



User Guide

Integrated Frequency Counter & Power Meter



FCPM-6000RC

1 - 6000 MHz

50 Ω



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Important Notice

This guide is owned by Mini-Circuits and is protected by copyright, trademark and other intellectual property laws.

The information in this guide is provided by Mini-Circuits as an accommodation to our customers and may be used only to promote and accompany the purchase of Mini-Circuits' Parts. This guide may not be reproduced, modified, distributed, published, stored in an electronic database, or transmitted and the information contained herein may not be exploited in any form or by any means, electronic, mechanical recording or otherwise, without prior written permission from Mini-Circuits.

This guide is subject to change, qualifications, variations, adjustments or modifications without notice and may contain errors, omissions, inaccuracies, mistakes or deficiencies. Mini-Circuits assumes no responsibility for, and will have no liability on account of, any of the foregoing. Accordingly, this guide should be used as a guideline only.

Trademarks

Microsoft, Windows, Visual Basic, Visual C# and Visual C++ are registered trademarks of Microsoft Corporation. LabVIEW and CVI are registered trademarks of National Instruments Corporation. Delphi is a registered trademark of Delphi Technologies, Inc. MATLAB is a registered trademark of The MathWorks, Inc. Agilent VEE is a registered trademark of Agilent Technologies, Inc. Linux is a registered trademark of Linus Torvalds. Mac is a registered trademark of Apple Inc. Python is a registered trademark of Python Software Foundation Corporation.

All other trademarks cited within this guide are the property of their respective owners. Neither Mini-Circuits nor the Mini-Circuits Integrated Frequency Counter & Power Meter are affiliated with or endorsed or sponsored by the owners of the above referenced trademarks.

Mini-Circuits and the Mini-Circuits logo are registered trademarks of Scientific Components Corporation.

Mini-Circuits

13 Neptune Avenue
Brooklyn, NY 11235, USA
Phone: +1-718-934-4500
Email: sales@minicircuits.com
Web: www.minicircuits.com



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

Table of Contents

Chapter 1 – General Information	5-8
1.1 Scope of the User Guide.....	5
1.2 Warranty	5
1.3 Definitions	5
1.4 General Safety Precautions	5
1.5 Introduction	5
1.6 Service and Calibration	6
1.7 Contact Information.....	6
1.8 Technical Description.....	6-8
1.8.1 Features of Mini-Circuits	6
1.8.2 Intended Applications	7
1.8.3 Conformity	7
1.8.4 Supported software environments	7
Chapter 2 – Installation and Setup	8-13
2.1 Software Setup	8
2.2 Installation	9-10
2.3 FCPM-6000RC Physical Setup.....	11
Chapter 3 – Using the	13-26
3.1 USB Interface.....	13-16
3.2 Ethernet Interface	16-17
3.3 Measurements Screen	18-19
3.3.1 Model Status (Fig. 3.3) Error! Reference source not found.	18
3.3.4 Frequency Measurement (Fig. 3.3).....	19
3.4 Live Graph	19
3.4.1 Live graph indicators and functions (Fig. 3.4)	20



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

Table of Contents

3.5 Relative Frequency Points Table	20-21
3.6 Data Record	21-23
3.6.1 Center column(Fig. 3.6)	21
3.6.2 Right Column (Fig. 3.6).....	22
3.6.3 View Data.....	22
3.6.4 View Graph.....	23
3.6.5 Create Excel File	23
3.7 Firmware Update	24-26
3.8 Compact View	26



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

Chapter 1 – General Information

1.1 Scope of the User Guide

This User Guide provides general introduction, installation instructions and operating information for Mini-Circuits FCPM-6000RC Integrated Frequency Counter and Power Meter. For detailed instructions on specific measurement applications using Mini-Circuits measurement applications software see the [Application Measurement guide](#).

1.2 Warranty

See the Mini-Circuits website <http://www.minicircuits.com/support/ordering.html> for warranty information.

1.3 Definitions

Note: A note advises on important information you may need to ensure proper operation of the equipment. There is no risk to either the equipment or the user.

CAUTION

A caution advises about a condition or procedure which can cause damage to the equipment (no danger to users).

WARNING

A warning alerts to a possible risk to the user and steps to avoid it. **DO NOT** proceed until you are sure you understand the warning.

1.4 General Safety Precautions

Please observe the following safety precautions at all times when using Mini-Circuits smart FCPM-6000RC.

CAUTION

1. **Note the maximum input power rating in the datasheet and the conditions specified for it. Exceeding these values may damage the FCPM-6000RC.**
2. **Do not exceed the operational safe power levels for extended periods of time.**

1.5 Introduction

Traditionally, when you wanted to measure both power and frequency of a signal from electronic components or circuit boards, you'd have to connect them to a bulky and expensive bench-top spectrum analyzer, or assemble a complex setup using multiple test equipment. Not anymore. Mini-Circuits FCPM-6000RC offers a whole new approach, using a quick, simple, USB or Ethernet connection to testing both power and frequency in a compact, portable and low cost package. The FCPM-6000RC can be controlled from your PC or laptop, or run independently with readings displayed on its LCD screen.

The FCPM-6000RC includes all measurement and analysis functions Mini-circuits customers are familiar with from the PWR series power sensors and UFC-6000 Frequency counter, easy data storage, advanced data-processing capabilities, and remote operation via Ethernet. Like Mini-Circuits other Portable Test Equipment models, the FCPM-6000RC is self-calibrating and compensates automatically for temperature. It's quick and easy to use, whether you're in the field or helping someone complete a remote test installation over the phone.



INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

1.6 Service and Calibration

The only user-performed service possible for the FCPM-6000RC is external cleaning of the case, screen and connectors as needed. Do not use any detergents or spray cleaning solutions to clean the FCPM unit. To clean the connectors, use an alcohol solution, and to clean the FCPM case and LCD screen, a soft, damp cloth. The recommended calibration cycle for Mini-Circuits FCPM-6000RC model is once a year. Calibration service is available from Mini-Circuits. For details; see Ordering, Pricing & Availability Information link from individual model pages on the website.

1.7 Contact Information

Mini-Circuits inc.
13 Neptune Ave
Brooklyn, NY 11235
Phone: 1-718-934-4500
General Fax: 1-718-332-4661
Sales / Customer Service Fax: 1-718-934-7092
sales@minicircuits.com
For regional offices and tech support see <http://www.minicircuits.com/contact/offices.html>

1.8 Technical Description

1.8.1 Features of Mini-Circuits FCPM-6000RC

- ✓ Pocket-sized portability
- ✓ Automatic frequency and Power calibration
- ✓ Automatic temperature compensation
- ✓ Synchronized Power & Frequency measurements from practically any computer.
- ✓ Effective, easy-to-use software
 - User-friendly GUI for any Windows® 32- or 64-bit computer (command-line support for Linux®, Mac support for Ethernet control)
 - Remote control via Ethernet, local control via USB, or standalone operation with no data connection
 - Multiple data display and output options, including Excel®
 - Data averaging
 - Relative measurements
 - Scheduled data recording with user defined spec limits
 - Multi-unit support (up to 24), display options, and management tools
 - Measurement Applications suite to simplify many common test scenarios
 - DLL COM objects for both ActiveX, and .NET supporting LabVIEW®, Delphi®, C++, C#, Visual Basic®, and more (see [programming handbook](#) and application note [AN-49-001](#) for details)
 - Download and install in seconds from the included CD or online from minicircuits.com.

For specific model features, performance data and graphs, outline drawing, ordering information and environmental specifications, see our catalog at:

http://www.minicircuits.com/MCLStore/ModelSearch?search_type=info&model=FCPM-6000RC



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

1.8.2 Intended Applications

Mini-Circuits FCPM-6000RC model is intended for indoor use in:

- Lab and test equipment setups for both manual and automated measurements
- Remote location monitoring
- Automatic, scheduled data collection
- Evaluation of high-power, multi-port devices with built-in virtual couplers/attenuators & other software tools

The model can be used by anyone familiar with the basics of electronics measurements.

1.8.3 Conformity

Mini-Circuits FCPM-6000RC model conforms to all requirements for the following international standards:

RoHS – The models comply with EU directive for Restriction of Hazardous Substances for 6 substances.

USB 2.0 – The model meets the specifications of the Universal Serial Bus Ver. 2.0 communication standard as described by USB-IF.

USB HID – The model meets the requirements for Universal Serial Bus Human Interface Devices according to USB-IF's Device Class Definition for Human Interface Devices firmware rev. 1.11.

TCP/IP The model complies with the specifications of the Transmission Control Protocol (TCP) and Internet Protocol (IP) as defined in RFC 791 and RFC 793.

HTTP – The model supports all requirements for communicating with the Hypertext Transfer Protocol (HTTP) as defined in RFC 1945.

Telnet – The model supports all requirements for communicating with the Telnet protocol, as defined in RFC 854.

1.8.4 Supported software environments

Mini-Circuits FCPM-6000RC have been tested in the following operating systems:

32 bit systems: Windows 8, Windows 7, Windows Vista, Windows XP Windows 98

64 bit systems: Windows 8, Windows 7, Windows Vista, Linux

The FCPM-6000RC will work with almost any software environment that supports ActiveX or .Net including: C++, C#, CVI®, Delphi®, LabVIEW® 8 or newer, MATLAB® 7 or newer, Python, Agilent VEE®, Visual Basic®, AutoIT, Visual Studio® 6 or newer, and more

Additionally the HTTP and Telnet protocols can operate from almost any computer with a network connection.

For more information see [Mini-Circuits programming handbook](#) on our website.



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Chapter 2 – Installation and Setup

This chapter provides information on installing the operating software and setting up Mini-Circuits' FCPM-6000RC. System requirements for USB control are a computer (Pentium II or better) with support for USB HID.

For Ethernet control an Ethernet port with support for HTTP or Telnet, and a suitable power source are needed (an AC/DC power adaptor suitable for most mains power sockets is included with the FCPM-6000RC).

To run the GUI program (described in chapter 3) a Windows operating system (either 32 or 64 bits) is also needed.

2.1 Software Setup



If you have had any problems installing the software, we're here to help.

Try following these complete step-by-step instructions. If you still experience problems, give us a call at Mini-Circuits Worldwide Technical support. It's (718) 934-4500 or e-mail apps@minicircuits.com for North America, or go to minicircuits.com/contact/worldwide_tech_support.html for other regional numbers and addresses.

2.1.1 First save all work in progress and close any other programs that may be running.

2.1.2 Next, Insert the *Mini-Circuits* CD into the CD-ROM drive, or download the full CD software from minicircuits.com. If installing from files downloaded from the web - unzip the downloaded files to a temporary folder on your desktop or C: drive, then open the file folder you created and double-click the "Install" icon.

2.1.3 If installation from the CD does not start automatically, run *install.exe* from the <CD drive> root directory.

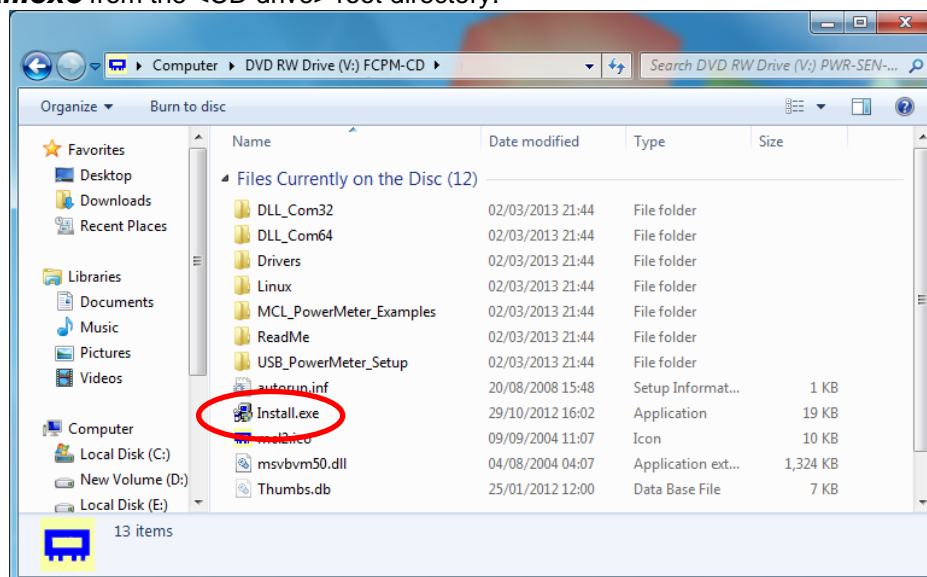


Figure 2.1.3 CD file listing window



INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

2.2 Installation

2.2.1 **The installer window** should now appear. Click the “Install Now” button.

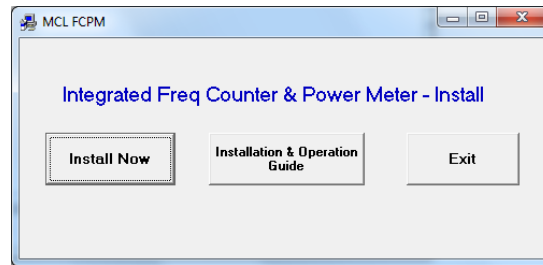


Figure 2.2.1 Installation window

2.2.2 **The license agreement** should now appear. To proceed, click “I Agree” and the “Continue” button.

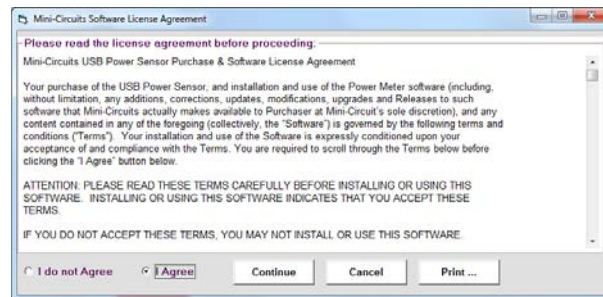


Figure 2.2.2 License agreement

2.2.3 **The installation program will launch.** Click the “OK” button to continue.

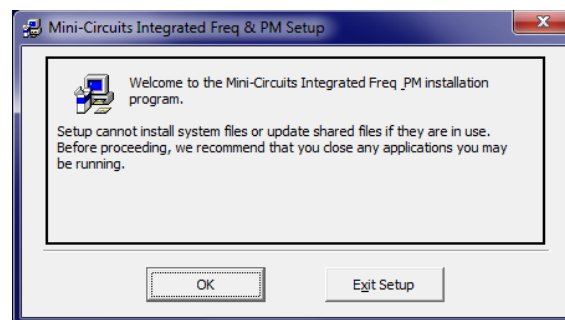


Figure 2.2.3 Installation Program window

2.2.4 The destination directory window will appear. At this point it's a good idea to take a second and confirm the full destination address for the software. In most cases, the default will be your computer's hard drive (C:)\Program Files (x86)\Mini-Circuits Integrated Freq_PM\ . Or Change it then click the large button at the top to continue.

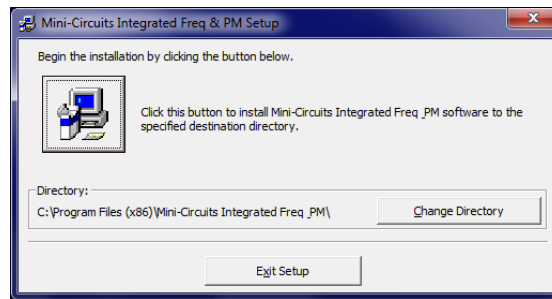


Figure 2.2.4: Destination Directory window

2.2.5 The Program Group window will appear. This window allows you to select the program group under which the link for the smart power meter program in the Start Menu will be created. If you change the Program Group for this software, be sure to record that information together with your destination address. Click on "Continue" to proceed.

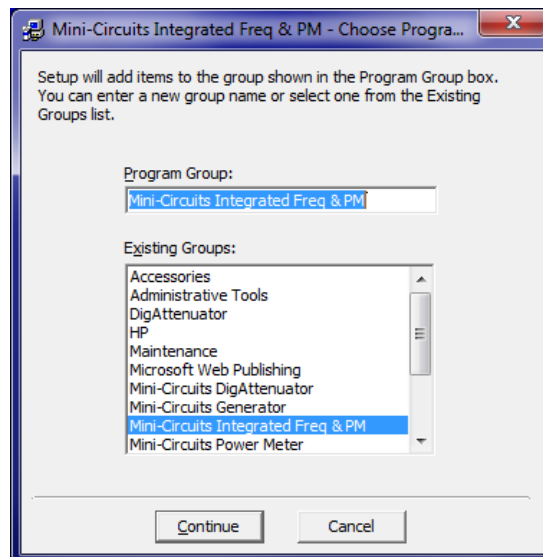


Figure 2.2.5: Program Group Window

2.2.6 In a second or two, your installation will be complete. Click "OK" to close the installer.

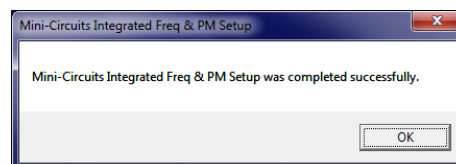


Figure 2.2.6: Installation complete

2.3 FCPM-6000RC Physical Setup

2.3.1 **Align the red dot at** the FCPM-6000RC USB/LAN connection with the one on the supplied cable and press in until you hear a 'click'.



Figure 2.3.1: Plug cable into unit

CAUTION

1. Note the maximum rating power input in the datasheet and the conditions specified for it. Exceeding these values may damage the FCPM-6000RC.
2. Do not exceed the operational safe power levels for extended periods of time.

2.3.2 **For USB control**, connect the USB type B plug of the supplied cable to the computer USB port and begin testing. The RJ45 connector may remain unconnected when in USB control.

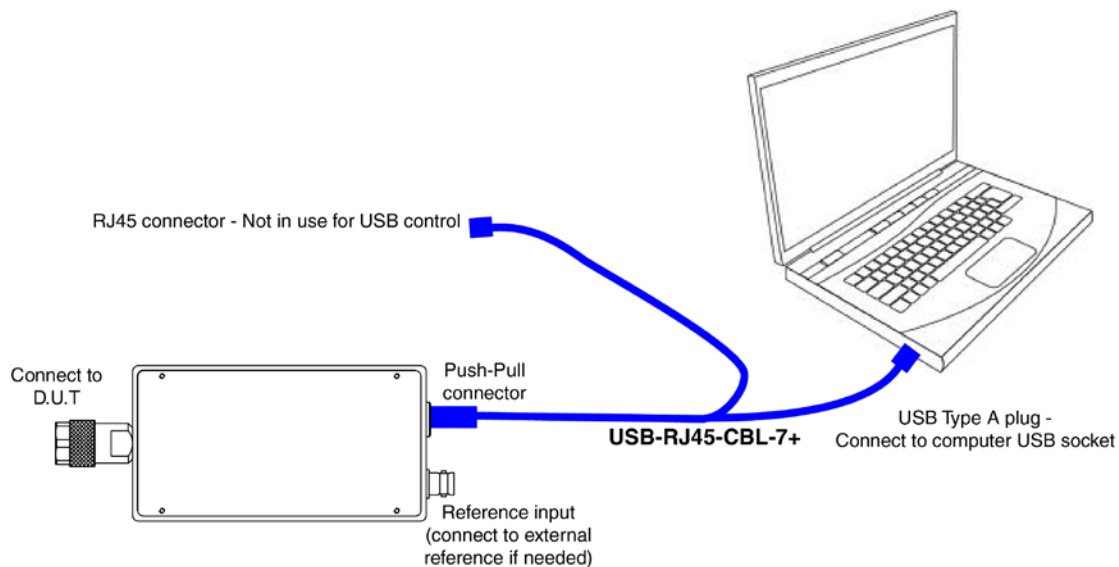


Figure 2.3.2a: Connections for USB control

2.3.3 For Ethernet control using AC/DC adaptor

- Connect the USB type A plug of the 'Y' cable to the provided power adaptor and plug it in to a mains power socket, note the FCPM-6000RC's power indicator lights up.
- Connect the Ethernet plug to a network port and note FCPM-6000RC's Ethernet status indicators light up.

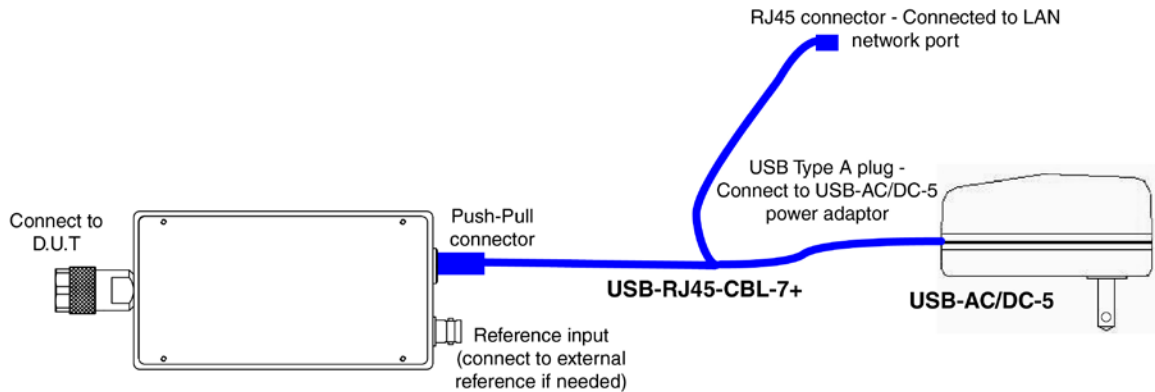


Figure 2.3.3: Connections for Ethernet control with power adaptor

2.3.4 For Ethernet control using Power Over Ethernet

- Connect your PoE splitter Data & Power socket to a network port providing DC power over Ethernet according to the instructions for the PoE splitter.
- Connect the USB plug of the 'Y' cable to the power connection of the PoE splitter (may require an adapter), note the power indicator lights up.
- Connect the RJ45 plug of the 'Y' cable to the PoE splitter's LAN socket and note the Ethernet status indicators light up.

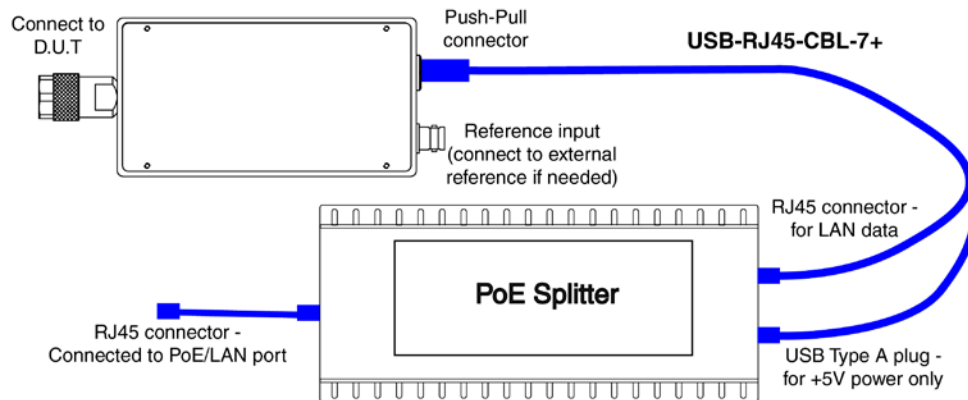


Figure 2.3.4: Connections for Ethernet control using Power Over Ethernet

Note: Using power over Ethernet requires the local network be set up to supply DC voltage in a range matching the DC input specifications of the PoE splitter used. The FCPM-6000RC cannot receive power via the Ethernet port and must use a POE splitter.

2.3.5 Using External reference

- To use the FCPM-6000RC with external reference connect a 10MHz reference signal to the FCPM's BNC port.
- The FCPM-6000RC will automatically detect the reference and switch to external reference mode.

Note: Connecting a signal other than 10MHz to the FCPM's reference in may result in measurement errors.

Chapter 3 – Using the Integrated Freq. & Power Meter

3.1 USB Interface

3.1.1 **Go to the Start Menu** and select All Programs>Mini-Circuits Integrated Freq & PM (default), or go to the other destination address you selected earlier. The “Mini-Circuits Integrated Freq & PM” icon should be waiting there for you. Click on it and get started!

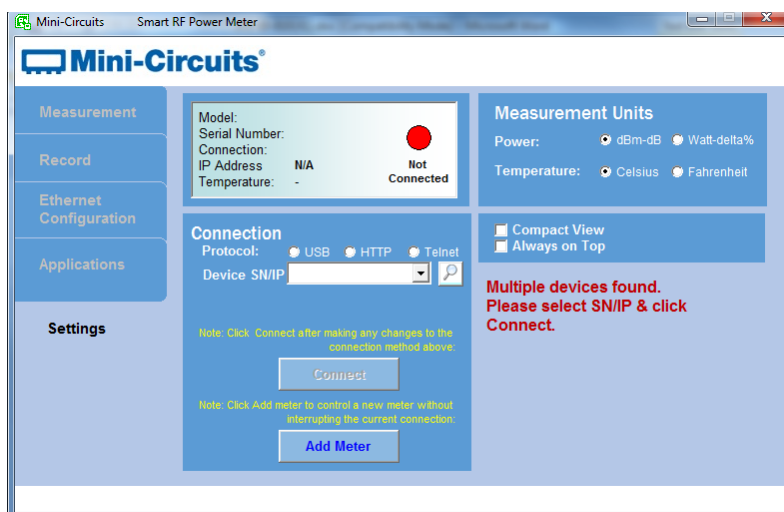


Figure 3.1.1: FCPM-6000RC Startup screen

3.1.2 **The startup allows** you to select the control method you wish to use for the FCPM-6000RC, USB or Ethernet(HTTP or Telnet) by clicking on the appropriate radio button. For USB control see below, for Ethernet control see **section 3.2**

3.1.3 **If a single FCPM-6000RC is** connected to the computer via USB, the measurement display will appear, already displaying your unit ready to start measurements.

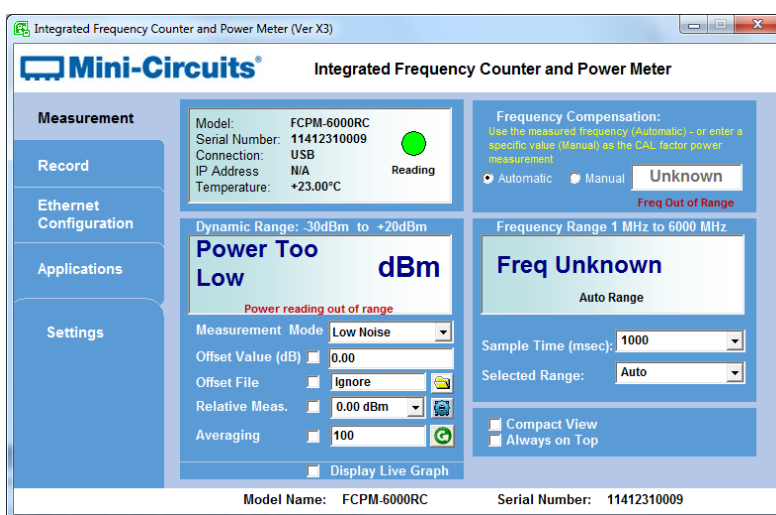


Figure 3.1.3: Measurement screen

3.1.4 If **multiple FCPM-6000RC are** connected to the computer via USB, an alert will appear on the right side of the screen notifying you multiple units were detected. Select the unit you wish to use from the S/N drop box and click "Connect". If you want to use multiple units click on "Add Meter" to open an additional window. Additional units can be added at any point up to 24 units connected *simultaneously*.

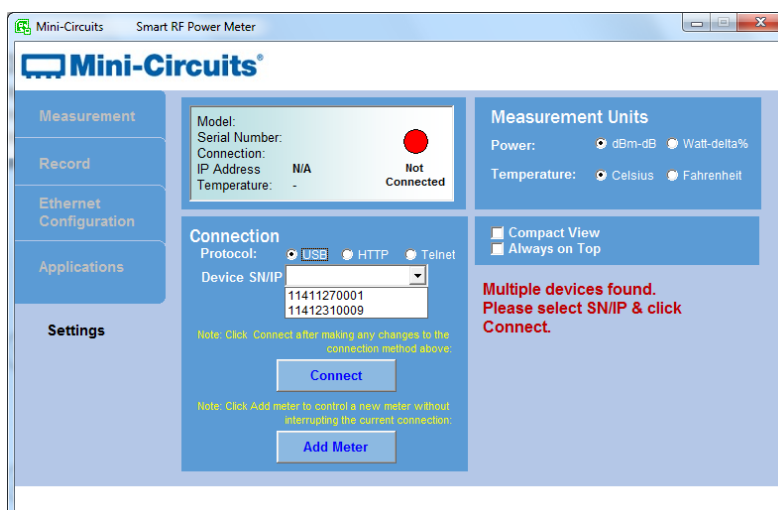


Figure 3.1.4: Unit selection screen

3.1.5 If **there's a faulty D.U.T connection**, no RF power or the power is below the sensors dynamic range 'Power Too Low' and 'Frequency unknown' notices will appear.

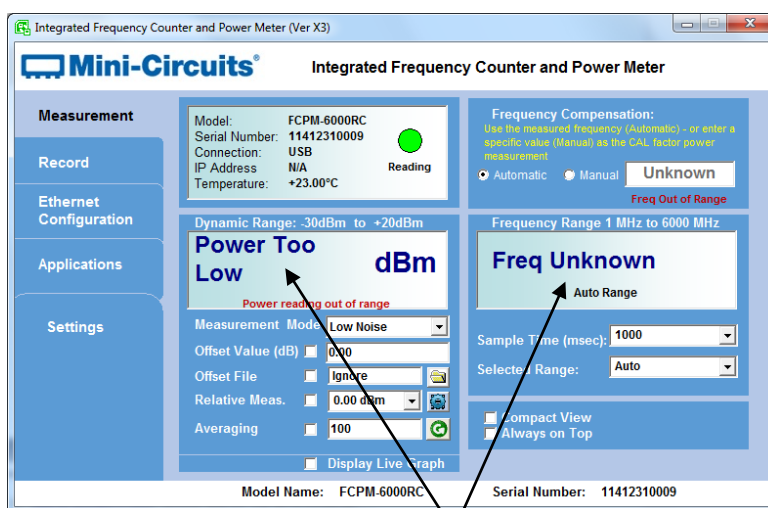


Figure 3.1.5: Signal not Found

3.1.6 **The Ethernet Configuration screen can** only be accessed in USB control. Click on the Ethernet Configuration tab on the left side of the screen, to access this. The display will shift to show the current Ethernet configuration. **Figure 3.1.6** shows the factory default of the FCPM-6000RC. If these settings fit your local network, you do not need to access the setup before connecting the FCPM-6000RC to the network.

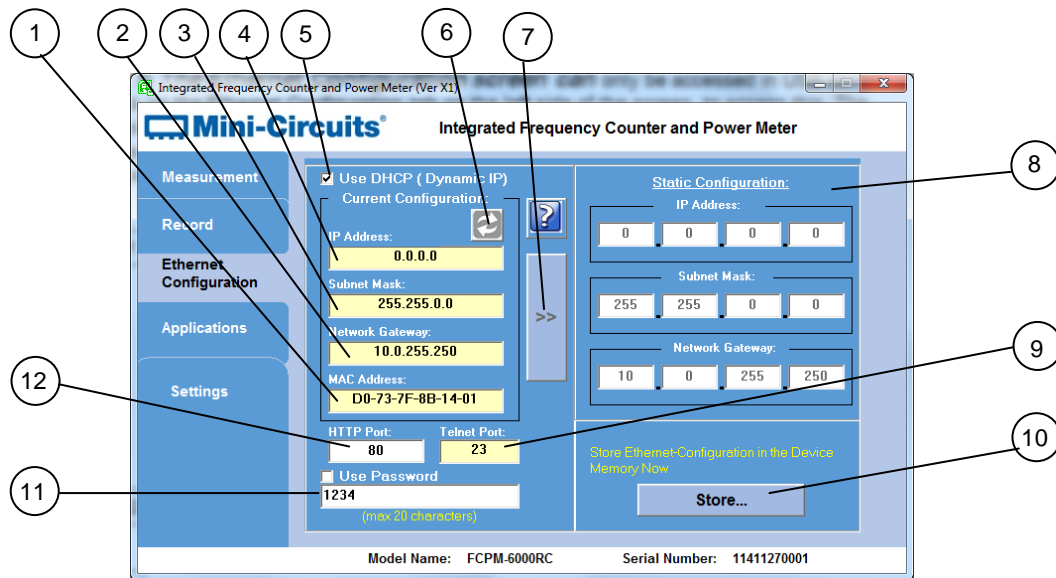


Figure 3.1.6: Ethernet Config. screen (showing factory default state)

Note: If you are using a proxy server for your LAN connections you may need to define a name for the FCPM-6000RC IP address, or disable the proxy server to connect to the FCPM-6000RC via Ethernet.

3.1.7 The Ethernet Configuration settings are:

#	Name	Description
1	MAC Address	Media Access Control Address – a unique, unchanging identifier for the FCPM unit.
2	Network Gateway	IP address of the network gateway. When DHCP is selected this is assigned by the server.
3	Subnet Mask	The Network's Subnet Mask. When DHCP is selected this is assigned by the server.
4	IP Address	The IP address of the unit in your Network. When DHCP is selected this is assigned by the server.
5	Use DHCP	When selected the FCPM will query the server for appropriate parameters with no input from the user and will disregard manually entered IP address, subnet mask and network gateway settings.
6	Refresh	Request IP address, gateway and subnet mask from the server.
7	Copy State	Copies current state of dynamic IP to static IP, not available when DHCP is selected.
8	Static Configuration	When DHCP is not selected the user must specify the values below and will not be changed by the server.
9	Telnet Port	Port to be used for Telnet communication. Cannot be changed by user
10	Store	After you've made all changes you want to click on this button to save the settings.
11	Password	If you want to limit the users able to access the FCPM-6000RC select "Use Password" and enter the desired password (up to 20 characters).
12	HTTP Port	Specify the port to use for HTTP communication with the network (default 80). Note port address does not get assigned by the server when DHCP is selected. Port 23 is reserved for Telnet communication and cannot be used.

3.1.8 After making the changes you want, click on "Store" and the changes will be saved to the smart power meter's memory. See **section 3.2** for working with Ethernet

control.

3.2 Ethernet Interface

3.2.1 After starting the GUI (section 3.1) you select the control method you wish to use for the FCPM by clicking on the appropriate radio button. For operation with USB see **section 3.1**. For HTTP and Telnet control either select the IP address and port of the FCPM-6000RC from the drop box list, or click on the search icon to the right of IP address drop box to get the details of the units detected.

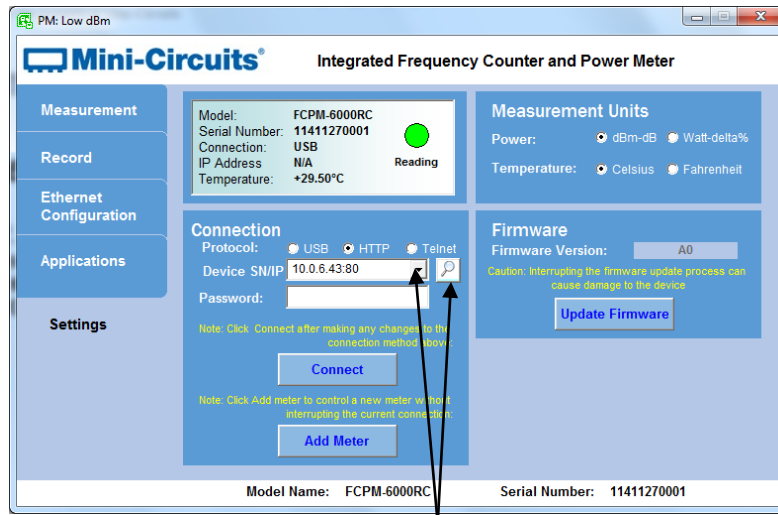


Figure 3.2.1: FCPM-6000RC Ethernet Startup screen

3.2.2 Clicking on the search icon will shift the display to a list of FCPM-6000RC IP addresses found and their HTTP ports on the left side of the screen, and full details of each unit on the right. Mark the IP address you wish to use and click select. The display will return to previous screen with the IP address entered in the IP address field automatically.

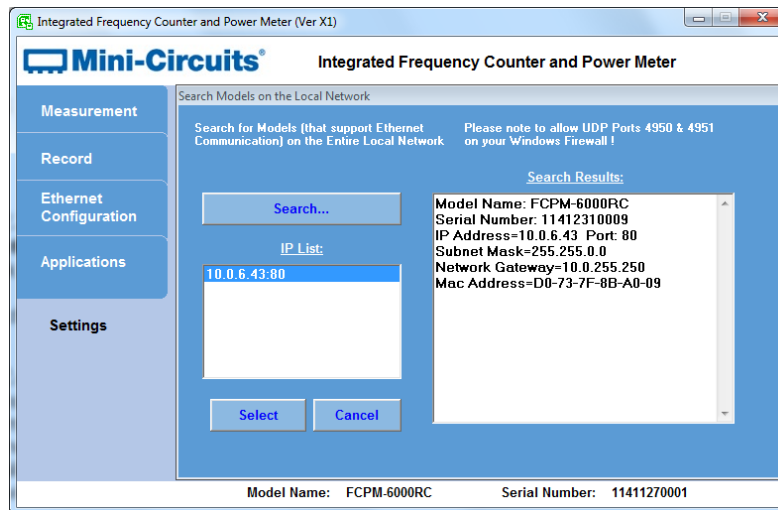


Figure 3.2.2: Ethernet IP search screen

Notes:

- 1) To refresh the list of units found click on the Search button.
- 2) The search function uses ports UDP 4950 and UDP 4951 for communication, ensure your firewall allows access to these ports.



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

3.2.3 After entering the IP address, enter your password if you set one (see **section 3.1.7**), and click start, the display will change to the measurement screen.

Note: changing Ethernet settings is only possible via USB control, see **section 3.1.6** for details.

3.2.4 Telnet or HTTP commands can also be used to control the FCPM-6000RC without using the GUI. Just type in the command in the address field of your Internet browser or implement a Get/Post HTTP function in your selected application (for HTTP) or establish a Telnet connection (for Telnet). A full list of the commands available and their syntax is available in Mini-Circuits programming handbook, and in a text file on the CD provided with the FCPM-6000RC, in the Ethernet directory.

Note: Depending on the browser used and your network configuration you may need to disable the proxy server for your computer, or add the FCPM's IP address to the list of addresses in the proxy server.



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

3.3 Measurements Screen

This screen provides a simple and easy-to-use interface for measuring CW signals RF power and frequency with the FCPM-6000RC (See **Fig 3.3**).

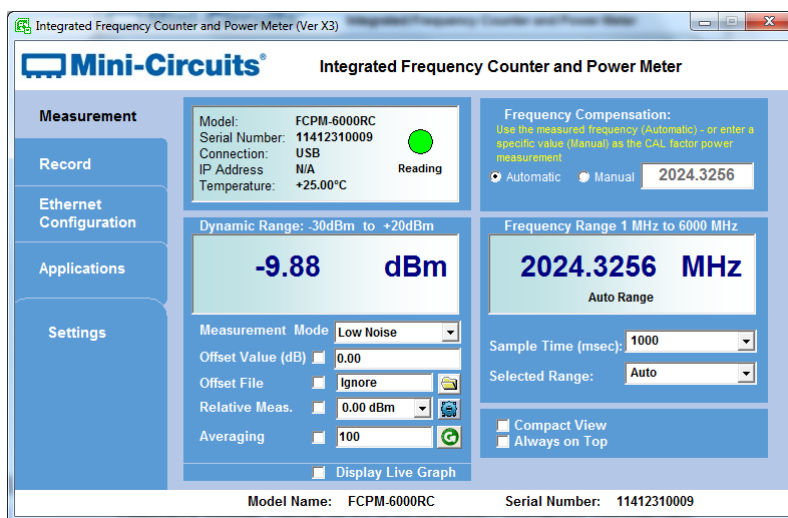


Figure 3.3: FCPM Measurements Screen

3.3.1 Model Status (Fig. 3.3)

Model	Displays model name of FCPM-6000RC currently connected.
Serial Number	Displays serial number of FCPM-6000RC currently connected.
Connection	Displays the current control method used
IP Address	Displays the IP address and port when in Ethernet (HTTP or Telnet) control
Temperature	Displays the FCPM-6000RC's internal temperature in either Celsius or Fahrenheit according to the specified settings. The FCPM-6000RC compensate automatically for any temperature variation in the 0-50°C (32-122°F) range.
Reading/ Searching/ Disconnected	Displays the status of the connection. If communication is interrupted it will change to 'Searching' for a few seconds and then 'Disconnected' if communication is not successfully re-established or back to 'Reading'

3.3.2 Power Measurement (Fig. 3.3)

Power	Displays the power reading in the requested format.
Measurement Mode	Select the measurement mode in which you wish to operate. "Low Noise" – 100ms typ, "Faster" – 30 ms typ.
Offset Val.	This feature allows the user to compensate for Loss or Gain in their DUT setup. A positive value compensates for a Loss, and a negative value for a Gain. Click on the check box, and enter the appropriate value (in dB) in the window below.
Offset File	Check to get offset values from a saved file. Primarily used for advanced Measurement Applications, see Measurement Applications Guide chapter 13 for details.
Relative Meas.	Check to save your current power reading as a baseline value or select 'Table' from the drop box. To define a table click on the icon to the right of the drop box (See section 3.5 for details). From then until unchecked, power measurements will show how DUT power varies from the specified baseline. In dBm format, relative results are given in dBc and in Watt format in %.



Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Averaging

Check the averaging box and enter the number of measurements you wish to average. Individual measurements will be taken at the specified measurement speed (see section 3.3.2). When selected the FCPM-6000RC will average the power reading over the number of measurements specified in Avg. Count and display the number of measurements averaged. Clicking on the button to the left of the average count window will clear the averaged values and reset the count.

Display Live Graph

Check to activate real-time graph of power measurement, see **section 3.4** for details.

3.3.3 Frequency compensation (Fig. 3.3)

This is the frequency used to calculate the frequency compensation(calibration factor) for power measurement. Unlike standard power meters and sensors the FCPM can calculate this automatically using the measured frequency value when set to 'Auto' (default setting). If 'Manual' is selected the FCPM will disregard the measured frequency and use instead the value entered by the user in the frequency compensation field.

3.3.4 Frequency Measurement (Fig. 3.3)

Frequency

Displays the Measured frequency in MHz. When frequency compensation is set to 'Auto' this value is used for the power measurement frequency compensation.

Sample Time

The Sample time used for the Frequency Measurement. Longer sample time will produce more accurate measurement.

Selected Range

The selected Frequency range. The default mode (Auto) will automatically shift ranges to the appropriate range for the detected signal.

Compact View

Reduce size of window. This option is usually employed for multi-sensor setups. See **section 3.8** for details.

Always on Top

Click to keep your FCPM-6000RC screens on top of other applications.

3.4 Live Graph

Checking the 'Display Live Graph' box in the bottom of the measurement screen will cause a graph window (Fig. 3.4) to appear below the measurement screen showing the power measurements.

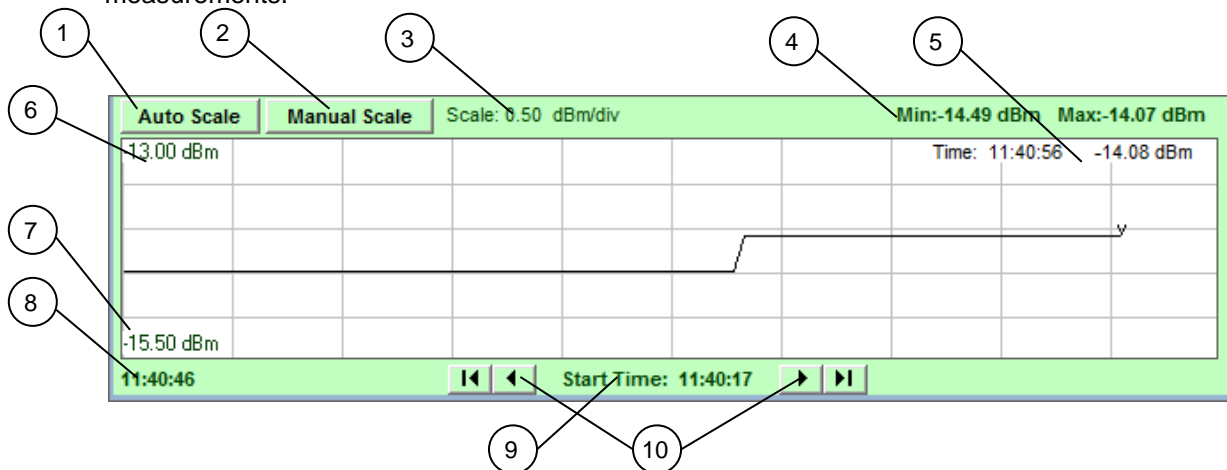


Figure 3.4: Real-Time graph

3.4.1 Live graph indicators and functions (Fig. 3.4)

#	Name	Description
1	Auto Scale	Set Y scale automatically to best display current data.
2	Manual Scale	Opens a small window to allow setting the Max value and value per div. of the Y axis. The values shown will be in the same units as those specified in the Main screen format field. Clicking on the button a second time will close the Manual Scale window.
3	Scale	Current value per division of Y axis
4	Min/Max values	Minimum and Maximum values currently displayed in graph
5	Current reading	Current time and power reading
6	Max scale	Max value of Y scale
7	Min scale	Min value of Y scale
8	Time	Start time of currently displayed graph
9	Start Time	Time at which real-time graph was started
10	Arrows	Use arrows to scroll back and forth in graph.

3.5 Relative Frequency Points Table

3.5.1 Clicking on the icon to the right of the Relative Meas. check box, or selecting 'Table' from the drop box when no table is defined will open the relative frequency points table shown in Fig 3.5. This table allows specifying multiple points for relative power measurements. To add a point to the table click on 'Add Relative Point' – the specified frequency with the current power reading will be added to the table. If frequency compensation is set to 'Manual' you will need to enter the relevant frequency manually before adding the point to the table.

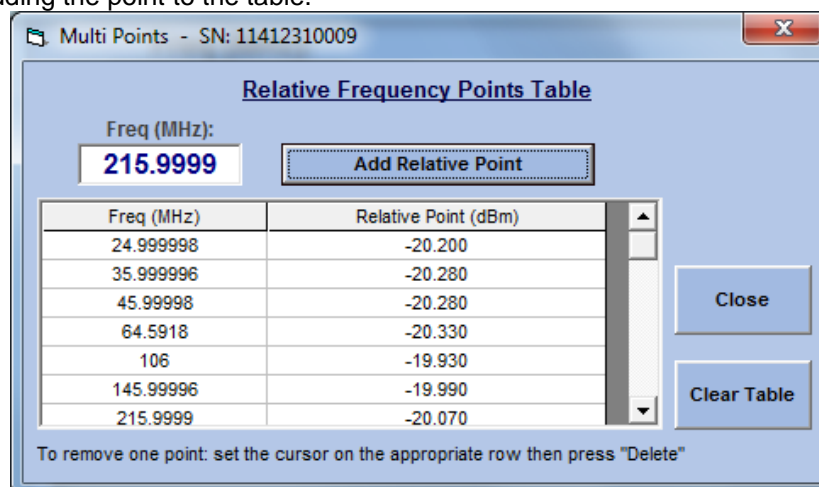


Figure 3.5.1: Relative Frequency Points Table

3.5.2 To delete a point click on the row you wish to delete then press the 'Delete' key. To delete all values from the table click on the 'Clear Table' button.

3.5.3 **Once you're satisfied** with the entries close the table, the main screen will now show 'TABLE' in relative measurement field. Checking the 'Relative' checkbox will change all measurements into relative measurements referenced to the values in the table. If a frequency not listed in the table is specified for measurement the FCPM GUI program will calculate the correct reference value based on interpolation of existing data points.

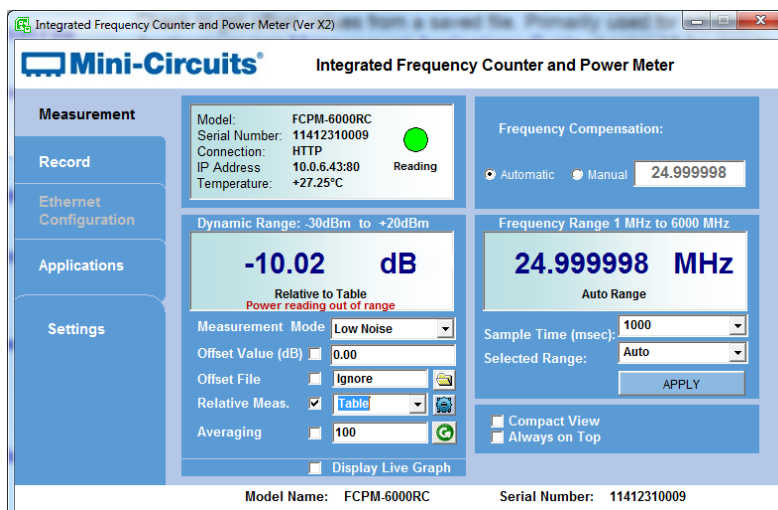


Figure 3.5.3: Measurements relative to table

3.6 Data Record Screen

Get started by clicking the Record button on the left side of the Screen. The display will change to the Record Screen:

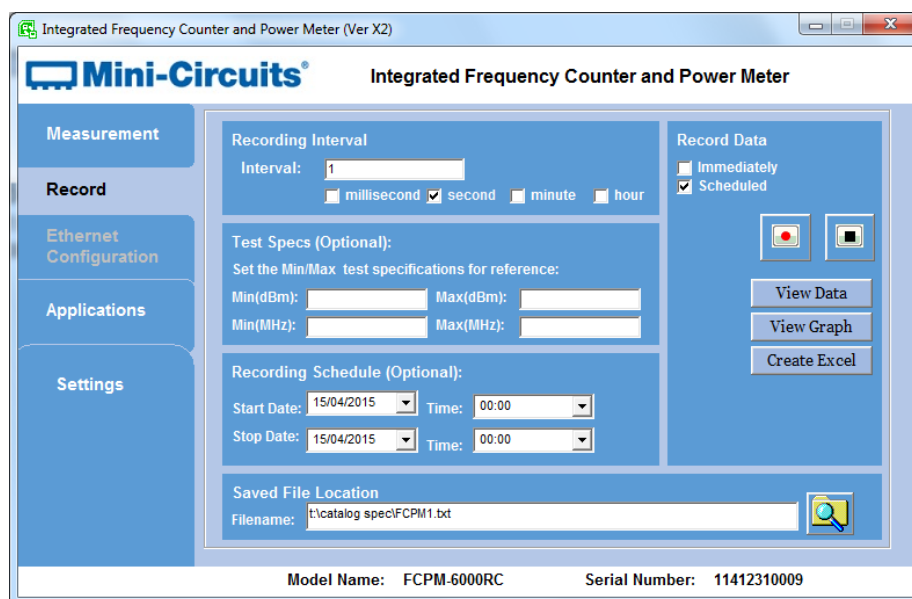


Figure 3.6: Data Record Screen

3.6.1 Center column(Fig. 3.6)



INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

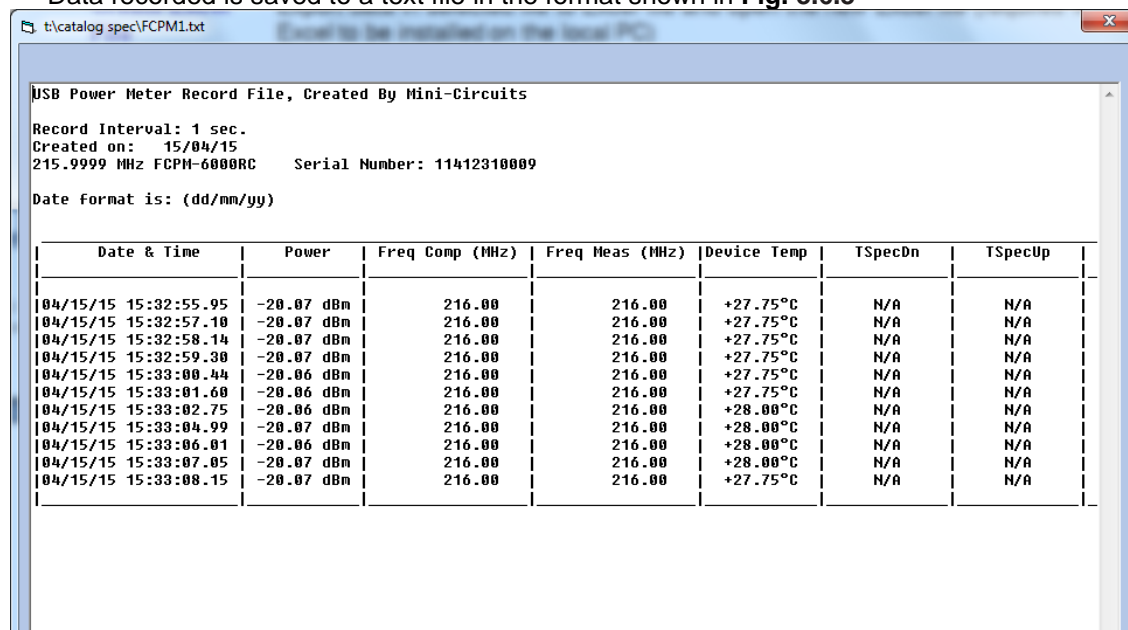
- Record Interval** Specify the interval at which data points will be recorded, from every 30ms, to 9999 hours. Make sure the measurement speed is less than the record interval.
- Test Spec** If you enter specification limits in these fields data points which exceed these limits (either above or below) will be marked in the data by an asterisk (*).
- Recording Schedule** If you wish to set recording to start at a later time, and/or to stop at a specified time enter here the start and stop date and time.
- Saved File Location** Enter the path and file name where you wish to record data, there is no required file name. See **section 3.6.3** for data format.
- Note:** Before starting recording you must enter a file path where you have Read/write/create privileges

3.6.2 Right Column (Fig. 3.6)

- Immediately/Scheduled** Check 'Immediately' to begin recording with no delay, or 'Scheduled' to record according to the specified schedule
- Icons** Click on the icons to start or stop recording
- View Data** Open a window showing the recorded Power and Frequency data and the Test Specs for both (See section 3.6.3 for data format).
- View Graph** Open a graphical presentation of the data stored in the selected file (See section 3.6.4 for data format).
- Create Excel File** Export data in selected file to Excel file and open the new Excel file (requires Microsoft Excel to be installed on the local PC)

3.6.3 View Data

Data recorded is saved to a text file in the format shown in **Fig. 3.6.3**



USB Power Meter Record File, Created By Mini-Circuits

Record Interval: 1 sec.
Created on: 15/04/15
215.9999 MHz FCPM-6000RC Serial Number: 11412310009

Date format is: (dd/mm/yy)

Date & Time	Power	Freq Comp (MHz)	Freq Meas (MHz)	Device Temp	TSpecDn	TSpecUp
04/15/15 15:32:55.95	-20.07 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:32:57.10	-20.07 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:32:58.14	-20.07 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:32:59.30	-20.07 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:33:00.44	-20.06 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:33:01.60	-20.06 dBm	216.00	216.00	+27.75°C	N/A	N/A
04/15/15 15:33:02.75	-20.06 dBm	216.00	216.00	+28.00°C	N/A	N/A
04/15/15 15:33:04.99	-20.07 dBm	216.00	216.00	+28.00°C	N/A	N/A
04/15/15 15:33:06.01	-20.06 dBm	216.00	216.00	+28.00°C	N/A	N/A
04/15/15 15:33:07.05	-20.07 dBm	216.00	216.00	+28.00°C	N/A	N/A
04/15/15 15:33:08.15	-20.07 dBm	216.00	216.00	+27.75°C	N/A	N/A

Figure 3.6.3: Data File Window

3.6.4 View Graph

Clicking on the 'View Graph' button in the data record window (**Fig 3.6**) will open a graphical presentation of the recorded data(**Fig 3.6.4**). Default presentation is of power only, using the same units as the data was recorded in, but user can select to present both power and temperature by checking 'Show temperature graph' or change the power units by clicking on the arrow next to the graph title.

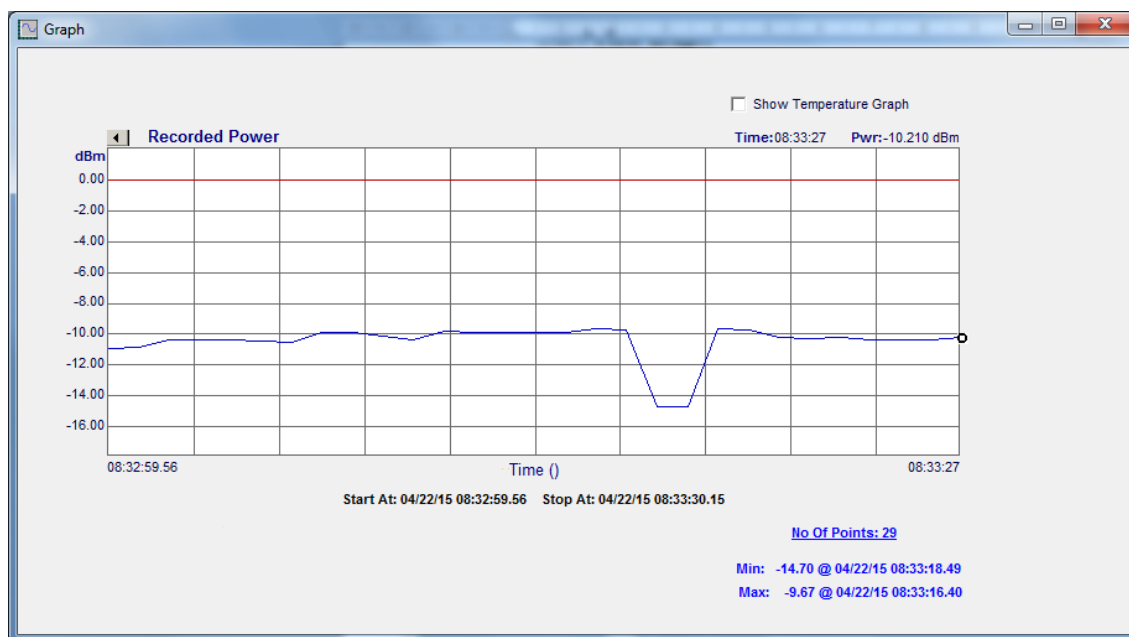


Figure 3.6.4: View Graph Window

3.6.5 Create Excel File

When exporting data to an excel file Data will initially be in format shown in Fig 3.6.5

Date & Time	Power	Freq Comp (MHz)	Freq Meas (MHz)	Device Temp	TSpecDn	TSpecUp	TFreqDn	TFreqUp
22/04/15 08:32:59.56	-10.90 dBm	2989.52	2989.52	+29.25-C	N/A	N/A	0	0
22/04/15 08:33:00.60	-10.89 dBm	2989.52	2989.52	+29.25-C	N/A	N/A	0	0
22/04/15 08:33:01.61	-10.38 dBm	2988.66	2988.66	+29.50-C	N/A	N/A	0	0
22/04/15 08:33:02.69	-10.38 dBm	2988.66	2988.66	+29.50-C	N/A	N/A	0	0
22/04/15 08:33:03.74	-10.37 dBm	2989.52	2989.52	+29.50-C	N/A	N/A	0	0
22/04/15 08:33:04.79	-10.44 dBm	2989.6	2989.6	+29.50-C	N/A	N/A	0	0
22/04/15 08:33:05.87	-10.52 dBm	4291.88	4291.88	+29.50-C	N/A	N/A	0	0
22/04/15 08:33:06.88	-9.92 dBm	4291.88	4291.88	+29.25-C	N/A	N/A	0	0
22/04/15 08:33:07.92	-9.91 dBm	4991.05	4991.05	+29.25-C	N/A	N/A	0	0
22/04/15 08:33:08.97	-10.10 dBm	5402.5	5402.5	+29.25-C	N/A	N/A	0	0

Figure 3.6.5: Excel data Window

3.7 Firmware Update

The firmware upgrade process requires a computer running a Windows operating system and with the latest Mini-Circuits GUI (Graphical User Interface) program installed for the PTE model to be upgraded.

3.7.1 In line with our Quality Policy and our efforts toward continuous improvement, Mini-Circuits frequently adds new features to improve our existing software. To get the latest firmware, go to:

http://www.minicircuits.com/support/software_download.html scroll to the FCPM-6000RC section and click on the Firmware Download link at the bottom right corner of the section (**Fig 3.7.1**), this will take you to the firmware download page.


Power Meter				
Product Name	Version	Download	Description / Instructions	Models Supported
Power Meter - Setup	B18	Download	Smart Power Meter GUI program for Windows 32/64 bit - Latest Version - Setup.	PWR-6G PWR-6GHS PWR-8GHS PWR-4GHS PWR-8FS PWR-4RMS PWR-2GHS-75 PWR-2.5GHS-75
Power Meter - CD	B18	Download	Latest Version of the entire Power Meter CD: GUI program, DLL COM Objects 32/64 bit, Linux Support, drivers and Documents. When extracting the files after download, keep the folder names.	
mcl_pm.dll	Jul 04, 2013	Download	mcl_pm.dll - ActiveX com object file. Registering to Windows is required. Recommended for 32 bit programming.	
mcl_pm64.dll	Jul 04, 2013	Download	mcl_pm64.dll - .NET Class Library. Recommended for 64/32 bit programming.	
Programming Manual	A1	Download	PDF File: Detailed Guide for Programmers.	
Project Examples	Aug 10, 2014	Download	Projects Examples for several Programming environments such as: VB6, VB.NET, C#, C++, Delphi, LabView, Matlab, LINUX. When extracting the Zip file after download: keep the folder names.	Firmware Download 

Figure 3.7.1: Software Download page, PWR section

3.7.2 Check the revision listed for FCPM-6000, if it is newer than the revision you have installed - click on the download link for it. Save the zip archive to your computer and extract the .Hex file it contains without changing the filename.

Note: If the file name of the .Hex file is changed it will not be recognized as a valid firmware file.

3.7.3 USB control for the FCPM GUI must be selected (See section 3.1) to allow Firmware upgrade. When in USB control, you will note in the settings display the firmware information section on the right, below the Measurement units section.

CAUTION

A power interruption, to either the computer or the FCPM-6000RC while the firmware is being updated may cause the firmware to be corrupted. It is therefore recommended to only update the firmware while the computer is connected to an Uninterruptible Power Supply (UPS).

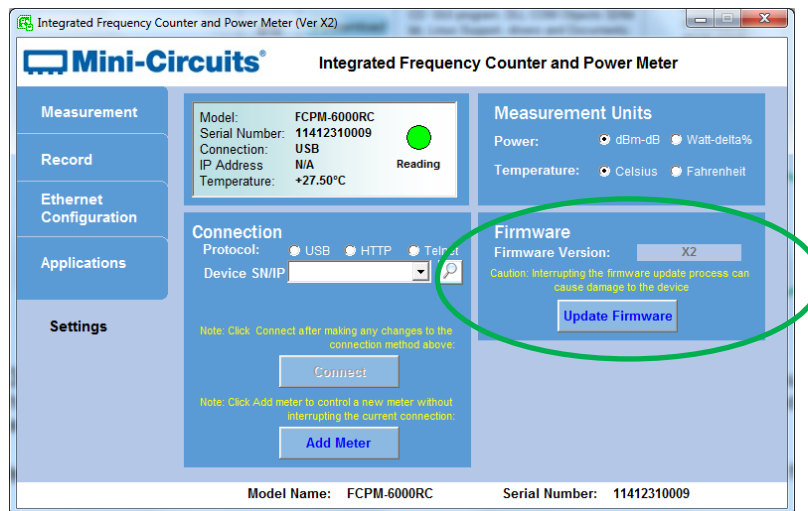


Figure 3.7.3: Firmware section in Settings

3.7.4 Clicking on the 'Update Firmware' will open a browse window to the firmware directory under the path you selected when installing the GUI program (See **Fig. 3.7.4**). Navigate to where you saved your firmware file in **section 3.7.1**, Select the firmware version you wish to install and click 'O.K'.

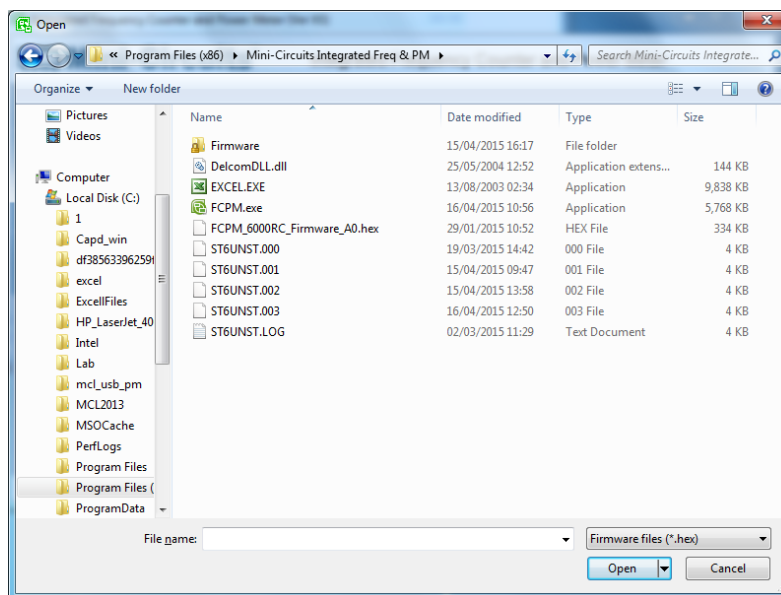


Figure 3.7.4: Firmware - Browse Window

3.7.5 **The selected file will be installed in the FCPM-6000RC.** The process will take up to a minute.

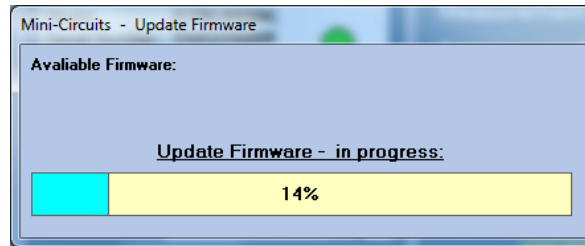


Figure 3.7.5: Firmware - Progress Bar Window

3.7.6 **After the firmware has updated** an alert will appear. Click 'OK' to shut down the FCPM program and restart automatically.

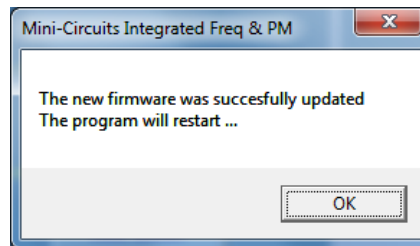


Figure 3.7.6: Firmware - Successful Update

3.8 Compact View

3.8.1 **Checking 'Compact View'** in the bottom right corner of the main screen will cause the screen to shrink to the compact view display. In compact view the program displays power measurement, measurement units, FCPM-6000RC S/N, and the frequency entered but you must return to main screen to change any parameters.

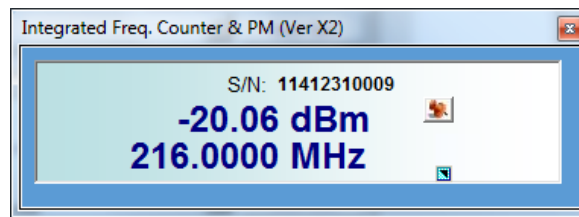


Figure 3.8.1: Compact view window