![Boonton logo]

CPS2000

True-Average Connected Power Sensors

98408200A | Rev 0

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation and maintenance of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Boonton Electronics assumes no liability for the customer's failure to comply with these requirements.

DO NOT OPERATE THE INSTRUMENT IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions dangerous voltages may exist even though the power cable was removed, therefore; always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications on the instrument. Return the instrument to Boonton Electronics for repair to ensure that the safety features are maintained.

SAFETY SYMBOLS

This safety requirement symbol has been adopted by the International Electro-technical Commission, Document 66 (Central Office) 3, Paragraph 5.3, which directs that an instrument be so labeled if, for the correct use of the instrument, it is necessary to refer to the instruction manual. In this case it is recommended that reference be made to the instruction manual when connecting the instrument to the signal source and USB host.

The CAUTION symbol denotes a hazard. It calls attention to an operational procedure, practice or instruction that, if not followed, could result in damage to or destruction of part or all of the instrument and accessories. Do not proceed beyond a CAUTION symbol until its conditions are fully understood and met.

The NOTE symbol is used to mark information which should be read. This information can be very useful to the operator in dealing with the subjects covered in this section.

The HINT symbol is used to identify additional comments which are outside of the normal format of the manual, however can give the user additional information about the subject.

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Overview

This document describes the setup and usage of the CPS2000-Series True-Average Connected Power Sensors, CPS2000 GUI application software, Boonton CPS2000 IVI.NET driver software, and Boonton CPS2000 IVI-C driver software.

1.2 Definitions

Term/Abbreviation	Definition
VISA	Virtual Instrument Software Architecture. A test & measurement device I/O specification.
IVI	Interchangeable Virtual Instruments. A test & measurement device I/O specification layered above VISA.
PoE	Power over Ethernet. A system or method by which power is passed along with data via Ethernet cabling.
LAN	Local Area Network

2 Setup & Installation

2.1 System Requirements & Dependencies

2.1.1 CPS2000 GUI System Requirements

The CPS2000 GUI software application's minimum system requirements are as follows:

Operating System	Windows 7 SP1 or newer (32- and 64-bit)
Processor	1 GHz CPU
RAM	1 GB RAM
Disk Space	512 MB of Available Disk Space
Graphics	DirectX 9 Compatible Integrated or Dedicated Graphics Card
Other	.NET Framework 4.0 or later *– Included with the CPS2000 GUI application installer*

Table 1 - Minimum System Requirements

2.1.2 CPS2000 GUI Software Requirements

To communicate with power sensors, the Boonton Power Viewer software application makes use of the Boonton CPS2000 IVI.NET driver.

The Boonton CPS2000 IVI.NET driver is an IVI-Compliant driver included as part of the CPS2000 GUI application installer. Also included with the CPS2000 GUI application installer is the Boonton CPS2000 IVI-C driver.

The Boonton CPS2000 IVI-C driver has the following software prerequisites:

Software	Minimum Version
VISA Shared Components	5.6.0
IVI Shared Components	2.4.2

Table 2 - IVI-C Driver Prerequisites

The Boonton CPS2000 IVI.NET driver has the following software prerequisites:

Software	Minimum Version
VISA.NET Shared Components	5.6.0
IVI.NET Shared Components	1.4.0

Table 3 - IVI.NET Driver Prerequisites

2.1.2.1 IVI Shared Components Availability

The IVI and IVI.NET Shared Components required by the CPS2000 GUI software application and IVI drivers are included with the CPS2000 GUI application installer.

Alternatively, the shared components are available from the official IVI foundation website:

http://www.ivifoundation.org

2.1.2.2 VISA Implementations and Availability

The VISA and VISA.NET Shared Components **are not** included with the CPS2000 GUI application installer.

Known compatible VISA implementations, and their required minimum version, are listed below:

Vendor	Software	Minimum Version	Recommended Version	Download Location
National Instruments	NI-VISA	15.0.1	17.0	http://www.ni.com/download/ni-visa-17.0/6646/en/
Keysight	IO Libraries Suite	17.2.20407.1	18.1.22713.0	https://www.keysight.com/find/iosuite

Table 4 – VISA Implementations & Availability

The recommended VISA implementation is NI-VISA 17.0 provided by National Instruments.

2.2   Installation

> **Note!**
>
> *Installation and operation of the CPS2000 GUI requires installation of the IVI.NET, IVI, VISA.NET, and VISA shared components. The IVI.NET and IVI shared components are included with the CPS2000 GUI software installer, **but the VISA shared components are only obtainable from a 3rd party vendor**. These components must be installed before using the CPS2000 GUI software. See section 2.1.2.*

Installation of the CPS2000 GUI software application Boonton CPS2000 IVI drivers can be performed using the CPS2000 GUI software application installer available on Boonton's website.

The setup installer includes the CPS2000 GUI software application, the required IVI Shared Components, and Boonton CPS2000 IVI drivers.
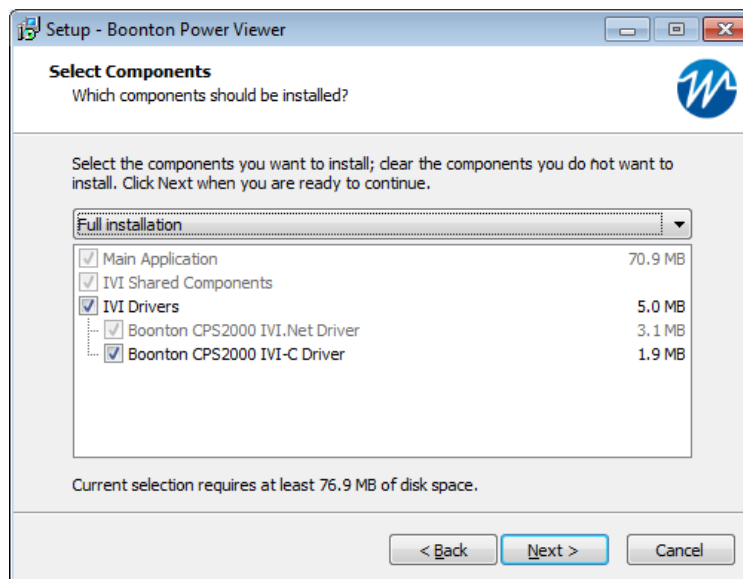
3   General Use & Configuration

3.1   Connecting to a Power Sensor

The CPS2000 series of devices supports connection via USB and Ethernet (TCP/IP). Specifically, the supported modalities are as follows:

Connected to PC via USB.
Powered by the USB connection to the PC.

Connected to PC via Ethernet LAN (TCP/IP).
Powered by PoE (Power over Ethernet).

Connected to PC via Ethernet LAN (TCP/IP).
Powered by USB Power Adapter.

Connected to PC via Ethernet LAN (TCP/IP).
Powered by USB connection to the PC.

3.1.1 USB

All CPS2000 power sensors support connection to a PC using USB.

3.1.1.1 Required Equipment

a) CPS2000 Power Sensor
b) USB 2.0 Type A Male to Type B Male cable
c) PC with the CPS2000 GUI application installed

3.1.1.2 Setup Steps

To setup and take measurements with a CPS2000 power sensor connected by USB, follow these steps:

1. Connect the CPS2000 power sensor to the PC using a standard USB 2.0 Type A Male to Type B Male cable.
2. Start up the CPS2000 GUI application.
3. The CPS2000 power sensor will appear in the device list. Select the device and click OK to open the device.
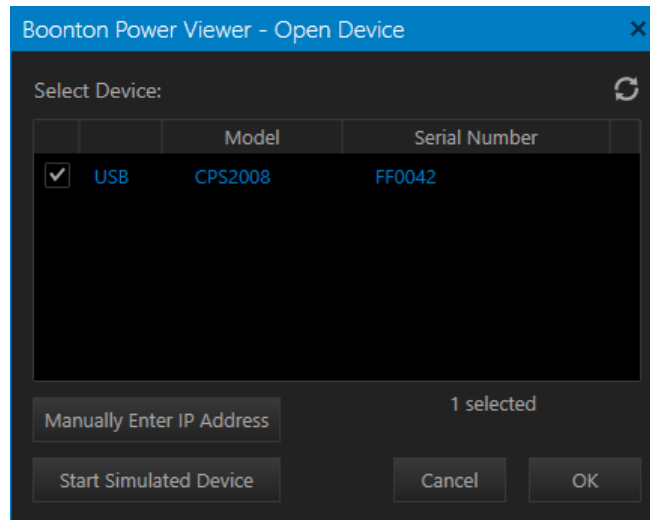

Figure 1 - USB Device Selection

4. The application will immediately begin taking power measurements.

Start Simulated Device

When a CPS2000 power sensor is not available, users may still access the CPS2000 GUI by selecting the *Start Simulated Device* button.

3.1.2 Ethernet

The CPS2000 power sensors also support connection to a LAN network via standard Ethernet cabling.

3.1.2.1 Required Equipment

a) CPS2000 Power Sensor
b) CAT5 or CAT6 Ethernet Cable
c) Local network with router setup and configured
d) PoE ("Power over Ethernet") Ethernet switch *or* USB wall power source
e) PC with the CPS2000 GUI application installed

> *Note!*
> *When using the device via an Ethernet connection, the device must be powered using PoE or with a USB power adapter.* **The device does not support connection to a PC via both Ethernet and USB at the same time.**

3.1.2.2 Setup Steps

To setup and take measurements with a CPS2000 power sensor connected by Ethernet, follow these steps:

1. Connect the CPS2000 power sensor to your LAN using a standard Ethernet cable.
   a. If not using Power over Ethernet, connect the CPS2000 power sensor to a power using a USB power adapter.
2. Start up the CPS2000 GUI application.
3. Select *Manually Enter IP Address* button.
4. Enter the IP address of the device.

> *Note!*
> *To determine the IP address of a CPS2000 power sensor, users need to connect to the sensor via USB. Then go to the* File -> Configure Network Settings… *menu and select the sensor in question. A Network Configuration window will appear with the information. Please see section 3.1.2.3 for additional information.*
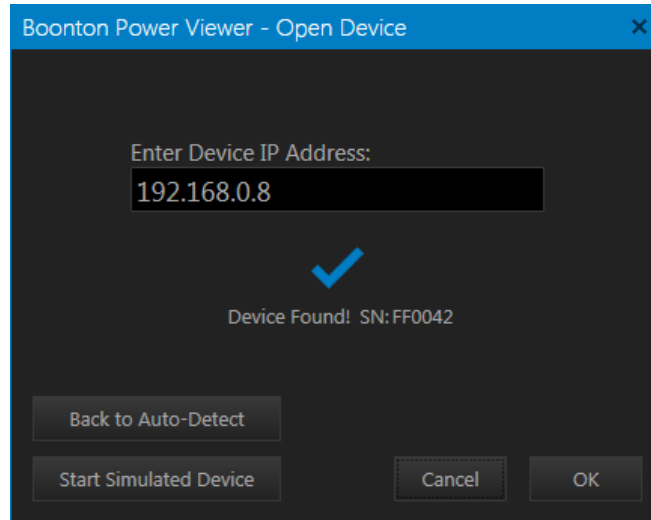
5. The software will then verify the IP.


Figure 2 - TCPIP Search Success

6. Click OK to open the device.
7. The application will immediately begin taking power measurements.

Auto-detect

If the *Cancel* button is selected, the user will be returned to the Open Device window with Auto-Detect of USB devices disabled. To return to the Open Device window with Auto-Detect with Auto-Detect enabled, select the Back to *Auto-Detect* button.

3.1.2.3 Configuring the TCP/IP Settings of a Power Sensor

To configure the TCP/IP settings of a Power Sensor, select the device you want to configure under the *File -> Configure Network Settings…* menu:
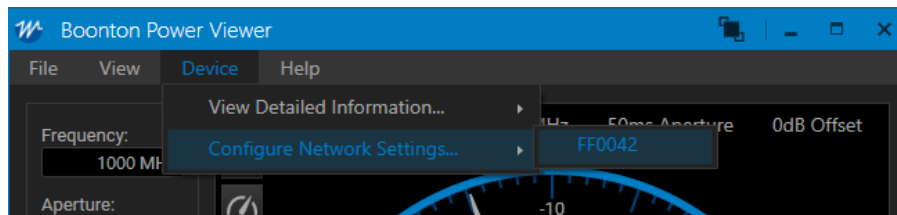
Configure the settings as required using the input boxes within the *New Settings* section of the window. When finished, click the *Store New Settings…* button to apply the changes.

Boonton Power Viewer - Network Configuration - FF0042   ✕

Device SN: FF0042
MAC Address: 79:4E:3A:0D:1A:7F

Active Settings

Obtained Via: DHCP
IP Address: 192.168.0.2
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.0.1

New Settings
◉ Use DHCP   ◉ Use Static IP
Static IP Settings
IP Address: 192.168.0.100
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.0.1

Cancel   Store New Settings

Boonton Power Viewer   ✕

⚠ Warning!

These settings will persist across power cycles.
If set improperly, you may lose connectivity with your device over TCP/IP.

Are you sure you want to do this?

Yes   No

Boonton Power Viewer   ✕

ⓘ Settings applied!

The device must be power cycled before the changes will take effect.

OK

3.2   Configuring a Power Sensor

The CPS2000 GUI application provides a simple device configuration UI.
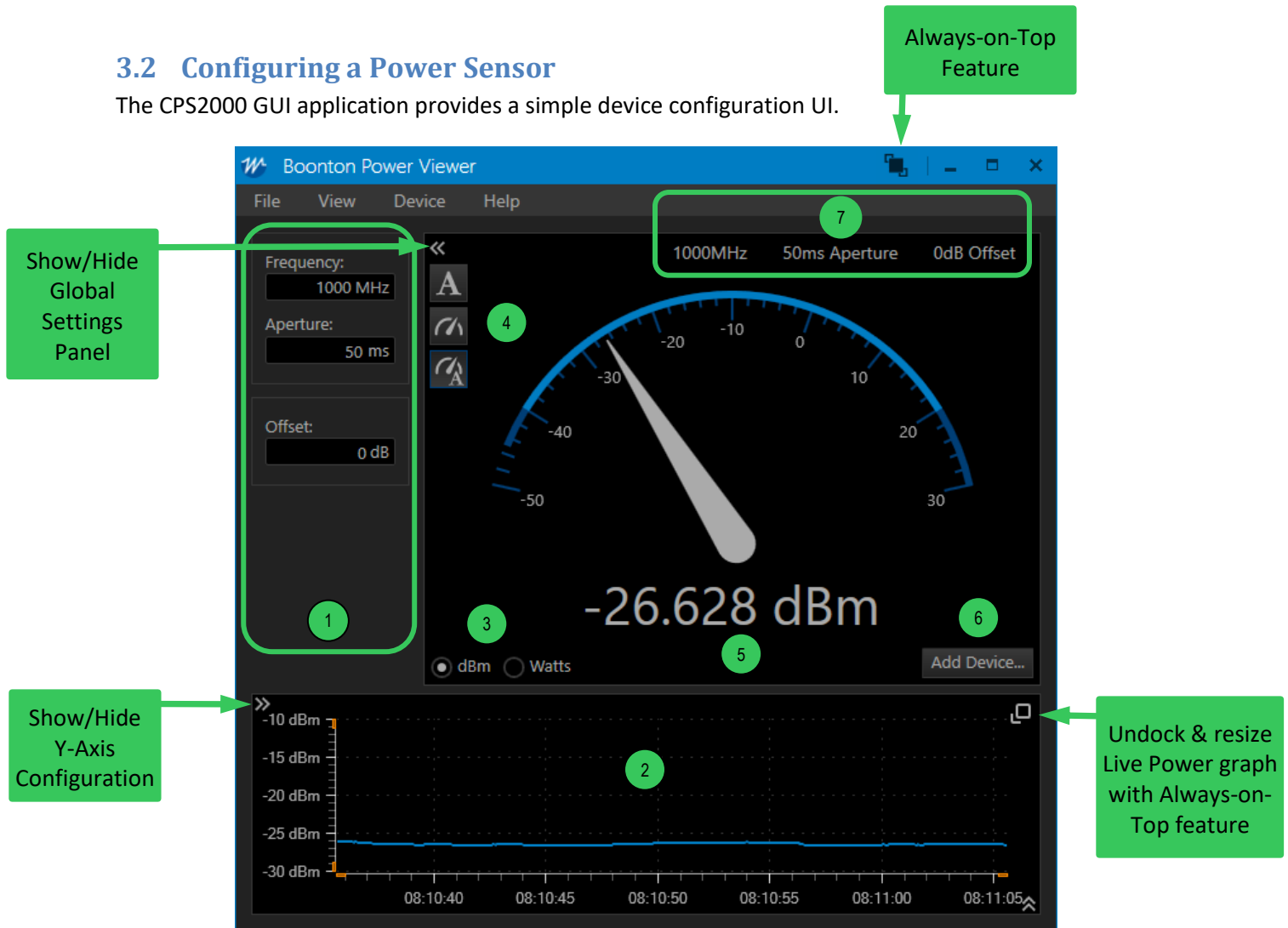
Figure 3 - Software Overview

1	Settings panel, including Frequency, Aperture, and Offset settings.	3	Units selection
Aperture 1 ms - 2 s	The aperture time is the total time the sensor observes the input signal to make one power measurement.	4	Visualization selected. Options include Text-Only, Gauge-Only, and Text + Gauge.
Offset +/-200 dB	This feature provides the ability to apply corrections to measurements when RF devices are between the sensor and DUT.	5	Power Measurement
		6	*Add Device…* button for adding additional devices
2	Live Power vs. Time graph (units are dBm only)	7	Applied settings

3.3 Connecting to Multiple Power Sensors

The CPS2000 GUI application supports connecting multiple devices. To connect to additional devices, click the *Add Device…* button.

To toggle the view between single and multiple sensor readings, navigate to *View -> Graph -> All Channels* or *No Channels*.
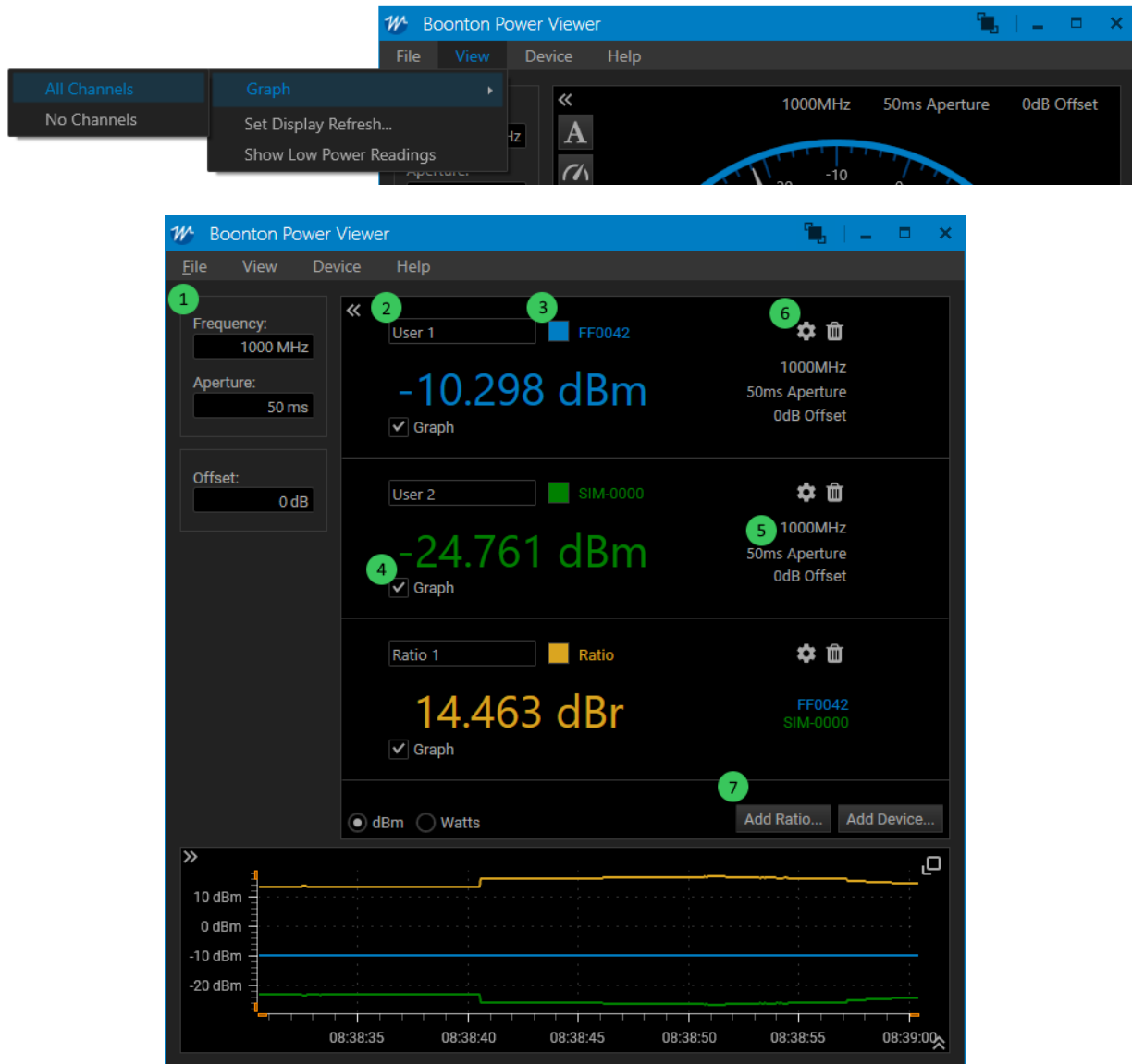
Figure 4 - Multiple Device View

1	Global settings panel, affects all devices that are linked to the global settings	**5**	Applied device settings for each device
2	Device label – A user configurable label for a Power Sensor or Ratio	**6**	Toggle buttons to configure or remove a specific Power Sensor or Ratio
3	Color selector	**7**	Adds a ratio between two power measurements
4	Graph toggle checkbox		

3.4   Upgrading the Firmware on a Power Sensor

To determine the current firmware version on a CPS power sensor, navigate to *Device -> View Detailed Information -> and* select the sensor of interest.
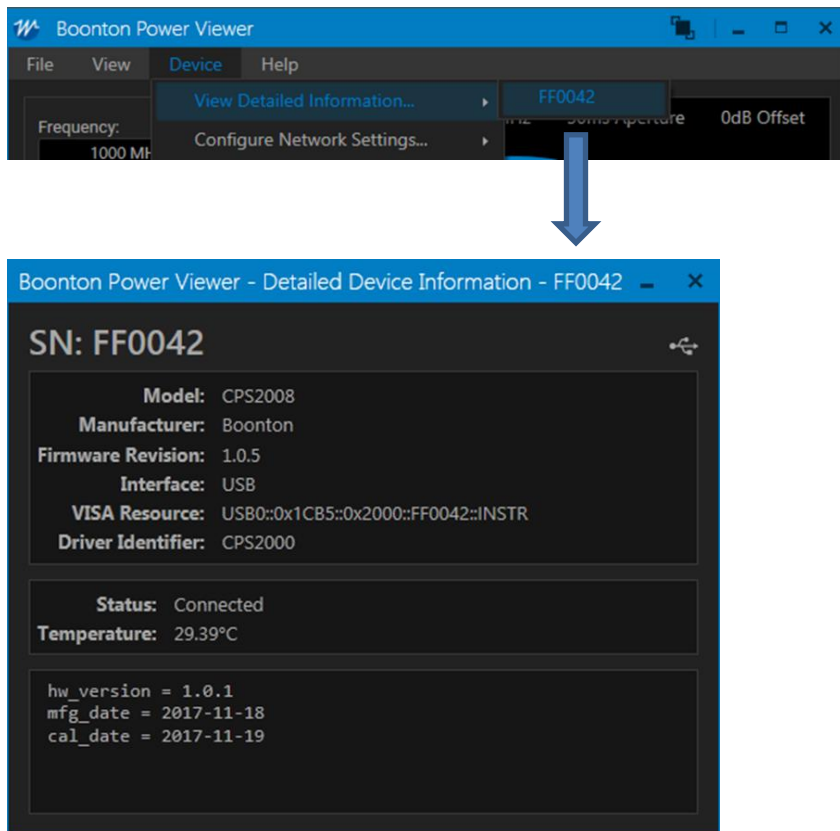
To upgrade firmware, the CPS2000 GUI application includes a utility for loading firmware onto a CPS2000 power sensor. The utility is accessible using the *File -> Upgrade Device Firmware…* menu:
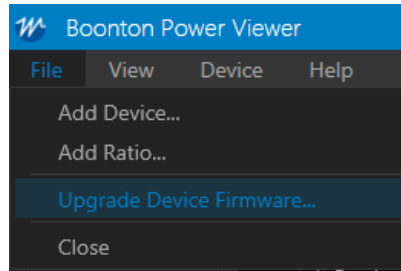

Figure 5 - Firmware Upgrade Menu

To load new firmware onto a power sensor, select it from the list of devices, select an upgrade file, and then click the *Start Upgrade* button.
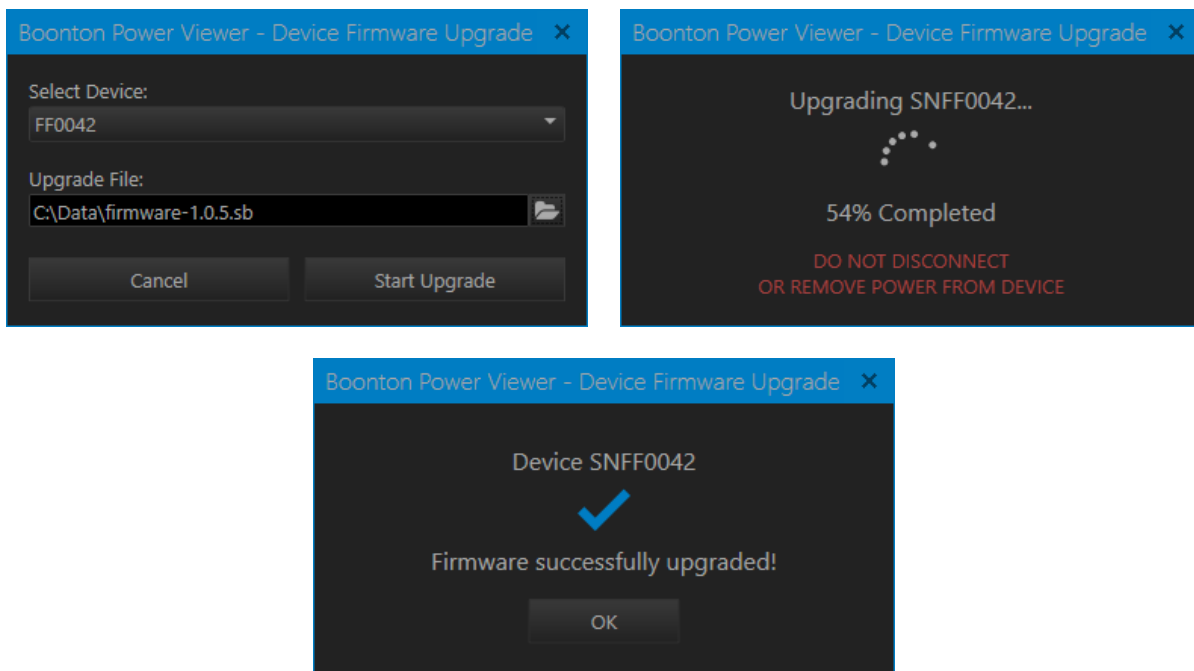
Figure 6 - Firmware Upgrade Process

When the firmware loading process has completed, the power sensor will automatically be reconnected and power measurements will automatically startup again.

3.5   Other Features

The CPS2000 GUI includes additional features described below.
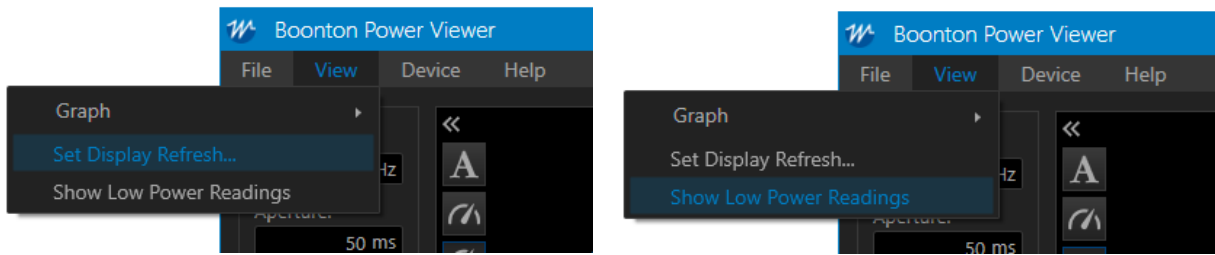
3.5.1   Set Display Refresh

Users can select the display refresh rate from x to y.

3.5.2   Show Low Power Readings

The CPS2000 power sensor can detect power levels below the specified measurement range. Users can elect to display these readings by selecting *Show Low Power Readings*. Otherwise, the when power levels are below the specified range, the display will read "Too Low" (default setting).

4   Troubleshooting

4.1   Recovery After a Failed Firmware Upgrade

If a failure is encountered when attempting to upgrade a device, such as if the cable is disconnected during an upgrade, the device may be left in a state that prevents operation of the normal upgrade procedure.

If this occurs, the device can still be recovered. To recover the device, follow these steps:

1. Open a Windows Command Prompt window
2. Within the command prompt, navigate to the CPS2000 GUI application's directory:

```
> cd C:\Program Files(x86)\Boonton\CPS2000
```

Note: This location depends on the location where the application was installed. If you installed the application to a different location, you will need to use a different path.

3. Execute the following command, replacing **`<path>`** with the path to your firmware upgrade .sb file.

```
> blhost.exe --usb 0x1cb5,0x2000 receive-sb-file <path>
```

4. Allow the upgrade to complete.
5. When finished, execute the following command:

```
> blhost.exe --usb 0x1cb5,0x2000 reset
```

6. The device will reset and will then be available for use in the CPS2000 GUI application.

5   Boonton Resources on RF Power Measurements

Information regarding power measurement and Boonton Power Sensor products is available free of charge from the Resource Library section of the Boonton website. All Boonton power sensor instruction manuals cover the details of RF power measurement techniques. The following links highlight a few of the available application notes, articles, webinars and white papers related to RF Power measurements and techniques:

*   Principles of RF Power Measurements:
    http://www.boonton.com/resource-library/power-measurement-reference-guide
*   Videos:
    http://boonton.com/resource-library?brand=Boonton&go=videos
*   Application Notes:
    http://www.boonton.com/resource-library?brand=Boonton&go=application_notes

- Whitepapers:
  http://www.boonton.com/resource-library?brand=Boonton&go=white_papers
  - Articles:
    http://www.boonton.com/resource-library?brand=Boonton&go=articles
  - Webinars:
    http://www.boonton.com/resource-library?brand=Boonton&go=webinars

Appendix A – Software License

END-USER LICENSE AGREEMENT

License below is hereby granted for the following product(s):
- Boonton CPS2000 Series True-Average Connected Power Sensors

IMPORTANT-READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and Boonton Electronics, a subsidiary of the Wireless Telecom Group, Inc., for the Boonton Electronics software product identified above, which includes instrument software and may include associated media, printed materials, "online" or electronic documentation, and Internet-based services ("Product"). An amendment or addendum to this EULA may accompany the Product.

YOU AGREE TO BE BOUND BY THE TERMS OF THIS EULA BY INSTALLING, COPYING, OR OTHERWISE USING THE PRODUCT. IF YOU DO NOT AGREE, DO NOT INSTALL OR USE THE PRODUCT; YOU MAY RETURN IT TO YOUR PLACE OF PURCHASE FOR A FULL REFUND.

1. GRANT OF LICENSE. Boonton Electronics grants you the following rights provided that you comply with all terms and conditions of this EULA:

    - Installation and use. You may install, use, access, display and run this Product only in conjunction with a Boonton 55 Series, 54 Series or 4540 Series RF Power Sensor. The Product may not be used on any other hardware.
    - Reservation of Rights. Boonton Electronics reserves all rights not expressly granted to you in this EULA.

2. UPGRADES. To use a Product identified as an upgrade, you must first be licensed for the product identified by Boonton Electronics as eligible for the upgrade. After upgrading, you may continue to use the product that formed the basis for your upgrade eligibility.

3. TRANSFERABILITY. This product is transferable only to other Boonton models listed in Paragraph 1.

4. LIMITATION ON REVERSE ENGINEERING, DECOMPILATION, AND DISASSEMBLY. You may not reverse engineer, decompile, or disassemble the Product, except and only to the extent that it is expressly permitted by applicable law notwithstanding this limitation.

5. TERMINATION. Without prejudice to any other rights, Boonton Electronics may cancel this EULA if you do not abide by the terms and conditions of this EULA, in which case you must destroy all copies of the Product and all of its component parts.

6. NOT FOR RESALE SOFTWARE. This software product is "Not for Resale" and may not be separately resold, transferred or used for any purpose other than operation with Boonton instrument models listed in the paragraph 1.

7. EXPORT RESTRICTIONS. You acknowledge that the Product is of U.S. origin and subject to U.S. export jurisdiction. You agree to comply with all applicable international and national laws that apply to the Product, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments.

8. U.S. GOVERNMENT LICENSE RIGHTS. All Product provided to the U.S. Government pursuant to solicitations issued on or after December 1, 1995 is provided with the commercial license rights and restrictions described elsewhere herein. All Product provided to the U.S. Government pursuant to solicitations issued prior to December 1, 1995 is provided with "Restricted Rights" as provided for in FAR, 48 CFR 52.227-14 (JUNE 1987) or DFAR, 48 CFR 252.227-7013 (OCT 1988), as applicable.

9. APPLICABLE LAW. If you acquired this Product in the United States, this EULA is governed by the laws of the State of New Jersey. If this Product was acquired outside the United States, then local law may apply.

10. ENTIRE AGREEMENT. This EULA (including any addendum or amendment to this EULA which is included with the Product) are the entire agreement between you and Boonton Electronics relating to the Product and the support services (if any) and they supersede all prior or contemporaneous oral or written communications, proposals and representations with respect to the Product or any other subject matter covered by this EULA. To the extent the terms of any Boonton Electronics policies or programs for support services conflict with the terms of this EULA, the terms of this EULA shall control.

11. The Product is protected by copyright and other intellectual property laws and treaties. Boonton Electronics owns the title, copyright, and other intellectual property rights in the Product. The Product is licensed, not sold.

Appendix B – Warranty & Repair

B.1 Repair Policy

If a Boonton power sensor is not operating correctly and requires service, contact the Boonton Electronics Service Department as indicated in **Section B.2 Contacting Boonton** for return authorization. You will be provided with an RMA number and shipping instructions. Customers outside the USA should contact the authorized Boonton distributor for your area. The entire instrument must be returned in its original packing container. If the original container is not available, Boonton Electronics will ship a replacement container and you will be billed for the container cost and shipping charges.

Note that sensors which have failed due to overloading, improper mating, or connecting to an out-of-tolerance connector are not considered defective and will not be covered by the Boonton Warranty.

B.2 Contacting Boonton

RMAs for service or calibration may be obtained directly from the Boonton website: http://www.boonton.com/service-and-support/request-an-rma

Customers in the United States having questions or equipment problems may contact Boonton Electronics directly during business hours (8 AM to 5 PM Eastern) by phoning (973) 386-9696. FAX messages may be sent at any time to (973) 386-9191.

Email inquiries should be sent to service@boonton.com. International customers should contact their authorized Boonton Electronics representative for assistance. A current list of authorized US and international representatives is available on the Boonton website at www.boonton.com.

B.3 Limited Warranty

Boonton Electronics warrants its products to the original Purchaser to be free from defects in material and workmanship and to operate within applicable specifications for a period of three years from date of shipment for instruments, probes, power sensors and accessories. Boonton Electronics further warrants that its instruments will perform within all current specifications under normal use and service for three years from date of shipment. These warranties do not cover active devices that have given normal service, sealed assemblies which have been opened, or any item which has been repaired or altered without Boonton's authorization.

Boonton's warranties are limited to either the repair or replacement, at Boonton's option, of any product found to be defective under the terms of these warranties.

There will be no charge for parts and labor during the warranty period. The Purchaser shall prepay inbound shipping charges to Boonton or its designated service facility and shall return the product in its original or an equivalent shipping container. Boonton or its designated service facility shall pay shipping charges to return the product to the Purchaser for domestic shipping addresses. For addresses outside the United States, the Purchaser is responsible for prepaying all shipping charges, duties and taxes (both inbound and outbound).

At Boonton's option, an extended Warranty period may be available for an additional charge. If an extended warranty option has been purchased, the extended period is substituted for the 3-year period above. Note that the extended warranty does not extend the instrument's calibration interval past 12 months. The instrument must be maintained in a calibrated state throughout the warranty period to be eligible for warranty service to remedy "out of spec" operation.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Boonton will not be liable for any incidental damages or for any consequential damages, as defined in Section 2-715 of the Uniform Commercial Code, in connection with products covered by the foregoing warranties.

Note: Specifications, terms and conditions are subject to change without prior notice.

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