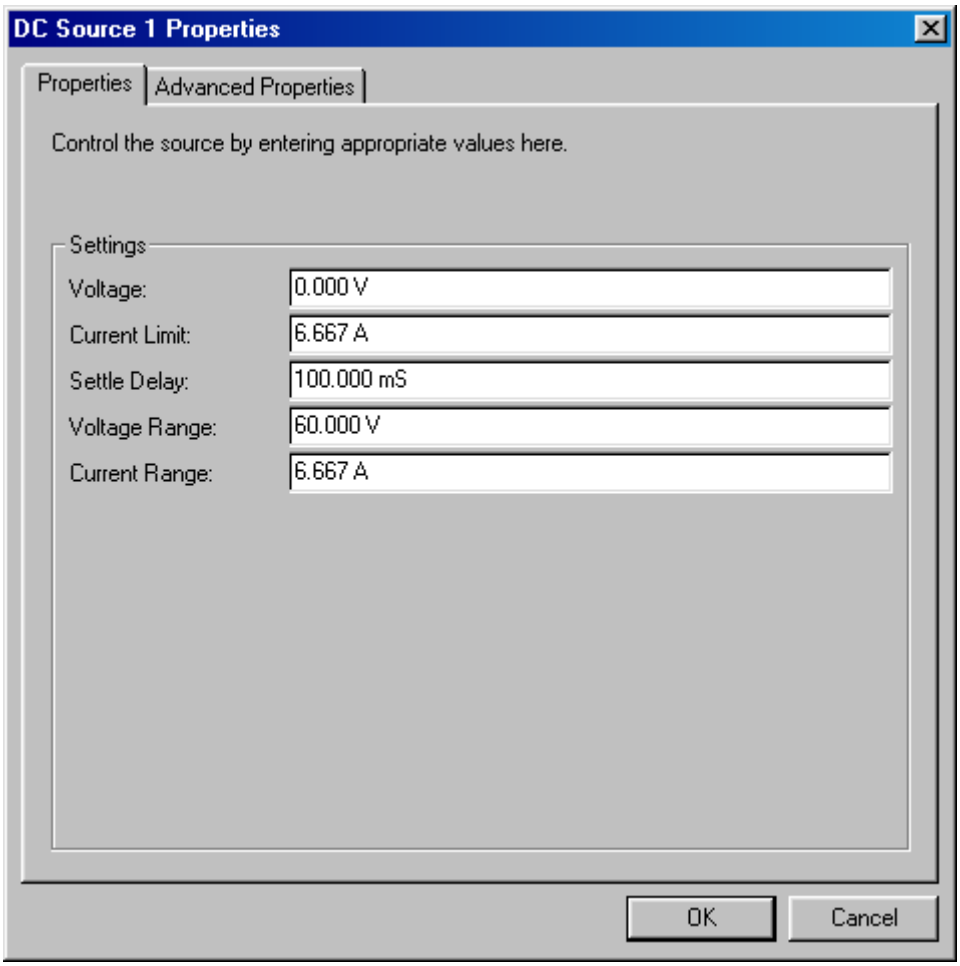
7.3.2 Taking Measurements

7.3.3 Saving and Restoring Configuration

7.4 Programming

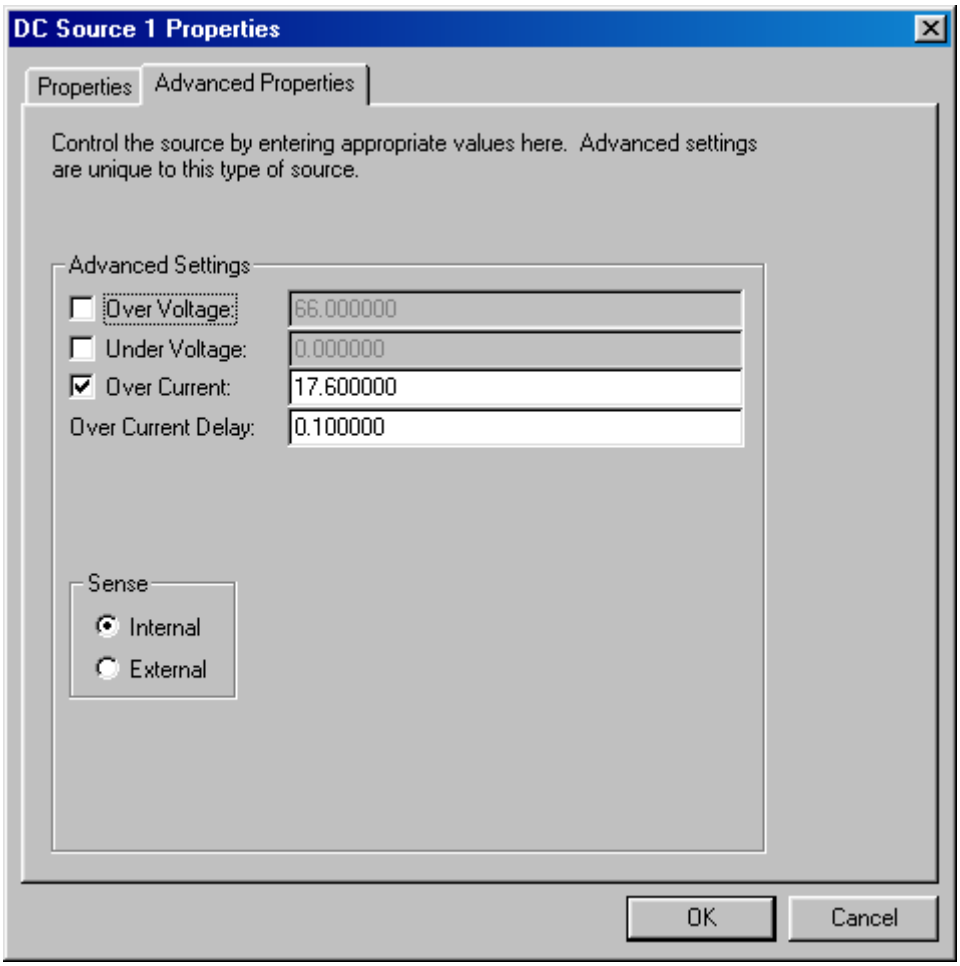
Note: See the *emPower* ® Programming Manual for a description of the standard device driver interface functions.

All NHR sources support these five commands: Voltage, Current Limit, Settle Delay, Voltage Range, and Current Range.



- **Voltage sets the output voltage of the source.**
- **Current Limit sets the maximum current the source will supply. If a device tries to draw more that this current, the voltage will drop.**
- **Settle Delay is length of time the driver will wait after turning on the source before returning so that it has had time to fully come up to voltage.**
- **Voltage Range is only used for error checking. These sources have only one voltage range.**
- **Current Range is only used for error checking. These sources have only one current range.**

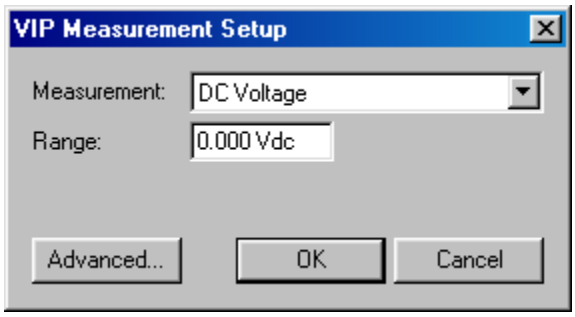
NHR S6K DC Sources' device specific functions are:



- **Over Voltage is the maximum voltage the source can detect and continue to stay on. If an over voltage is detected the source will generate and error and turn off.**
- **Under Voltage is the minimum voltage the source can detect and continue to stay on. If an under voltage is detected the source will generate and error and turn off.**
- **Over Current is the maximum current the source can detect and continue to stay on. If an over voltage is detected the source will generate and error and turn off. If Current Limit is set below the over current value, then the over current condition will never happen.**

If the checkboxes for Over Voltage, Under Voltage, or Over Current are not checked, then those conditions are not tested. Sense for voltage regulation can internal or external. External sense can compensate for voltage drop across wiring.

NHR S6K DC Sources measurements are:



Measurements supported: DC Voltage, DC Current, DC Power, and its Temperature.

Measurement commands include a measurement range. The sources have only one range and the measurement range value is not used. For more information, refer to the S6K DC Source User's Manual.