

# NPRT 2200

## Operation Manual



Module	Version
NPRT 2200	2.32
NprGraph	2.9
SwpEditor	2.00

02/20/2015

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## 1. Introduction

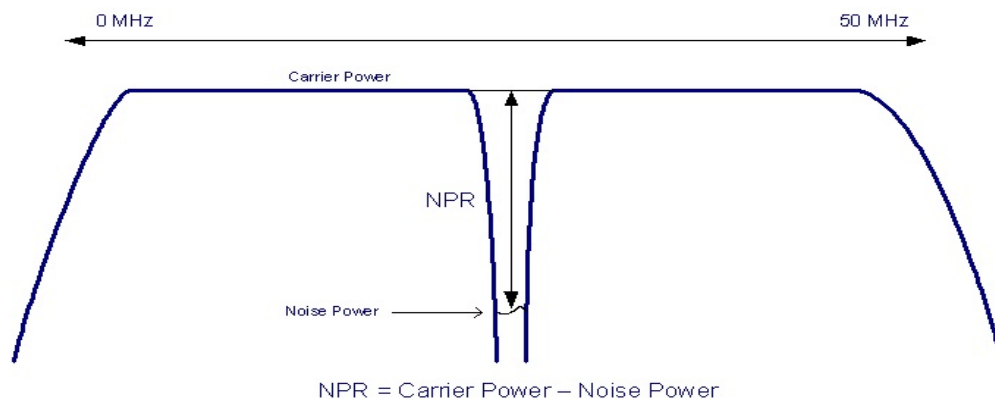
The Noise Power Ratio quantifies performance degradation in active RF components, primarily inter-modulation distortion.

The Applied Instruments Model NPRT 2200 Noise Power Ratio Test Set performs this test for cable return band components and other equipment that operates in one of the available frequency ranges. The available ranges include 5 to 42 MHz and 5 to 65 MHz; other ranges may be available upon request.

The NPRT 2200 operates as a stand-alone device or in conjunction with a PC application software package. The NprGraph Windows™ software is provided with the instrument.

### 1.1. NPR Measurement

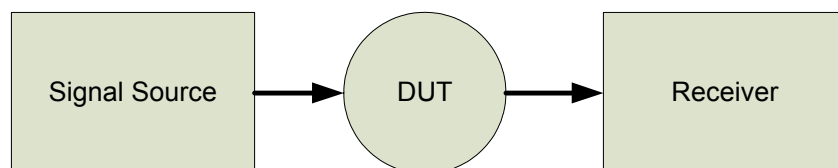
The Noise Power Ratio test compares the power of a carrier signal to the power of the noise generated by signal distortions. The technique uses a deep notch filter to remove a portion of the carrier signal in a very narrow frequency band where the noise power is measured. Then carrier power is measured at the same frequency with the notch filter removed.



### 1.2. NPRT Block Diagram

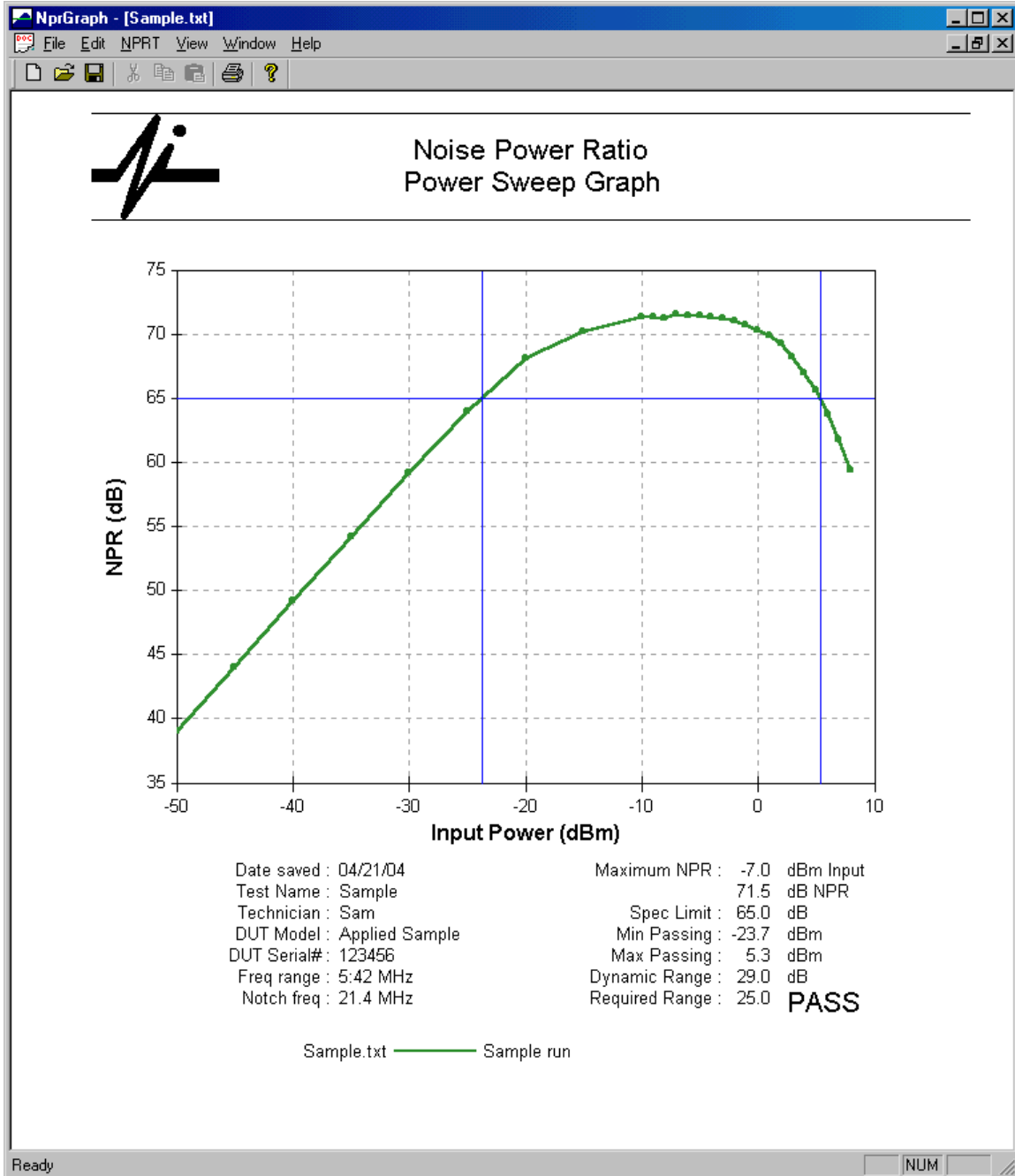
The NPRT 2200 consists of a calibrated signal source that generates a noise signal with a precise power level. This signal is used as the input stimulus to a Device Under Test (DUT). The DUT may be any active RF component that operates in the frequency band of the instrument.

The output from the DUT is measured by the receiver portion of the NPRT 2200, with and without the notch filter inserted into the input signal, and the NPR is calculated.



### 1.3. Power Sweep Graph

In a Power Sweep test, the NPR is measured for a sequence of input power levels. Using a PC, this data can be plotted to characterize the performance of the DUT across its input power range.



The graph includes a horizontal line at a specified NPR limit and calculates the points where the curve crosses the line. The difference between these two points is the usable dynamic range of the DUT and is compared to required range limit to determine a PASS/FAIL grade for the test.

## **2. Installation and Setup**

### **2.1. Connections**

- 1) Connect the NPRT 2200 “Noise Output” port to the device under test (DUT) RF input port.
- 2) Connect the DUT RF output to the NPRT 2200 “Receiver Input” port.
- 3) Connect your PC using either:
  - a) PC serial port to the NPRT 2200 serial port on the back panel with the provided cable (or a standard straight-thru serial cable).
  - b) PC USB port to NPRT USB port on back panel (USB Type A to B standard cable)

Note: Instruments built prior to 7/10/2014 do not support the USB cable connection even though a USB port is present on the back panel.

### **2.2. Warm-up**

The instrument is temperature compensated to maintain accuracy over normal room temperatures but a short warm-up period of 5 minutes after power up is recommended.

### **2.3. Software Installation**

The software provided with the NPRT is designed to run under the Microsoft Windows XP™, Vista, 7 or 8 operating systems. The software is provided on CD or may be downloaded from our website:

[www.appliedin.com/downloads/nprtsetup.exe](http://www.appliedin.com/downloads/nprtsetup.exe)

Run (or open or double click) the file to unzip the files onto your PC's hard drive. You will be asked to select your operating system for the installation of drivers and shortcuts.

If you are NOT asked to select an operating system, but only the file Unzip window shows, then using Windows Explorer or My Computer, navigate to the C:\Applied\ folder where the files were unzipped and double click setup.bat. This should continue the installation.

#### **Folders**

By default, the installation will create the following folders:

C:\Applied\	for program files
C:\Applied\Plans\	for setup files
C:\Applied\Data\	for saving data files

#### **Desktop Icons**

Shortcut icons will be placed on your Windows desktop to start the NprGraph.exe and SwpEditor.exe programs.

#### **USB Port Driver**

The USB port driver should be installed by the installation program above. However, if Windows does not recognize the driver when you connect the instrument, the Windows new hardware installation wizard should be directed to load the drivers from the CD or from the C:\Applied\ folder.

### **3. Front Panel Operations**

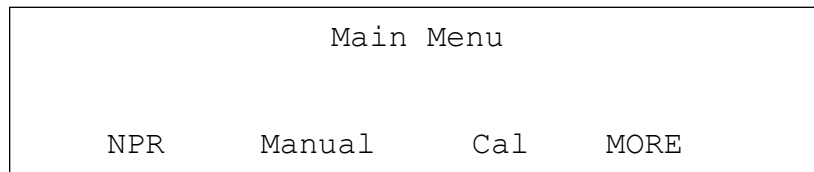
The NPRT 2200 stand-alone operations are limited to single point NPR testing, source controls, calibration and diagnostics. Stand-alone power sweep tests may be available in a future version. Power Sweep tests are available with this version using the supplied PC software.

The manual control screen lets you select which frequency range, and notch filter to use, if more than one are provided. It also lets you switch the notch in and out and set any desired output power level. Finally, it displays the measured input power.

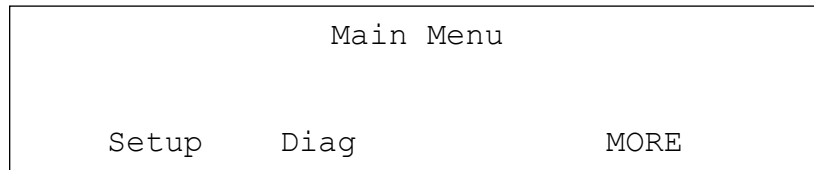
In a single point manual NPR test, you enter the desired power level and the instrument measures and displays the corresponding Noise Power Ratio.

#### **3.1. Main Menu**

The first screen shown after power-up is the main menu. There are two main menu screens:



Press MORE to display the second menu screen:



The menu options are:

- 1) NPR – make NPR measurements at a selected power levels
- 2) Manual – Set source output controls and measure received power
- 3) Cal – Cable calibration procedure
- 4) Setup – change screen contrast and options
- 5) Diag – diagnostic screens

You may select an option by pressing the “soft key” directly under the menu option.

### 3.2. User Calibration

The instrument is temperature compensated and calibrated at the factory to maintain accuracy over normal operating conditions. The calibration screen allows offsetting the measurements to allow for cable and connector loss between the instrument and the DUT. This procedure requires an external power meter capable of measuring a level of  $-5$  dBm.

***Use of the calibration screen is NOT required.***

These calibration offsets can be turned on or off in the setup screen.

There are nine offsets adjusted by this procedure: three for each of the possible frequency ranges. The following screen appears when the CAL button is pressed:

CALIBRATION	R1	0.00	0.00	0.00
OFFSETS	R2	0.00	0.00	0.00
	R3	0.00	0.00	0.00
START	EXIT	(Tx)	(High)	(Low)

The offsets may be entered manually but it is best to use the automated procedure. Press START to begin the procedure and the following instructions are shown:

```

Calibration           Range 5:42 MHz
Connect Power Meter to Noise Output.
Enter power meter reading: __. __ dBm
EXIT      OK
  
```

Be sure the power meter is zeroed and calibrated then connect it to the “Noise Output” port or at the end of the cable coming from the output port. The power level should be close to  $-5$  dBm. Enter the exact power meter reading into the NPRT 2200 (use the keypad and press ENTER) then press OK. This establishes the Tx (source) offset and the following instructions are displayed:

```

Calibration
Connect Noise Output to Receiver Input.

EXIT      OK
  
```

Connect the Noise Output to the Receiver Input with a loop-back cable. You can probably just insert a barrel connector in place of your DUT. Press OK when connected.

The system will now supply a  $-5$  dBm signal to the receiver and calculate the offset needed to correct the readings for both the high and low power range of the receiver.

These screens will then repeat for the other frequency ranges installed in the instrument. When complete, the calibration offset screen will be displayed again with the offsets filled in. You can then press exit to return to the menu.

*To activate the calibration offsets, go to the SETUP screen and set the User Cal option ON.*

### 3.3. Manual Operations

Press "Manual" from the main menu to display the following screen, which can be used to set individual source controls and display the measured power:

```

MANUAL      Range: 5:42      Power: Off
            Notch: 21.4     Source: -50.00
            In/Out: Out     Receiver: UNDER
            EXIT           (ENTER changes options)
    
```

This screen has five fields where you can position the cursor and change values. The Source field is a numeric entry field and the others are multiple choice fields. For the multiple choice fields you may press ENTER to go to the next choice for that field or may use the digit keys.

Note: the ranges and notch filters available on this screen will depend on the options installed in your instruments.

**Range:**

Press ENTER to change the frequency range between 5-42, 5-65 and 5-200 MHz.  
Or press "1" to select 5-42, "2" to select 5-65 or "3" to select 5-200.

**Notch:**

Press ENTER to change the notch filter between 21.4 and 30.5 MHz.  
Or press "1" to select 21.4 or "2" to select 30.5.

**In/Out:**

Press ENTER to switch between the notch-in and notch-out conditions.  
Or press "0" to select notch out or "1" to select notch in.

**Power:**

Press ENTER to switch the RF power on or off.  
Or press "0" to turn RF power off or "1" to turn RF power on.

**Source:**

Enter the desired source output power level.

### 3.4. NPR Test

The "NPR" menu option may be used to perform individual NPR measurements at specified power levels. To perform a manual NPR test:

- 1) Enter the desired power level.
- 2) Press ENTER

Before the ENTER key is pressed and after each measurement is complete, a cursor will appear in the power level field to accept entry of the desired power level. Enter the power level using the numeric keypad and press ENTER. Or press the START soft-key to begin the test using the displayed power.

```

Manual NPR          Input -10.00 dBm
Enter Input Power   Output  __. __ dBm
                   Noise  __. __ dBm
START   EXIT       NPR    __. __ dB
    
```



When the test is complete the measured output power, noise power and NPR will be displayed:

Manual NPR	Input 10.0 dBm
Enter Input Power	Output 26.6 dBm
	Noise-32.4 dBm
START      EXIT	NPR 59.0 dB

### 3.5. Setup

The SETUP menu option displays the following screen:

SETUP	Contrast 25
	Temp Comp On
	User Cal Off
EXIT      PRESET	Avg Limit 10

The contrast level may be adjusted by changing the contrast number. A higher number will make the screen darker.

The Temp Comp field may be used to disable the temperature compensation. Press ENTER to select either on or off. **Highly Recommended: keep this ON.**

The User Cal field may be used to disable the calibration offsets entered on the calibration screen. Press ENTER to select either on or off.

The Avg Limit field defines the number of samples that are averaged per reading. A value of 10 provides very reliable readings. A value as small as 4 will still provide acceptable readings and will run faster.

Note: there are two additional setup parameters which do not appear on this screen and can only be changed via the remote serial port. These are the settling time delay in milliseconds and the power units used in remote commands. See the Remote Commands section.

The PRESET button will initialize the flash memory used to hold these parameters and reset them all to their default values.

### 3.6. Remote Screen

When the device is being controlled from the computer, the following screen will be visible on the NPRT 2200 display.

Remote 5:42 21.4 MHz	Input:-10.0 dBm
waiting	Output: 2.1 dBm
	Noise:-45.3 dBm
EXIT	NPR: 47.4 dB

## 4. Diagnostic Screens

The diagnostic screens are intended for use in diagnosing possible problems with the instrument. ***These screens are not intended for use in normal operations.***

There are 3 screens, organized under a diagnostic menu screen around 3 major subsections of the device.

```

                                Diagnostics
                                -----
                                NS-3   Filter   Rxer   MORE
    
```

```

                                Diagnostics
                                -----
                                Tx Sw   Rx Sw           EXIT
    
```

### 4.1. NS-3 Diagnostic Screen

This screen contains the diagnostics for the NS-3 noise source module that provides the base noise signal.

```

NS-3 Diag           Base: 12.18
32.5 Deg C         Step:    1     NS-3: -1.10
                   DAC:  203     Path: -0.85
EXIT              Output: 10.23
    
```

You may specify the step number and DAC value for the NS-3 attenuators; the screen then displays the calibrated dB levels for those settings plus the base calibration value and calculates the resulting output power.

You may also specify the desired output level and the screen will calculate the required step and DAC settings.

Note that the NS-3 module output is connected to the filter and notch switching board before being routed to the “Noise Output” port. The “Output” level set on the NS-3 screen will only appear on the Noise Output port if the range attenuators are set to 0 and the notch filter is switched out.

## 4.2. Filter Board Diagnostics

This screen contains the diagnostics pertaining to the filter board.

Filter Diag	Range:1	Base: 10.36
32.5 Deg C	Atten:3	NS-3:-27.08
0.02	Notch:0	Path:-43.48
EXIT		Output:-60.20

You may specify:

- 1) The frequency range selection:
  - a) 1 = 5:42 MHz
  - b) 2 = 5:65 MHz
  - c) 3 = 5:200 MHz
- 2) attenuator setting
  - a) 0 = none
  - b) 1 = 15 dB pad
  - c) 2 = 30 dB
  - d) 3 = 45 dB
- 3) The notch filter switch setting
  - a) 0 = no notch
  - b) 1 = 21.4 MHz
  - c) 2 = 30.5 MHz
  - d) 3 = no notch available
- 4) The final output level

If you specify the range, attenuator and the notch settings, the screen will calculate the final output power level. If you specify the notch and the final output level, the system will calculate the other values.

## 4.3. Receiver Diagnostics

This screen contains diagnostics pertaining to the receiver board.

Rxer Diag	Filter: 1	Src:-60.00 dBm
32.5 Deg C	Atten: 1	ADC: 12100
	Notch: 1	Pwr: UNDER
EXIT		

You may specify:

- 1) The source power (input to DUT)
- 2) The receiver crystal filter selection:
  - a) 1 = 21.4 MHz
  - b) 2 = 30.5 MHz
  - c) 3 = none
- 3) The receiver board attenuator setting
  - a) 0 = none
  - b) 1 = 15 dB pad applied
- 4) The notch filter switch setting

- a) 0 = no notch
- b) 1 = 21.4 MHz
- c) 2 = 30.5 MHz
- d) 3 = not available

The system will display:

- 1) The temperature of the receiver
- 2) The measured A/D counts
- 3) The calibrated receiver measurement

#### **4.4. Switch Diagnostics**

The remaining two diagnostic screens, "Tx Sw" and "Rx Sw" contain controls for toggling individual switches on the RF boards. These are intended for troubleshooting use only and are not documented here.

## 5. Computer Controlled Operation

The following Windows™ applications programs are available for use with the NPRT 2200:

- 1) NprGraph – provides a power sweeping function and graphs the results.
- 2) SwpEditor – edits the setup files that define the sweep function for NprGraph.

See Section 2.3 Software Installation for instructions on installing the software to your PC.

### 5.1. Setup Files

Sweeping is controlled by a setup file that you can select when running the NprGraph program. The sweep setup files may be edited using the SwpEditor program.

The following icon should be placed on your desktop by the installation program. Or, you can start the program by opening the C:\Applied\SwpEditor.exe file.

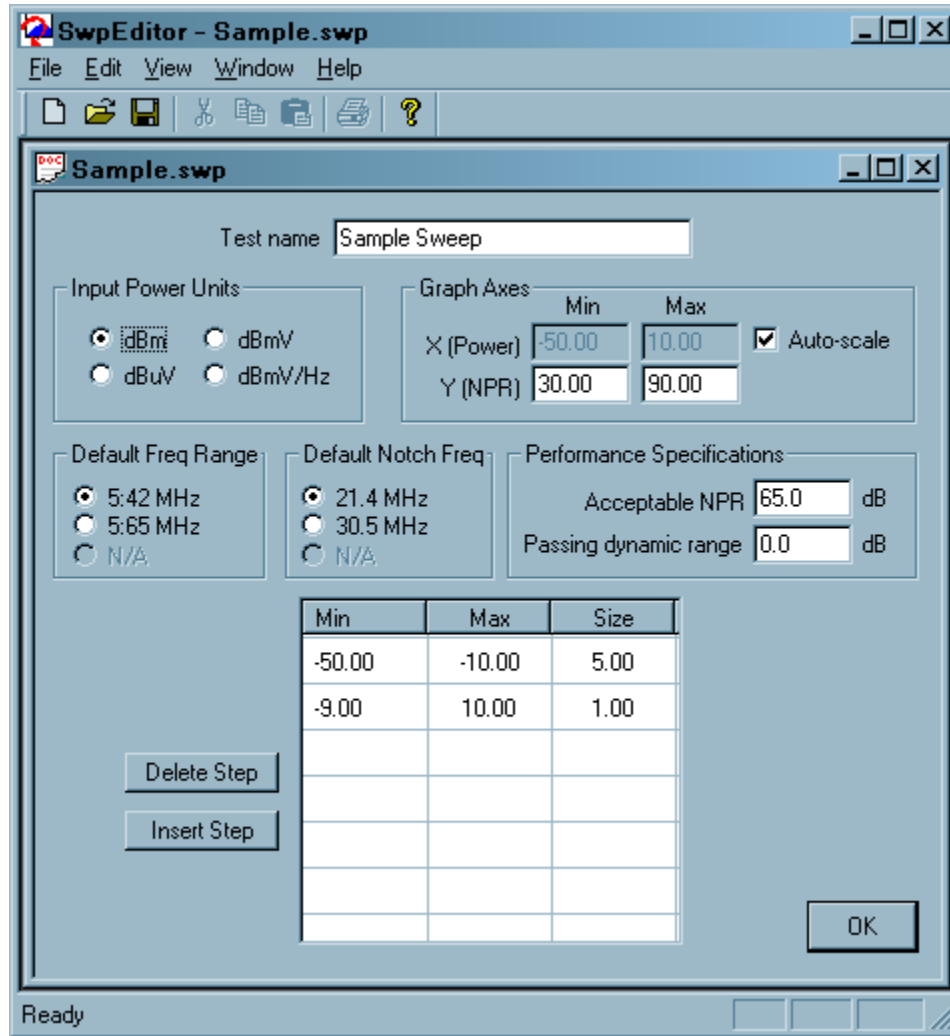


### 5.2. Setup File Parameters

Each sweep setup file defines parameters that control the appearance of the graph and contains a list of step definitions that control the values used in the power sweep. The parameters are:

- 1) **Test Name** - the test setup name is displayed in the drop down selection box when selecting a setup to use and appears on the printed graph as the "Test Name".
- 2) **Input Power Units** – select the display units from dBm, dBmV, dBuV or dBmV/Hz
- 3) **Graph Axes**
  - a) **Y Axis Range**
    - i) **Min** – provides the minimum NPR value for the Y axis
    - ii) **Max** – provides the maximum NPR value for the Y axis
  - b) **X Axis Range**
    - i) If **Auto-scale** is checked, the X axis will be scaled from the min and max step values.
    - ii) **Min** – if Auto-scale is NOT checked, defines the left end of the X axis.
    - iii) **Max** – if Auto-scale is NOT checked, defines the right end of the X axis.
- 4) **Default Freq Range** – selects the frequency range to use (if more than one is installed)
- 5) **Default Notch Freq** – selects the notch frequency to use (if more than one is installed)
- 6) **Performance Specifications**
  - a) **Acceptable NPR** - If non-zero, this number is used as a minimum acceptable NPR specification. A horizontal line is drawn on the graph at this point. The first and last points above this line are identified as the "Min Passing" input and "Max Passing" input points. Vertical lines are drawn at each of these points.
  - b) **Passing dynamic range** – The dynamic range is calculated as the difference between the two vertical lines. If the dynamic range is greater than or equal to this limit, a PASS grade is reported.

### 5.3. SwpEditor screen



The table defines the steps used in the power sweep. The NprGraph program will process each segment definition line in turn by starting at the minimum power level, and repeatedly adding the step increment until the maximum level is reached. An NPR measurement is made at each step.

A sample setup file is included in the installation that can be edited for your purposes.

### 5.4. Starting NprGraph program

To start the NprGraph program, double click the icon that should have been installed on your desktop or run the program installed as C:\Applied\NprGraph.exe.



The program will start up and display a Power Sweep dialog box.

## 5.5. Power Sweep

To run a test, select the setup file you want from the drop down menu. The frequency range and notch frequency will default to the selections made in the setup file but you may change them if desired. Enter any desired header information and then press START.

If you simply want to view an existing file, press Cancel and use the File menu to open the file.

The header information is optional and is stored in the data file and printed on the reports. You may enter this information on this screen before starting the test, or may add it later with the Header Information screen described below.

**Power Sweep**

Pick a setup file:

**Frequency Range**

5.42 MHz  
 5.65 MHz

**Notch Filter**

21.4 MHz  
 30.5 MHz

**Header Information**

Technician:  Optional: this information may be added later.

Model:

Serial#:

Notes:

**Progress**

Segment:  of

Step:  of

**Measurement**

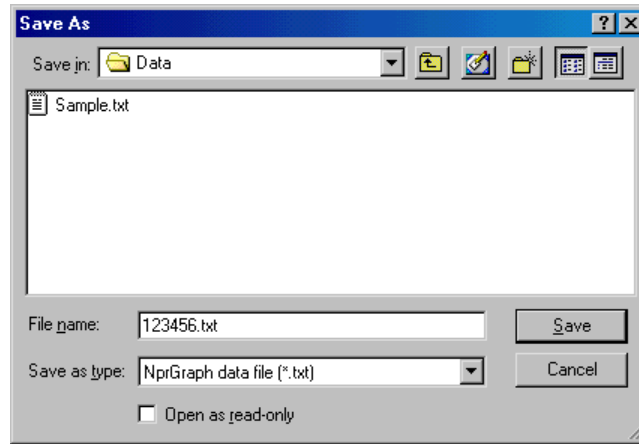
Power:  dBmV

NPR:  dB

Press START to begin.

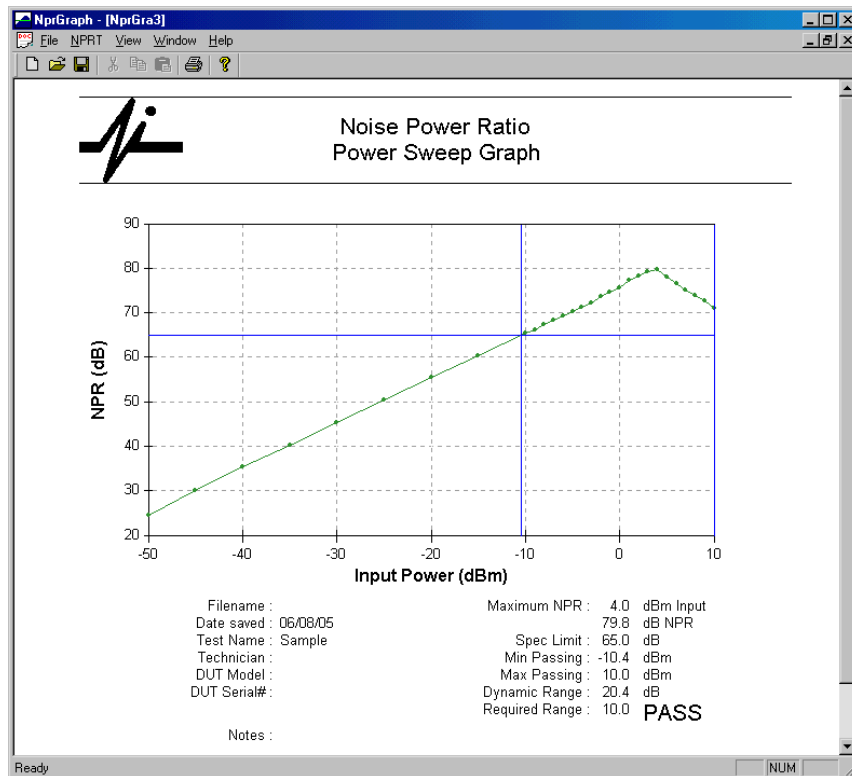
As the test is running, the progress will be shown in terms of segments and steps and the measurements will be displayed as they are obtained. At the same time, the graph will be drawn on the window behind the Power Sweep dialog box.

When the test is complete, a File Save dialog will appear that uses the serial number as the default file name.



### 5.6. Power Sweep Graph

At this point, the graph is complete and the pop-up dialogs are removed. You can now view and print the graph.



The graph plots measured NPR by Input Power. The data points are shown as dots connected by green lines. The header information is printed below the graph. The maximum NPR and the input power that produced the maximum are listed.

If an “Acceptable NPR” specification limit is entered either in the sweep setup file or in the Graph Setup dialog discussed in section 4.7, a horizontal blue line is drawn at that limit and vertical blue lines are placed on the first and last point that fall above the line. The input power values where the NPR curve crosses the limit line are calculated and listed as the Min Passing and Max Passing points. The difference between these points is listed as the dynamic range.



If a “passing dynamic range” limit is entered, a PASS or FAIL grade is reported indicating if the dynamic range meets the limit.

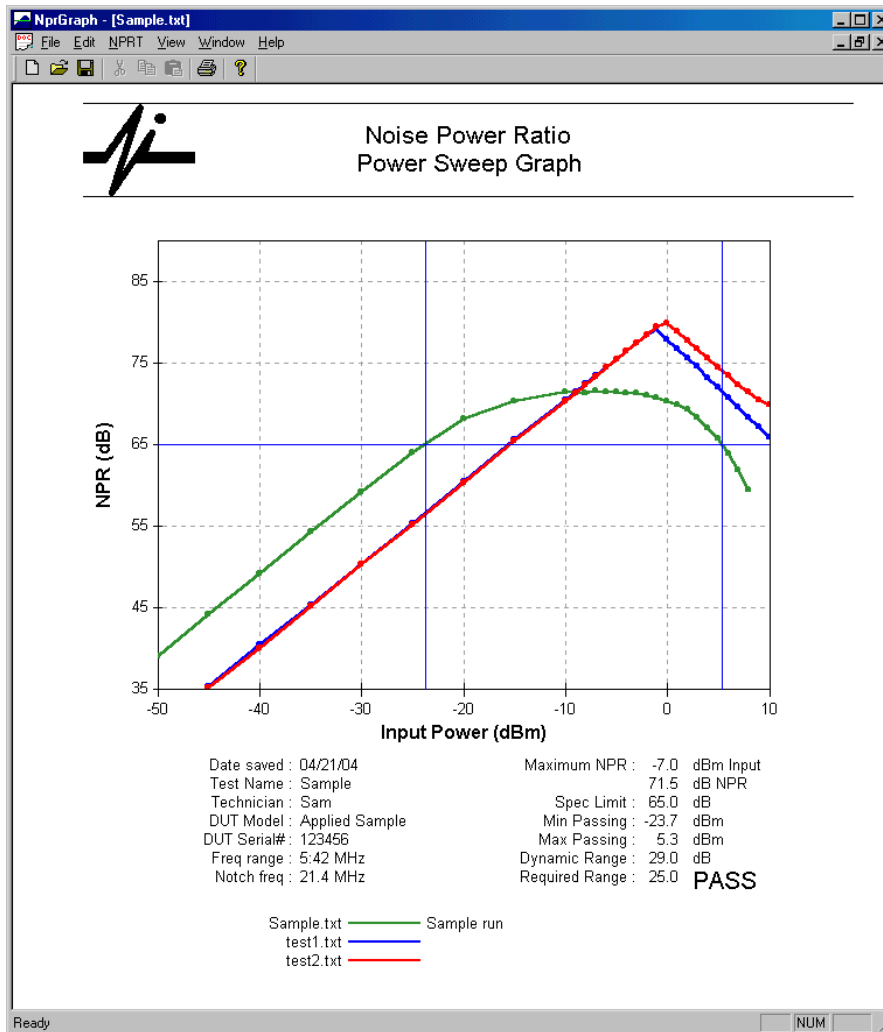
## 5.7. File Menu Options

The usual file menu options are available:

- File New – to start a new graph and access the Power Sweep dialog
- File Open – to open a previously saved graph
- File Close – to close the displayed graph
- File Save – to save the graph after making changes (see below)
- File Save As – to save the graph under a new name
- Add Line – to add a previously saved file to the present graph
- File Print – to print the graph

## 5.8. Adding Lines

Data from multiple tests can be overlaid on the same graph for comparison purposes. Select “Add Line” from the File menu and then pick a file to add to the presently displayed graph. Added lines will be drawn in different colors and a color legend will be added to the bottom of the report. The header “notes” are printed in the legend, to the right of the color bar.



## 5.9. Edit Menu Options

The Edit sub-menu provides the following functions:

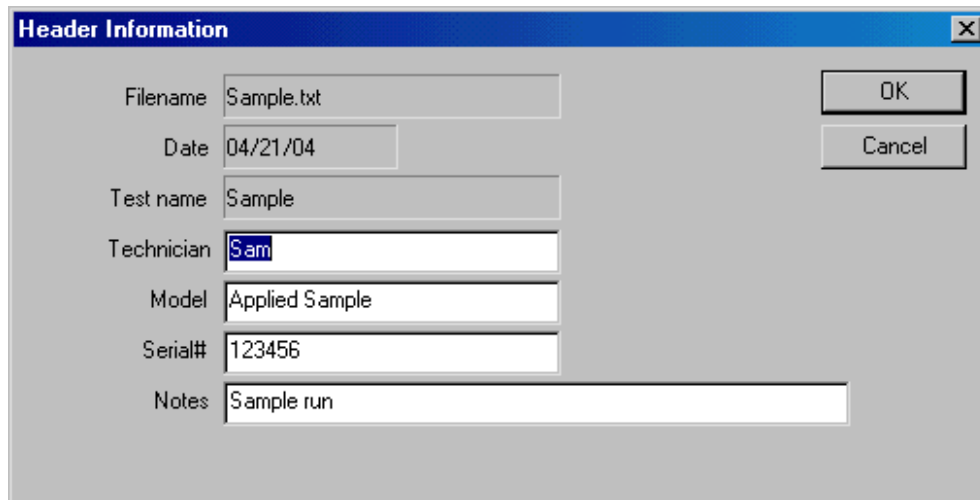
Copy	Copies the graph to the clipboard.
Header Info	To edit the header information first entered at the end of the test.
Graph Setup	To change the graph limits.
Sweep Editor	Starts up the Sweep Editor program.

### Copy

The copy function may be used to copy the graph image to a word processing or spreadsheet application. This makes it simple to include graphs into reports. The image does not include the title bar. The Control-C shortcut is also supported.

### Header Information

The information contained on this screen may be entered before the test is started, or after by using the NPRT, Edit Header Info menu option. You should save the file after changing this information.



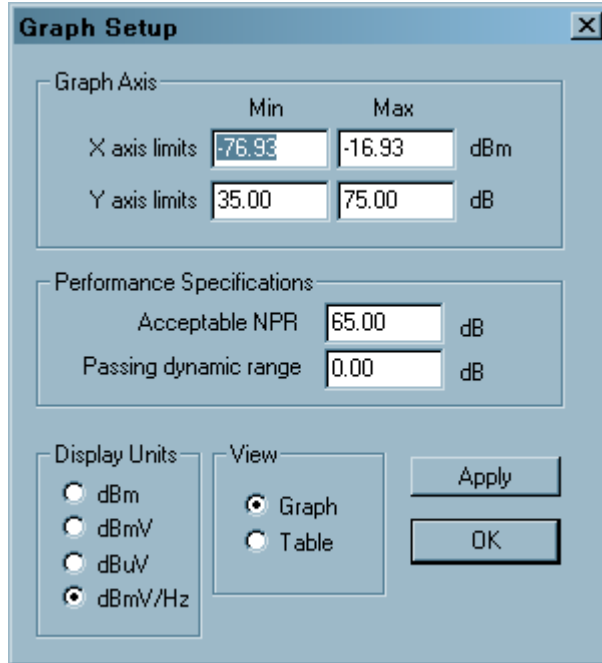
The screenshot shows a dialog box titled "Header Information" with a close button (X) in the top right corner. The dialog contains several input fields and two buttons (OK and Cancel) on the right side. The fields are:

- Filename: Sample.txt
- Date: 04/21/04
- Test name: Sample
- Technician: Sam
- Model: Applied Sample
- Serial#: 123456
- Notes: Sample run

## Graph Setup

The graph appearance may be altered using this dialog.

**Note: this dialog box is also available by right clicking on the graph.**



The image shows a 'Graph Setup' dialog box with the following sections:

- Graph Axis:** A table with columns 'Min' and 'Max'.

	Min	Max	Unit
X axis limits	-76.93	-16.93	dBm
Y axis limits	35.00	75.00	dB
- Performance Specifications:**

Acceptable NPR	65.00	dB
Passing dynamic range	0.00	dB
- Display Units:** Radio buttons for dBm, dBmV, dBuV, and dBmV/Hz (selected).
- View:** Radio buttons for Graph (selected) and Table.
- Buttons:** Apply and OK.

You may change the limits used for the X and Y axis.

You may enter an acceptable NPR limit values that places a horizontal line on the graph.

You may enter a passing dynamic range value to obtain a PASS/FAIL grade for the test.

You may select which units to display the power values in.

You may also view the data as a table or a graph by changing the view selection.

The changes you make to this dialog do not take effect until you press "Apply" or "OK". OK closes the dialog while Apply will make the changes to the view behind the dialog box.

## 5.10. NPRT Menu Options

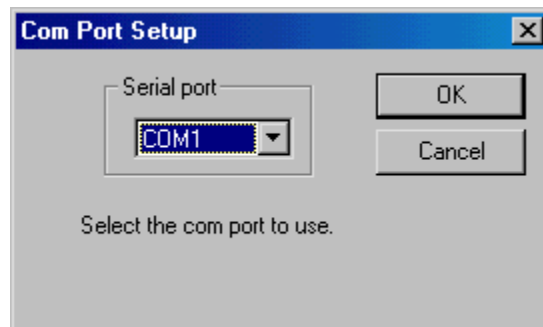
The NPRT sub-menu provides some additional functions:

Setup Com Port	To change the com port used
Connect	To test communication with the NPRT 2200
Run Sweep	To start a new graph (same as File New)

### Setup Com Port

Pick the desired port from the pull down list or select "Auto". Com1 thru Com20 are supported. All standard Windows com ports should work including USB to serial converters.

The built in USB port will also register as a Com port but the port number will vary depending on the other devices that have previously registered in windows. The Windows Device Manager may be used to identify the port number, but it is easiest to just use the "Auto" selection. If the USB port registers at a com port number above 20, it will be necessary to use the Device Manager and change the port to a lower number.



### Connect

The "connect" function is for testing the serial port connection to the NPRT 2200. It just tries to read the serial number and version from the unit.

## 5.11. Batch Operation

For automated testing, the NprGraph program can be run from a Windows DOS Command Prompt window. A DOS batch can be used to run several NPR tests in a row without human interaction.

Example command:

```
start /wait nprgraph 1234567 setup 2 3 /p
```

1. The "start /wait" command tells the command prompt processor to start a Windows application and wait for it to close before proceeding to the next command. This is needed when running the command from a batch file.
2. The "nprgraph" is the name of the application to run.
3. "1234567" is the serial number of the unit being tested and will be used to build a unique file name for the output.
4. "setup" is the name of the sweep setup file to be used.
5. "2" indicates the second band is to be used.
6. "3" indicates the third notch is to be used.

7. "/p" is optional and directs the program to automatically print the output to the default printer.
8. The command prompt window should be directed to the C:\Applied\ folder (or wherever NprGraph is installed) before running the command.

## 6. Remote Commands

As demonstrated by the NprGraph software, the instrument may be controlled from a computer using an RS-232 serial or USB connection. The remote command interface is similar to the standard SCPI protocol although that standard is not completely supported.

### 6.1. Cable and Handshaking

For RS232 operation, a standard 9 pin serial cable of the “straight thru” type is used. The instrument actually uses only 3 pins: transmit, receive and ground. The unit uses 9600 baud only, no parity, 8 data bits, 1 stop bit.

For USB operation, a standard Type A to Type B cable is used. The system uses a virtual com port driver to assign a com port number to the USB port. The driver is installed with NprGraph software.

### 6.2. Commands

These commands are described in the standard SCPI notation. Commands are terminated with a carriage return character. Most commands have a query form that returns the present value.

The notation uses square brackets to denote optional parts of the commands. The lower case portions may also be omitted to abbreviate the keywords.

#### RF On/Off

OUTPut[:STATe] <Boolean> Turns the RF output on or off.  
 OUTPut[:STATe]? Returns 0 for off or 1 for on.

#### Example:

```
output:state on
output:state?
1
```

#### Frequency Range Selection

[SOURce:]FREQUency:RANGe <value>  
 [SOURce:]FREQUency:RANGe?

Where value may be specified as an index (1 to 3) or the upper frequency in the desired range in MHz. If a range is selected that is not installed, an error 100, “Invalid value” will be posted.

The query form of this command returns the description of the frequency range.

#### Examples:

```
Freq:range 1           (for the first range)
Freq:range 42         (for 5:42 MHz)
Freq:range?
5:42 MHz
```

#### Frequency Range Availability

[SOURce:]FREQUency:RANGe:AVAILable?

This query returns the available frequency ranges as a list of comma separated fields. The first field is the number of frequency ranges that follow.

#### Example:

Freq:range:avail?  
2, 5:42 MHz, 5:65 MHz

### Notch Filter Selection

[SOURce:]NOTCH: FREQUency <value>  
[SOURce:]NOTCH:FREQUency?

Where value is the notch frequency in MHz. If a notch is selected that is not installed, an error 100, "Invalid value" will be posted.

The query form of this command returns the description of the notch frequency.

#### Example:

Notch:Freq 21.4  
Notch:Freq?  
*21.4 MHz*

### Notch Filter State

[SOURce:]NOTCH:STATe <Boolean>  
[SOURce:]NOTCH:STATe?

Turns the selected notch filter ON (inserts notch) or OFF (bypasses notch).

### Notch Availability

[SOURce:]NOTCH:AVAILable?

This query returns the available notch frequencies as a list of comma separated fields. The first field is the number of notch frequencies that follow.

#### Example:

Notch:avail?  
2, 21.4 MHz, 30.5 MHz

### Power Level

[SOURce:]POWer[:LEVel][:IMMediate][:AMPLitude] <value>  
[SOURce:]POWer[:LEVel][:IMMediate][:AMPLitude]?

Sets the output power level in the presently selected units.

#### Example:

source:power:level -20.0  
power -30  
power?  
*-30.0*

### Measuring NPR

MEASure:NPR?

Returns a single NPR measurement in dB taken at the presently selected range, notch and source power level.

**Measuring Level**

MEASure:LEVel?

Measures the received power level at the presently selected range, notch and source power level.

**Measuring Carrier Level**

MEASure:CARrier?

Removes the notch filter and measures the resulting carrier power level at the present source power settings.

**Measuring Noise**

MEASure:NOISe?

Measures the noise level within the notch at the presently selected range, notch and source power level.

**Fetching Associated Readings**

After executing an NPR measurement, you can also fetch the associated carrier level and noise level readings used in that NPR measurement with the following commands:

FETCh:CARrier?

FETCh:NOISe?

FETCh:NPR?

FETCh:[SOURce:]POWER[:LEVel]?

If the associated value is not valid an error –230 is posted. This is usually caused by an unrelated measurement being performed after the last instance of the desired parameter was taken. For instance: if a MEAS:NPR? is executed, all parameters are valid, then if a MEAS:NOISE? is executed, the carrier and NPR values are no longer valid because they are not measured by the MEAS:NOISE function.

**Changing Averaging Setup**

[SENSe:]AVERAge[:COUNT] <value>

[SENSe:]AVERAge[:COUNT]?

Set the averaging count

**Changing Settling Time**

[SENSe:]SETTle <milli-seconds>

[SENSe:]SETTle?

Sets the settling time between changing the power and taking a reading. The default is 500 mSecs.

**Turning Temperature Compensation On/Off**

CAL:COMP:TEMP <Boolean>

Turns temperature compensation on or off.

**Turning User Calibration Compensation On/Off**

CAL:COMP:USER <Boolean>



Turns user calibration on or off.

### Selecting Units

UNIT:POWer <units>  
UNIT:POWer?

Specifies the desired units for the power readings. The possible values are:

dBm (default)  
dBmV  
dBuV  
dBmV / Hz  
dBuV / Hz

### Releasing the Port

SYSTem:RELease

This command will release the locked port allowing either port access with the next command.

SYSTem:RELease:TIMEout <seconds>

This command will set a timeout for automatic release of the port if no further commands are received with the given number of seconds. A default value of 60 seconds is set upon power up.

See Section 6.6 for more information on these commands.

## 6.3. Error Reporting

The system error query command is supported for a few types of errors:

SYSTem:ERRor?

Returns one of the following:

0, "No error"  
-100, "Command error"  
-350, "Queue overflow"

## 6.4. SCPI Required Commands

The following commands are implemented as required by the SCPI standard but have no real function in the NPRT 2200.

*CLS	Clear Status Command
*ESE	Standard Event Status Enable Command
*ESE?	Standard Event Status Enable Query
*ESR?	Standard Event Status Register Query
*IDN?	Identification Query
*OPC	Operation Complete Command
*OPC?	Operation Complete Query
*RST	Reset Command
*SRE	Service Request Enable Command
*SRE?	Service Request Enable Query
*STB?	Read Status Byte Query

\*TST?            Self Test Query  
\*WAI            Wait to continue Command

The NPRT 2200 has no overlapped commands so the \*OPC, \*WAI and \*OPC commands are not needed.

### **6.5. Multiple Commands**

SCPI allows multiple commands to be strung together on the same line separated by semi-colons. This feature is not implemented.

### **6.6. Multiple Port Usage**

On units with a functional USB port (built after 8/15/2014), and firmware Version 2.31 it is possible to use either the RS232 port OR the USB port. Commands will be acted upon in the order received on either port.

In firmware Version 2.32 and above, to avoid conflicting use of the two ports, the following rules have been added:

1. The first command received on either port locks the instrument to that port.
2. While locked on one port, any commands received on the other port will receive a reply of "BUSY" and not be acted upon.
3. Receiving a SYSTEM:RELEASE command on the locked port will release the port.
4. If no commands are received on the locked port within a timeout period, the port will automatically be released.
5. The timeout period defaults to 60 seconds but can be set with the SYSTEM:RELEASE:TIMEOUT command.

This feature allows the instrument to be shared by two computers although one will have to wait while the other is using the instrument.

## **7. Upgrading Firmware**

As enhancements are added to the NPRT 2200 firmware, upgrades may be made by reprogramming the flash memory without returning the unit to the factory. Upgrades are available via the internet.

The firmware upgrade software for Windows is available from:

[www.appliedin.com/downloads/flashupdatezip.exe](http://www.appliedin.com/downloads/flashupdatezip.exe)

The installation procedure is similar to the installation of the NprGraph software. Once the FlashUpdate program is installed, connect your NPRT 2200 to the PC and start FlashUpdate. It will check our web site for the latest release and select the modified components for updating.

Contact Applied Instruments technical support (317-782-4331) for assistance if needed.

## WARRANTY

The Applied Instruments NPRT 2200 is warranted against defects in materials and workmanship for a period of twelve months. Applied Instruments agrees to repair or replace any assembly or component found to be defective under normal use during this period. Our obligation under this warranty is limited solely to repairing the instrument proved to be defective within the scope of the warranty when returned to the factory. Transportation to the factory is to be prepaid by the customer. Authorization by Applied Instruments is required prior to shipment.

Applied Instruments assumes no liability for secondary charges or consequential damages and, in any event, Applied Instruments' liability for breach of warranty under any contract shall not exceed the purchase price of the instrument shipped, and against which a claim is made.

Any application recommendation made by Applied Instruments for the use of its products are based upon tests believed to be reliable, but Applied Instruments makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Applied Instruments any liability in connection with the sale of our products other than that set forth herein.

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