USB / Ethernet

Integrated Frequency Counter & Power Meter FCPM-6000RC

50Ω   -30 dBm to +20 dBm,   1 MHz to 6000 MHz

The Big Deal

- Automatically synchronized power & frequency measurements
- **USB** *and* **Ethernet** control
- Includes GUI with measurement applications software, simplifying complex measurements
- Measurement speed 30ms

CASE STYLE: JL2029   *Installation CD*

Product Overview

Mini-Circuits' FCPM-6000RC Integrated Frequency Counter & Power Meter is a compact (5.00 x 2.66 x 1.36") precision test device controlled via USB or Ethernet (HTTP and Telnet protocols) or operated as standalone test instrument. It simplifies test setups by enabling synchronized frequency and power measurements from a single device. The unit features an LCD display allowing convenient readings directly off the measurement head, while our user-friendly GUI software enables easy remote test management via USB or Ethernet. It comes supplied with Mini-Circuits' GUI software, DLLs for programmers, user guide, programming instructions, and all the accessories needed for immediate use right out of the box (see page 8 for a complete list of included accessories).

Key Features

Feature	Advantages
Ethernet-TCP/IP- **HTTP** and **Telnet** Protocols (Supports DHCP and Static IP)	The FCPM-6000RC integrated freq. counter & power meter can be controlled from any Windows®, or Linux® computer, or even a mobile device with a network connection and Ethernet-TCP/IP (HTTP or Telnet protocols) support. Using a VPN would allow remote control from anywhere in the world.
USB control	User may also control the integrated freq. counter & power meter via USB connection. Plug-and-Play, no driver required. Compatible with Windows® or Linux® operating systems using 32 and 64 bit architecture (up to 24 sensors simultaneously).
GUI program with USB and Ethernet interfaces	Allows quick and easy measurement, average measurements, data recording, and more.
'Measurement Application' GUI software built-in	Automated measurement setups which allow the user to perform measurements on RF components such as Couplers, Filters, Amplifiers, etc., display numerical data and graphs, and analyze the data.
LCD character display	LCD character display providing the frequency and power readings, as well as information on the unit's status.
Operates with external or internal reference	The FCPM-6000RC can operate either synchronized with an external 10 MHz reference signal or independently, using its internal reference depending on user preference.
No calibration required before taking measurement	The FCPM-6000RC does not require any reference signal for calibration, reducing test time and simplifying operation.
5V power supply	Powered via USB plug from PC, supplied AC adapter or from commercially available Power Over Ethernet (PoE) splitter with 5V output.

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USB / Ethernet

Integrated Frequency Counter & Power Meter

FCPM-6000RC

50Ω   1 MHz to 6000 MHz

Product Features
- USB and Ethernet control
- Supports HTTP and Telnet network protocols
- Wide bandwidth, 1 to 6000 MHz
- Uses external or internal reference
- LCD character display
- 50 dB Dynamic Range, -30 to +20 dBm
- Good VSWR, 1.1:1 typ.
- Fast measurement speed, 30 ms (power), 100 ms (freq).
- Automatic frequency calibration & temperature compensation
- Multi-sensor capability (up to 24)
- Built in 'Application Measurement' software
- User-friendly Windows® Graphical User Interface
- Supports a wide range of programming environments (See application note **AN-49-001** for details)

CASE STYLE: JL2029   *Installation CD*

Included Accessories

Model No.	Description	Qty.
USB-AC/DC-5	AC/DC 5V Adapter	1
USB-RJ45-CBL-7+	6.6 ft "Y" data cable (USB & RJ45)	1
FCPM-CD	Installation CD	1

Typical Applications
- Production testing systems
- Field testing
- Remote location monitoring
- Automatic, scheduled data collection
- Evaluate high-power, multi-port devices with built-in virtual couplers/attenuators & other software tools

RoHS Compliant
See our web site for RoHS Compliance methodologies and qualifications

Mini-Circuits Program for Integrated Frequency Counter & Power Meters
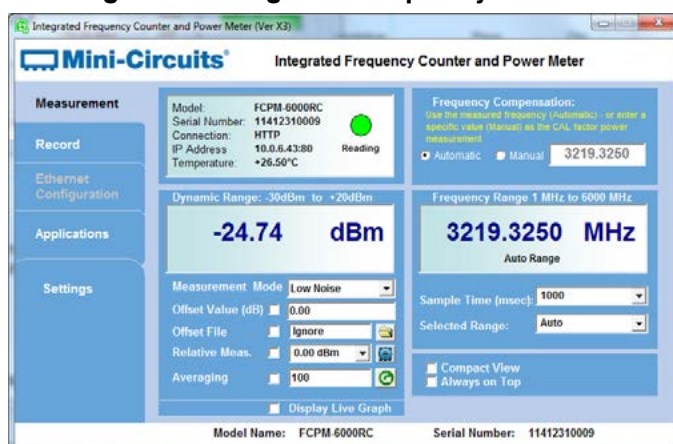
For programming instructions, see **programming manual** on Mini-Circuits' website.
For installation instruction and overview of FCPM-6000RC functions, see **user guide** on Mini-Circuits' website.

Electrical Specifications (CW) [1], -30 dBm to +20 dBm, 1 to 6000 MHz

Parameter		Freq. Range (MHz)	Min.	Typ.	Max.	Units
Dynamic range [2,3,4]	@ 25ºC	1 - 5700	-30	–	+20	dBm
		5700 - 6000	-28	–	+20	
	@ 0ºC to 50ºC	1 - 6000	-27	–	+20	
VSWR		1 - 6000	–	1.05	1.25	:1
Uncertainty of Power Measurement @ 25ºC	@ -30 to +5 dBm [5,6]	1 - 3000	–	± 0.10	± 0.30	dB
		3000 - 6000	–	± 0.15	± 0.30	dB
	@ +5 to +15 dBm	1 - 3000	–	± 0.15	± 0.30	dB
		3000 - 6000	–	± 0.15	± 0.30	dB
	@ +15 to +20 dBm	1 - 3000	–	± 0.20	± 0.40	dB
		3000 - 6000	–	± 0.20	± 0.40	dB
Uncertainty of Power Measurement @ 0ºC to 50ºC	@ -30 to +5 dBm [5,6]	1 - 3000	–	± 0.25	–	dB
		3000 - 6000	–	± 0.25	–	dB
	@ +5 to +15 dBm	1 - 3000	–	± 0.20	–	dB
		3000 - 6000	–	± 0.20	–	dB
	@ +15 to +20 dBm	1 - 3000	–	± 0.35	–	dB
		3000 - 6000	–	± 0.30	–	dB
Power Linearity @ 25ºC		1 - 6000	–	± 3.0	–	%
Power Resolution		1 - 6000	0.01	–	–	dB
Frequency Resolution		1 - 40 MHz	–	1	–	Hz
		40-190 MHz	–	10	–	
		190-6000 MHz	–	100	–	
Frequency Uncertainty (@1 sec measurement sample time) [4,7]		1 - 40 MHz	–	±2	–	Hz
		40-190 MHz	–	±20	–	
		190-1400 MHz	–	±200	–	
		1400 - 6000 MHz	–	±800	–	
Averaging Range		1 - 6000	1	-	999	–
Frequency Aging	Using int. Reference	–	–	–	±1.0	ppm/year
Measurement Speed (for power meas.)	@ Low Noise Mode	1 - 6000	–	100	–	msec
	@ Faster Mode		–	30	–	
Sample time (for frequency meas.) [8]		–	100	1000	3000	msec
Input Impedance		–	–	50	–	Ω
Reference In Frequency		–	–	10	–	MHz
Reference In Impedance		–	–	50	–	Ω
Reference In Power		–	-5	–	+10	dBm
Supply Voltage	via USB port	1 - 6000	4.5	5	5.5	V
Current (via USB port, in USB control)		1 - 6000	–	370	500	mA
Current (via USB port, in Ethernet control)		1 - 6000	–	380	500	mA
Ethernet communication		Supports both Telnet and HTTP protocols over TCP/IP with dynamic(DHCP) or static IP				

[1] All specifications apply to continuous wave (CW) signals.
[2] Maximum continuous safe operational power limit: +23 dBm. Performance is guaranteed up to +20 dBm.
[3] The FCPM-6000RC can operate down to -32 dBm, however performance is guaranteed only in the range specified in the table.
[4] Minimum power for Frequency measurement at 190-240 MHz may degrade by up to 3 dB due to measurement band switching.
[5] When using Faster mode at high frequencies below -20dBm, use of averaging is recommended to prevent noise errors.
[6] When using Faster mode power reading below -20dBm, uncertainty value may increase by up to 0.2 dB relative to Low noise mode power reading.
[7] Accuracy shown using external 10 MHz reference synchronized to test signal. Using Internal Reference adds 2 ppm of tested frequency to the accuracy values shown.
[8] Software function set by user, default option 1000 mec.

Minimum System Requirements

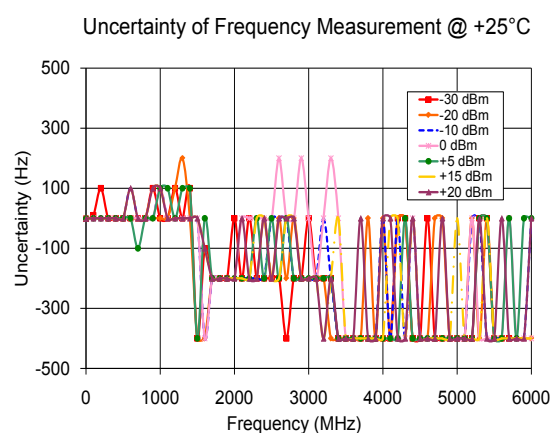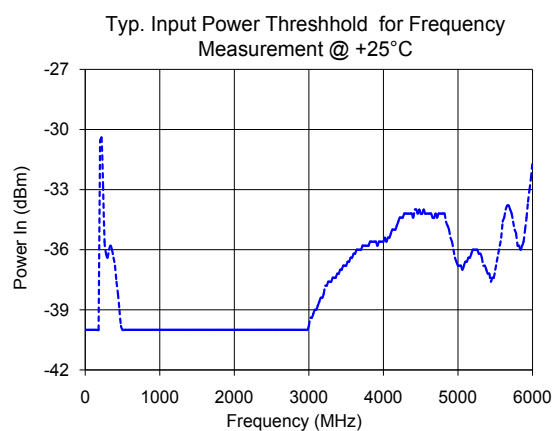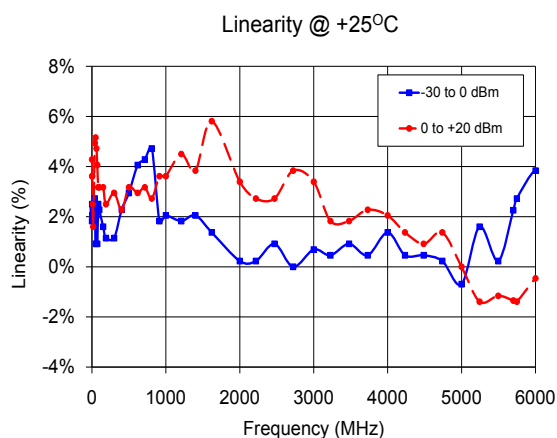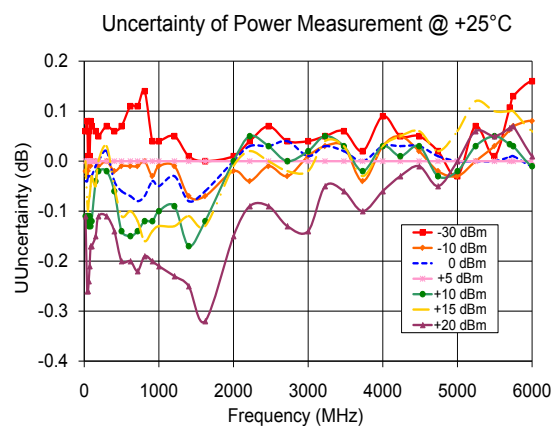| Parameter	Requirements
Interface	USB HID or HTTP Get/Post or Telnet protocols
Host operating system - USB control	**Windows 32/64 Bit operating system:** Windows 98®, Windows XP®, Windows Vista®, Windows 7®, Windows 8® **Linux ® support:** 32/64 Bit operating system
Host operating system - Ethernet control	Any Windows®, Mac®, or Linux® computer with a network port and Ethernet-TCP/IP (HTTP or Telnet protocols) support
Hardware	Pentium® II or better , RAM 256 MB
Y control cable for USB and Ethernet (supplied)	Model to be used with the supplied control cable only

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	0°C to 50°C
Storage Temperature	-30°C to 70°C
V_{USB} Max.	6 V
DC Voltage @ RF port	15 V
RF Power(CW) @ RF port	+25 dBm
DC Voltage @ Reference Input	25 V
RF Power(CW) @ Reference Input	+13 dBm

Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

Connections

Reference Input	(BNC-Female)
Signal Input	(N-Typ-Male)
Power & Control	(Push-Pull connector)

Typical Performance Curves

VSWR

Uncertainty of Power Measurement @ +25°C

Linearity @ +25°C

Typ. Input Power Threshhold for Frequency Measurement @ +25°C
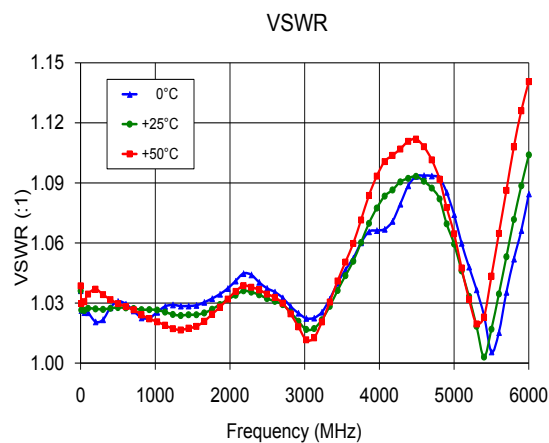
Uncertainty of Frequency Measurement @ +25°C

Outline Drawing (JL2029)
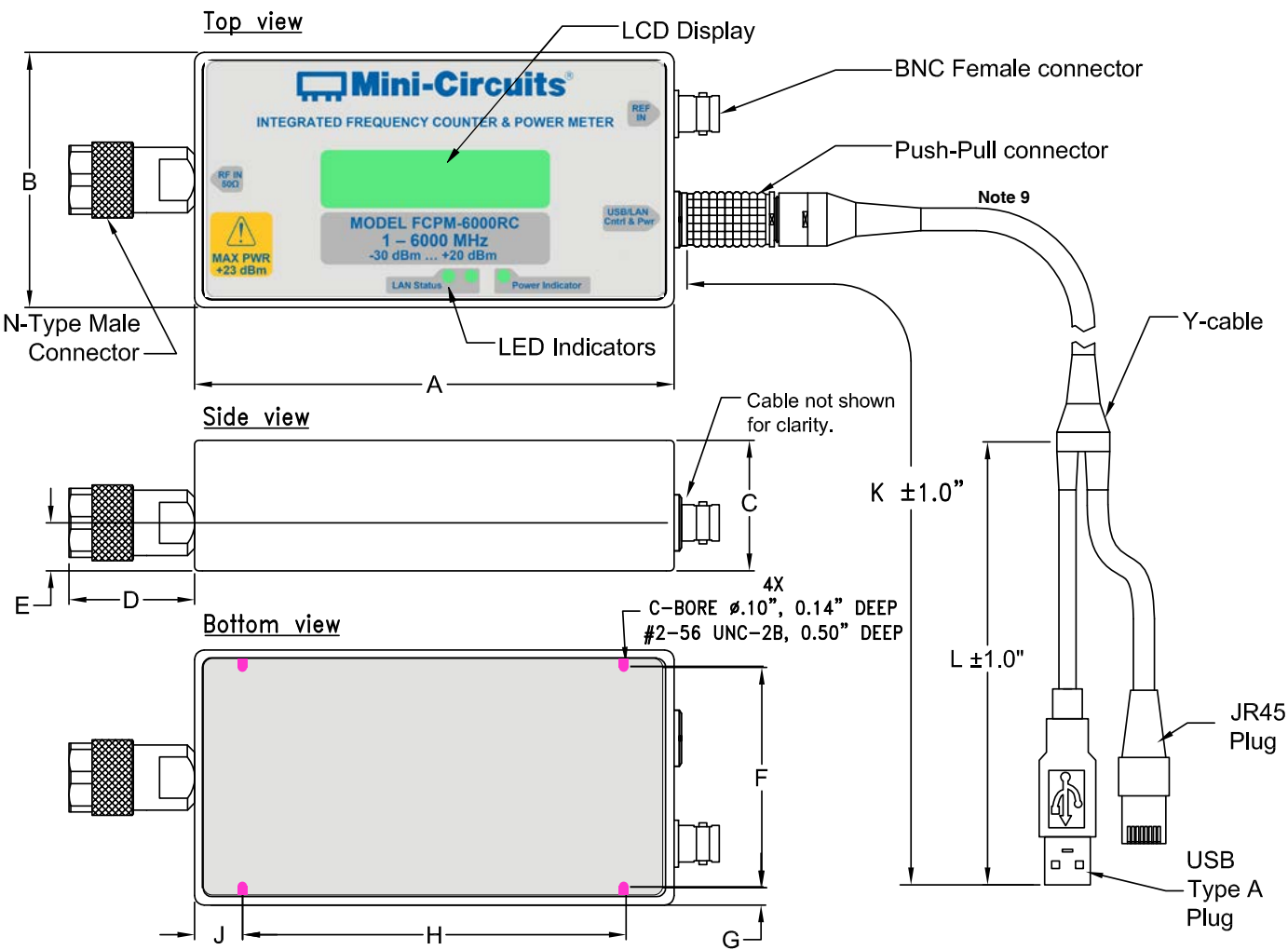
Outline Dimensions (inch/mm)

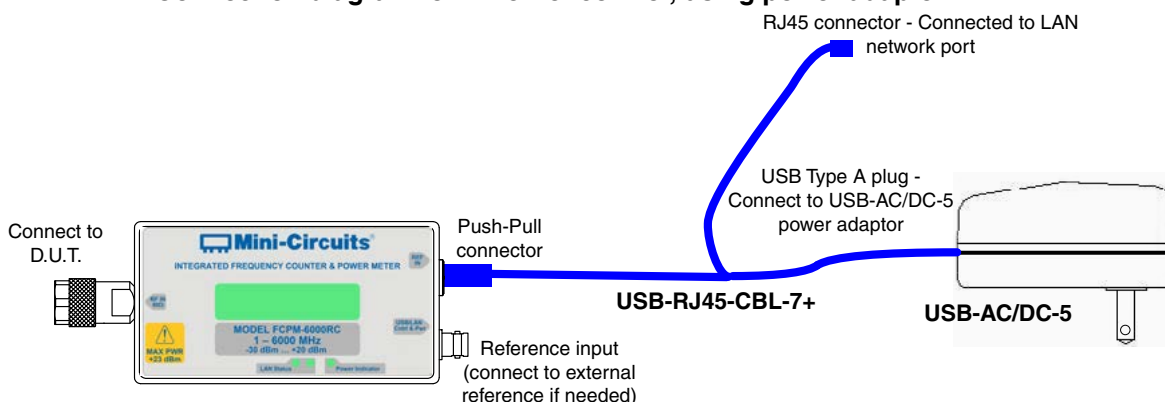| A	B	C	D	E	F	G	H	J	K	L	WT. GRAMS
5.00 (127.0)	2.66 (67.6)	1.36 (34.5)	1.31 (33.3)	0.50 (12.7)	2.300 (58.42)	0.18 (4.6)	4.000 (101.60)	0.50 (12.7)	81 (2057)	20 (508)	500

[9] FCPM-6000RC to be used with the supplied control cable only.
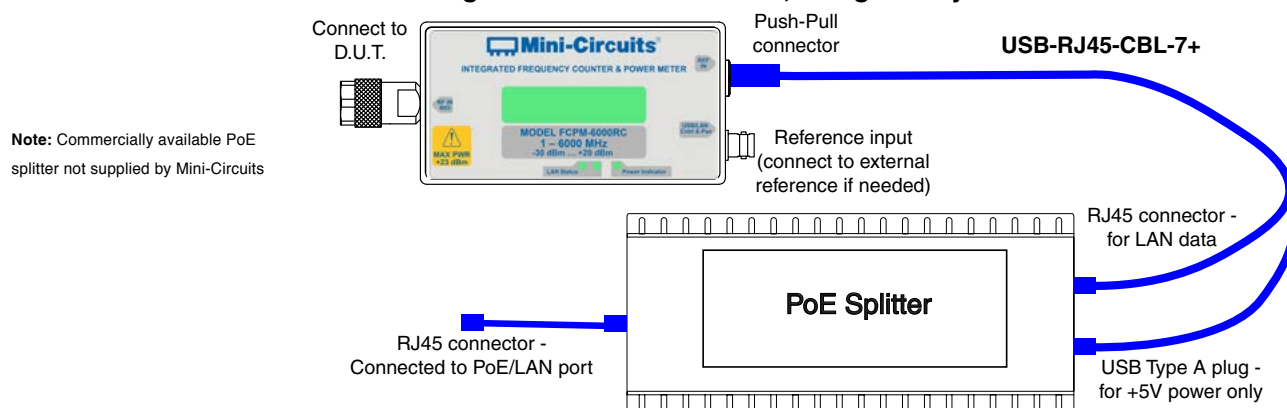
Connection diagrams

Connection diagram for USB control

RJ45 connector - Not in use for USB control

Connect to D.U.T.

Push-Pull connector

Mini-Circuits
INTEGRATED FREQUENCY COUNTER & POWER METER

MODEL FCPM-6000RC
1 ~ 6000 MHz
-30 dBm ... +20 dBm

MAX PWR +23 dBm

LAN Status   Power Indicator

Reference input (connect to external reference if needed)

USB-RJ45-CBL-7+

USB Type A plug - Connect to computer USB socket
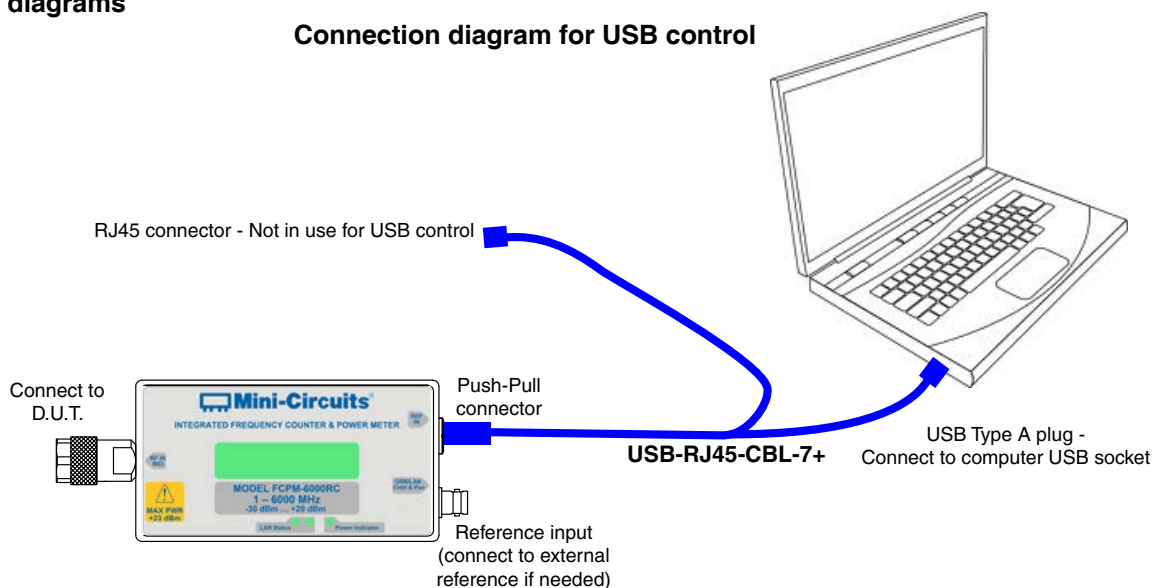
Connection diagram for Ethernet control, using power adapter

RJ45 connector - Connected to LAN network port

Connect to D.U.T.

Push-Pull connector

Mini-Circuits
INTEGRATED FREQUENCY COUNTER & POWER METER

MODEL FCPM-6000RC
1 ~ 6000 MHz
-30 dBm ... +20 dBm

MAX PWR +23 dBm

LAN Status   Power Indicator

Reference input (connect to external reference if needed)

USB-RJ45-CBL-7+

USB Type A plug - Connect to USB-AC/DC-5 power adaptor

USB-AC/DC-5

Connection diagram for Ethernet control, using PoE system

Connect to D.U.T.

Push-Pull connector

USB-RJ45-CBL-7+

Mini-Circuits
INTEGRATED FREQUENCY COUNTER & POWER METER

MODEL FCPM-6000RC
1 ~ 6000 MHz
-30 dBm ... +20 dBm

MAX PWR +23 dBm

LAN Status   Power Indicator

Note: Commercially available PoE splitter not supplied by Mini-Circuits

Reference input (connect to external reference if needed)

RJ45 connector - for LAN data

PoE Splitter

RJ45 connector - Connected to PoE/LAN port

USB Type A plug - for +5V power only

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Ordering Information

Model	Description
FCPM-6000RC	Integrated Frequency Counter & Power Meter

Included Accessories	Part No.	Description
UK / Europe & IL / US / Australia & China	USB-AC/DC-5	AC/DC Power Adapter with US, EU, IL, UK, AUS, and China two pin power plugs [10], [11]. Operating temperature: 0°C to +45°C, AC Input: 100-240V, 47-63 Hz, DC Output 5±0.25 V , I_{Max}=1A
	FCPM-CD	Software CD
	USB-RJ45-CBL-7+[12]	6.6 ft (2 m) "Y" data cable with USB Type-A and RJ45 plug connectors

[10] Power plugs for other countries are also available, if you need a power plug for a country not listed in the table please contact apps@minicircuits.com or check http://www.minicircuits.com/contact/offices.html for regional offices e-mail and phone numbers.

[11] The USB-AC/DC-5 may be used to provide the $5V_{DC}$ power input via USB port if operating with Ethernet control. Not required if using USB control.

[12] FCPM-6000RC to be used with the supplied control cable only.

Optional Accessories	Description
USB-AC/DC-5 (spare)	AC/DC $5V_{DC}$ Power Adapter with US, EU, IL, UK, AUS, and China power plugs
USB-RJ45-CBL-7+ (spare)	6.6 ft (2 m) "Y" data cable with USB Type-A and RJ45 plug connectors
NF-SM50+	N-Type Female to SMA Male Adapter (For mating with SMA devices).

Calibration	Description	
CAL-FCPM-6000RC	Calibration Service	Click Here

Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

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