

POWER

1400 SERIES Optical Power Meter

EPIQ User Manual



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Version: 1.10

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1 What's in this user manual?

You can find the following information in this document:

Before you begin	Conventions Safety information Working with optical fibers System requirements
Getting started	Introducing the POWER 1400 EPIQ Series Setting up hardware Managing your product with Cohesion Operator Instrument IP address
Working with your POWER instrument	Touchscreen display: Touchscreen display Graphical user interface CohesionUI: CohesionUI - Overview Controlling your POWER instrument with CohesionUI SCPI commands: Controlling your POWER instrument with SCPI commands Programming examples and applications
Maintenance	Upgrade firmware Restore factory settings

2 Conventions

Please make yourself familiar with these conventions; we use them throughout this user manual:



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in **death or serious injury**.

Do not proceed unless the required conditions are met and understood.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in **minor or moderate injury** or **component damage**.

Do not proceed unless the required conditions are met and understood.

NOTE

Indicates relevant information that requires your attention.

3 Safety information

Carefully read all safety information before using your Quantifi Photonics product.

3.1 Optical laser radiation precautions



WARNING

To protect yourself from harm caused by optical radiation:

- Do not install or terminate fibers while the light source is active.
- Turn the Quantifi Photonics product OFF before inspecting the end face(s) of the product, or any optical patch cords connected to it.
- Never look directly into a live fiber; ensure that your eyes are protected at all times.
- Equip all unused ports with protective caps or blanking covers.



CAUTION

The use of controls, adjustments, and procedures other than those specified in this document may result in exposure to hazardous situations involving optical radiation.

3.2 Electromagnetic compatibility



CAUTION

For electromagnetic compatibility, this product is a Class A product. It is intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.



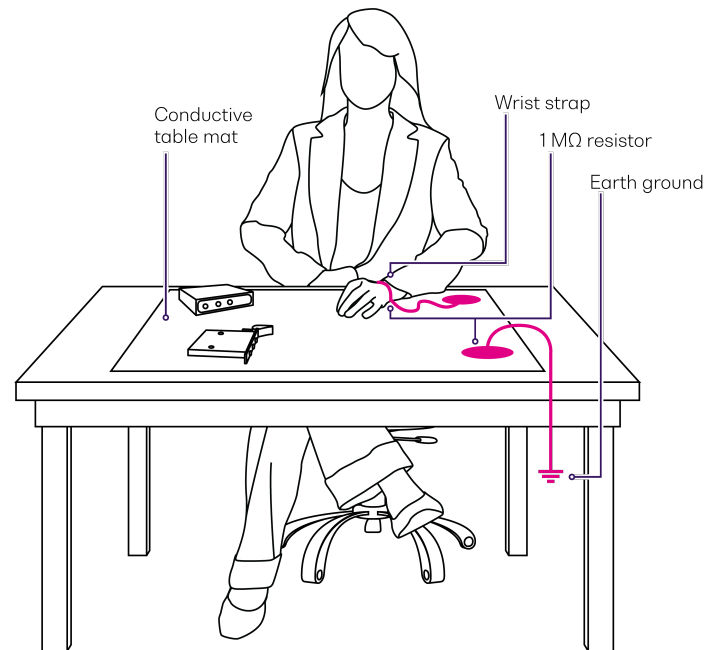
This symbol on the unit refers to documentation provided with the product for related safety information. Ensure that the required conditions are met and understood before using the product.

3.3 Electrostatic discharge precautions

CAUTION

The product is sensitive to electrostatic discharge (ESD). To ensure that you do not cause ESD damage to the product:

- Always follow proper grounding and ESD management practices.
- Store the unused product in the original protective electrostatic packaging that it was shipped in.
- Use a wrist strap and grounding table mat when unpacking or handling the product.



3.4 Connecting and disconnecting your instrument



CAUTION

To protect users from electric shock and prevent damage to the instrument:

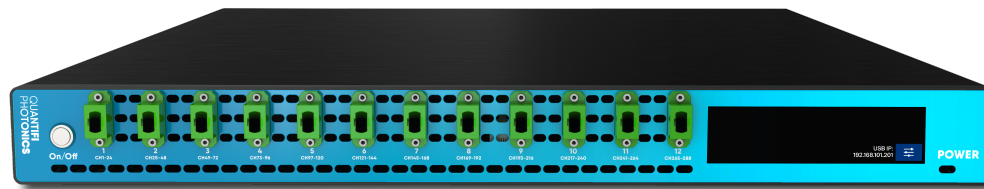
- **Earth your instrument:** Before powering on your instrument, ensure the protective grounding wire is securely connected and functioning.
- **Provide easy access to power disconnect:** Position the instrument so that you can easily disconnect it.

4 Introducing the POWER 1400 EPIQ Series

Optical power meters of the POWER 1400 EPIQ Series provide fast monitoring of signal power from -60 to +10 dBm and a broad wavelength range of 1250 to 1650 nm.

Equipped with up to 12 connectors and 24 channels per connector, the POWER 1400 EPIQ Series provides unequalled channel density by enabling power readings on up to 288 parallel channels in a single 1U rack-mountable instrument.

Integrated hardware triggering capabilities enable synchronizing of a variety of instruments through the trigger input. This offers a number of advantages over more traditional software-initiated measurements.



Programming interfaces

Through its programming interfaces you can take advantage of the SCPI-compliant command language and choose from programming tools such as LabView, C++, Python, or any of the other popular programming languages used to control automatic test equipment (ATE).

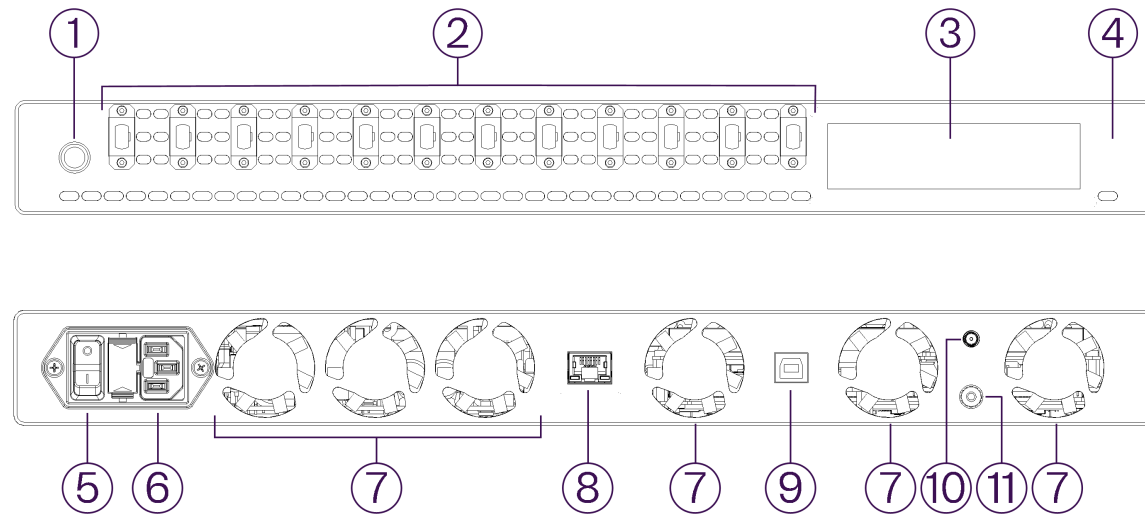
CohesionUI™

Quantifi Photonics' web-based graphical user interface CohesionUI is hosted on Microsoft Windows® and enables you to control your device from any supported web browser.

Touchscreen display

The touchscreen display makes it easy to quickly view and maintain a number of relevant settings.

4.1 Hardware description

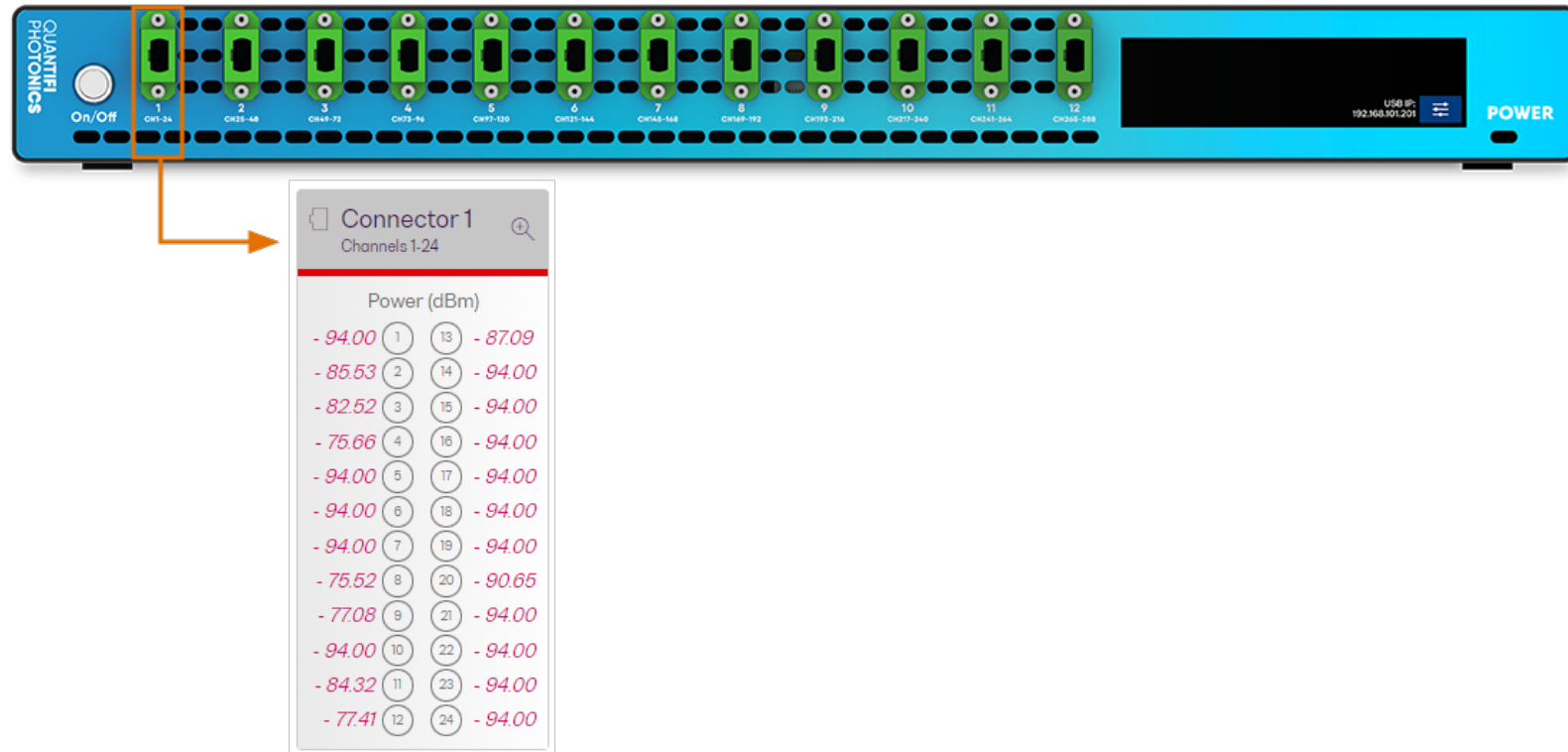


Front		Rear	
1	Power ON/OFF	5	Mains power ON/OFF isolation switch
2	Optical inputs MTP-24 Elite Male APC Connector 1 (channel 1-24) to Connector 12 (channel 265-288) (the number of connectors on your instrument can vary depending on your model)	6	AC power ~100-240V, 50-60Hz, 350W max
3	Touchscreen display	7	Ventilation fan - DO NOT OBSTRUCT
4	Connector type information	8	Ethernet port
		9	USB port (Type B)
		10	Trigger input (SMA max 3.3V TTL)
		11	Earth ground screw (M4)

4.2 Optical inputs

Instruments of the POWER 1400 EPIQ Series have up to 12 connectors for optical input with 24 channels per connector.

Each connector on the front panel corresponds with a connector displayed in CohesionUI and can be addressed via SCPI commands.



Connector	Channels	Connector	Channels
1	1-24	7	145-168
2	25-48	8	169-192
3	49-72	9	193-216
4	73-96	10	217-240
5	97-120	11	241-264
6	121-144	12	265-288

4.3 Environmental conditions

Range of environmental conditions:

Indoor or outdoor use	Indoor only
Altitude	Max. 2000m
Operating temperature range	5°C to 45°C 41°F to 113°F
Storage temperature range	-40°C to 70°C -40°F to 158°F
Relative humidity range	20% to 80%
Main supply voltage	100-240V~, 50/60Hz, 350W Max
Main supply voltage fluctuations	±10%
Fuse specification	6.3A, 250VAC
Overvoltage category	OVC II
Pollution degree	2

For fuse replacement, please adhere to the specifications provided in the table above.

5 Setting up hardware

Follow the instructions in this section when setting up your instrument.



CAUTION

The product is sensitive to electrostatic discharge (ESD). To prevent damage from ESD:

- Do not remove the product from the antistatic packaging until required to do so.
- Wear a grounded wrist strap at all times when handling the product.



CAUTION

Skin contact may leave corrosive residue and damage a connector:

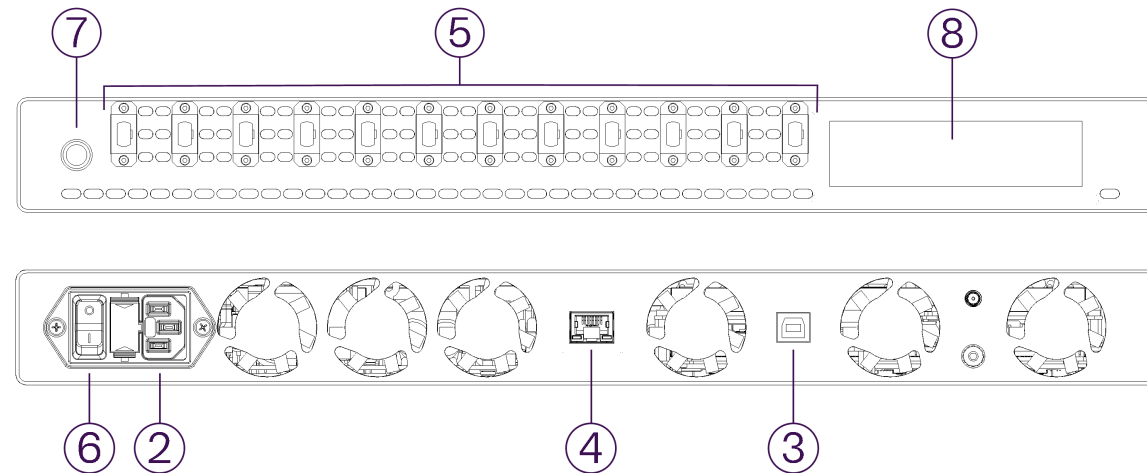
- Always clean optical end faces before mating.

NOTE

- You must use the IEC cable that Quantifi Photonics supplies with the unit.
- DO NOT attempt to remove or adjust any component of the product while the power is on. Ensure the product is powered OFF, and that the correct handling procedure detailed herein is followed when you remove or install any products.
- Please check for the fiber end-face type of the optical ports, such as PC or APC, and only use the same type optical connector to avoid damaging the end-face.

For advice on connector and fiber care, please refer to [Working with optical fibers](#).

5.1 Set up your POWER instrument and power ON



► To set up your instrument and power ON:

1. To allow for optimal air flow and avoid thermal issues, do not block the ventilation fans in the front and back of the instrument and set up your instrument with a minimum clearance of 2 inches (50.8mm) around it.
2. Insert the power cord to provide ground connection to the instrument
3. Connect to a client computer using a USB cable,

OR

4. Connect to your network or client computer using an Ethernet cable.
5. Make all required optical connections by mating MTP-24 Female APC connectors with the MTP-24 Elite Male APC front panel connectors.
6. Turn the isolation switch ON.
The switch will illuminate indicating that the AC power supply is live and the instrument is ready to be powered ON.
7. Power the instrument ON by pushing the ON button.
8. The instrument IP address will appear on the LCD screen. When the unit is connected via both Ethernet and USB cable, both the Ethernet and USB IP addresses are displayed.

After powering ON, please wait at least **1 minute** before attempting to communicate with the unit. This gives the unit time to finish boot procedures and initialize the communication server.

5.2 Instrument IP address

To access your Quantifi Photonics instrument from a client computer, you need the IP address of the instrument.

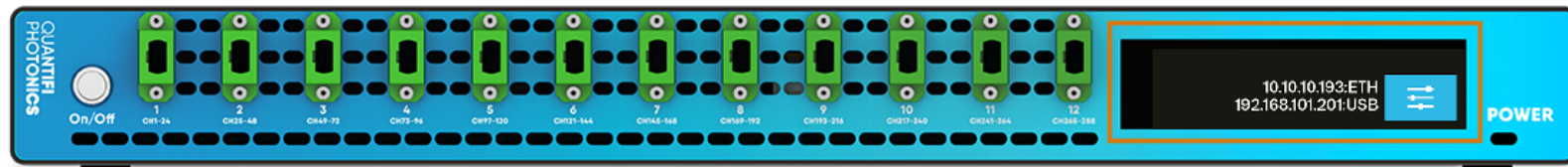
Your instrument can have two different IP addresses depending on your chosen connection method (USB or Ethernet):

- The default **USB IP address** is **192.168.101.201**. This is a static address set during instrument calibration.
- The default **Ethernet IP address** is dynamically assigned by the DHCP.

► To view an instrument's IP address:

With your instrument powered ON, you can view the current IP address on the LCD display.

If your instrument is connected with both, Ethernet and USB cables, both the USB and Ethernet IP address are displayed.



► To change an instrument's IP address:

You can change the instrument's static USB IP address and you can assign a static Ethernet IP address:

- using the touchscreen display
- using CohesionUI

Multi-instrument control

If you have several Quantifi Photonics instruments with static IP addresses on your network, make sure to assign a unique IP address to each instrument before connecting.

For details, refer to [CohesionUI - Overview](#) or [Touchscreen display](#).

6 Managing your product with Cohesion Operator

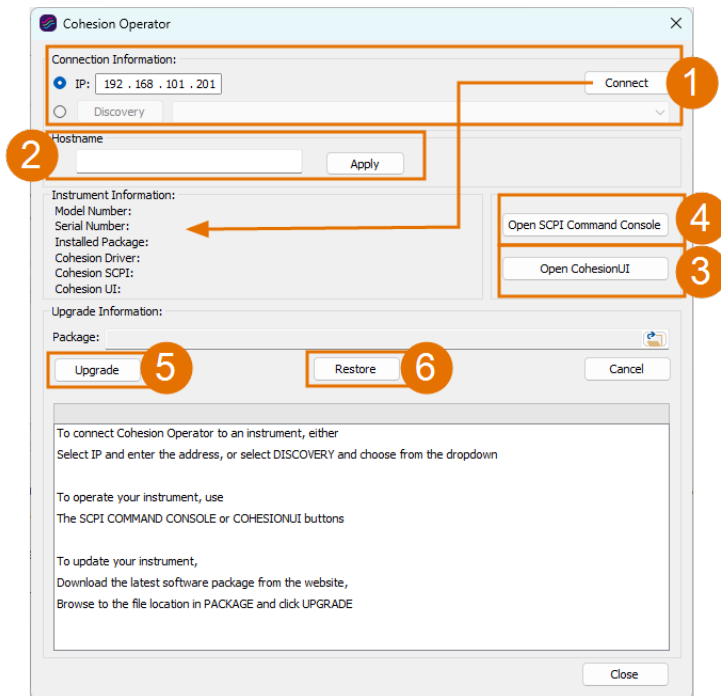
(Cohesion Operator 3.2.6)

To work with Quantifi Photonics instruments, you need to install the latest version of the **Cohesion Operator** software package on any computer that you use to connect with your instrument (client computer).

The software package is included on the USB media device that we provide with your instrument, or you can download it from quantifiphotonics.com (go to Resources > Drivers, software and manuals > EPIQ Series).

Cohesion Operator enables you to:

1. **Connect** with instruments that are available on your network to retrieve instrument information and validate the instrument's IP address.
2. View and modify the **hostname** of the instrument.
3. Access an instrument using **CohesionUI**, a web-based graphical user interface.
4. Work with an instrument using the **SCPI Command Console**.
5. Upgrade instrument **firmware**.
6. Restore an instrument to **factory settings**.



Static vs dynamic IP address

Use one of the following methods to connect Cohesion Operator to the instrument:

- **Static IP Address** (recommended, USB cable required)

Connect using the instrument's static IP address as shown on the instrument screen (for example, **192.168.101.201**). A USB cable is typically required for the initial connection.

- **Dynamic IP Address** (USB cable not required)

Connect using a dynamic IP address. To enable automatic IP detection, ensure the computer running Cohesion Operator has at least one IP address on the same subnet as the instrument. For example, if the instrument IP address is **10.198.177.xxx**, the computer must also have an IP address in the **10.198.177.xxx** subnet.

This allows Cohesion Operator to automatically detect IP address changes after an instrument reboot and maintain communication.

6.1 Install the Cohesion Operator software package

▶ To install the software package on a client computer:

1. (recommended) Save your work and close all programs.
2. Download the Cohesion Operator software package from the website, or insert the **USB media device** that includes the software package in the computer.
3. Double-click **CohesionOperator-<version>.exe** and follow the prompts.

A Windows Security Alert may prompt you to allow network access. We recommend that you allow access to both, private and public networks, to enable any network configuration.

The installation wizard will install required drivers, applications, and desktop icons on the computer.

Multi-instrument control

If another Quantifi Photonics instrument is already connected to the client computer via USB, make sure each instrument has a unique USB IP address to avoid any addressing conflicts.

▶ To open the Cohesion Operator application:

- Double-click the **Cohesion Operator** desktop icon or open **Cohesion Operator** from the Start menu.

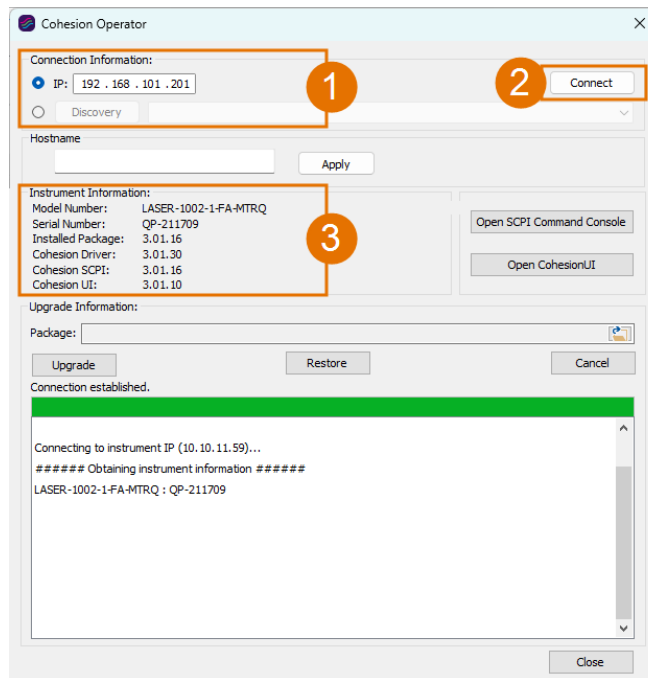
6.2 Connect with an instrument and retrieve instrument information

Using Cohesion Operator, you can check the firmware version and other details of Quantifi Photonics instruments that are available on your network.

► To check details in Cohesion Operator:

1. Select the instrument.
2. Click **Connect**.
3. Current instrument information will be displayed.

Installed Package refers to the currently loaded firmware version.



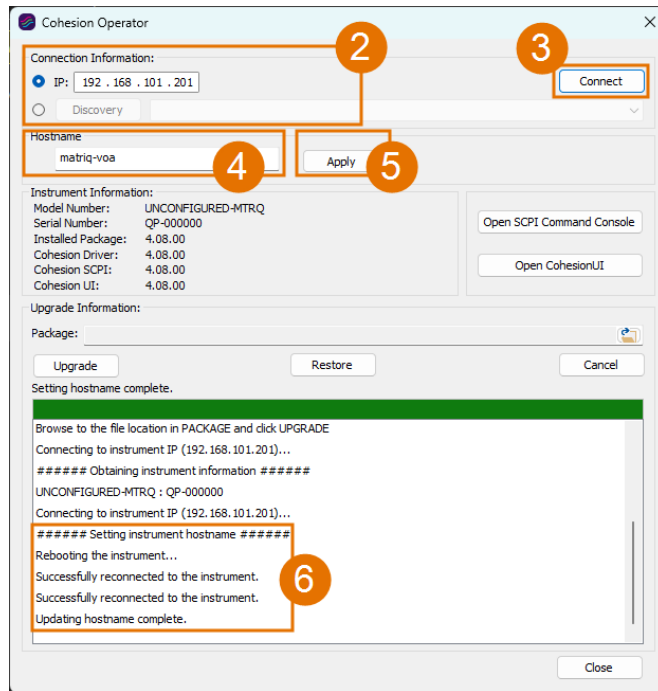
6.3 Set a hostname

Using Cohesion Operator, you can view and modify the hostnames of connected instruments.

We recommend that you assign a hostname via a USB connection to prevent possible connection loss when using an Ethernet connection.

► To assign a hostname:

1. Open the Cohesion Operator, for example by double-clicking the **Cohesion Operator** desktop icon.



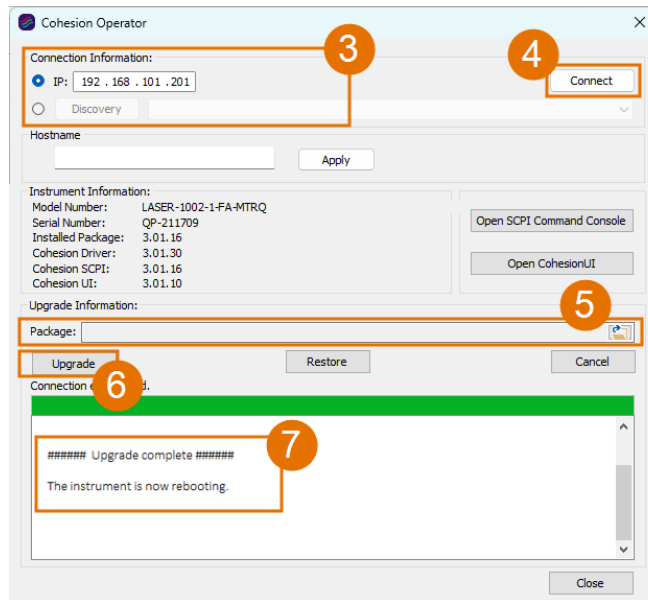
2. Select the instrument by entering its **IP address** or by selecting it from the **Discovery** drop down list.
3. To confirm that you have selected the correct instrument, click **Connect**. This will retrieve instrument information.
4. Enter a hostname.
5. Click **Apply**. Cohesion Operator will assign the hostname to the instrument. This can take a few minutes and the instrument might reboot several times in the process.
6. A message shows when setting the hostname was successful.

6.4 Upgrade firmware

We recommend that you upgrade firmware via a USB connection to prevent possible connection loss when using an Ethernet connection.

► To upgrade an instrument with the latest firmware:

1. Get the latest EPIQ firmware package **CohesionEPIQ-<version>.qfw**, for example by downloading it from [quantifiphotonics.com](https://www.quantifiphotonics.com) (go to **Resources > Drivers, software and manuals > EPIQ Series**), and save it to your network.
2. Open the Cohesion Operator, for example by double-clicking the **Cohesion Operator** desktop icon.



3. Select the instrument by entering its **IP address** or by selecting it from the **Discovery** drop down list.
4. To confirm that you have selected the correct instrument, click **Connect**.
This will retrieve instrument information, with **Installed Package** showing the current firmware version.
5. In **Package**, click the Browse button, navigate to the previously downloaded firmware package and select it.
6. Click **Upgrade**. The instrument will be upgraded to the selected firmware package. This can take a few minutes and the instrument might reboot several times in the process.
7. A message shows when the upgrade is complete.

To verify the new firmware version, click **Connect** (4) to retrieve the latest instrument information.

NOTE

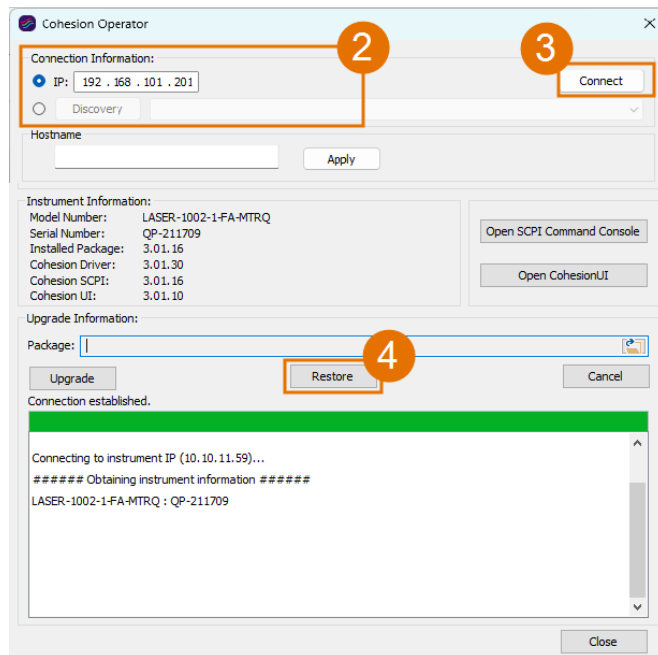
If an upgrade attempt is unsuccessful, the Cohesion Operator will stop the upgrade process and restore the instrument to its previous firmware version. Messages will be displayed accordingly.

6.5 Restore factory settings

We recommend that you restore factory settings via a USB connection to prevent possible connection loss when using an Ethernet connection.

► To restore factory settings:

1. Open the Cohesion Operator, for example by double-clicking the **Cohesion Operator** desktop icon.



2. Select the instrument by entering its **IP address** or by selecting it from the **Discovery** drop down list.
3. To confirm that you have selected the correct instrument, click **Connect**.
This will retrieve instrument information, with **Installed Package** showing the current firmware version.
4. Click **Restore**.
The instrument will be returned to factory settings, including IP address settings.

7 Touchscreen display

The touchscreen display provides local access to the web server application of the POWER instrument.

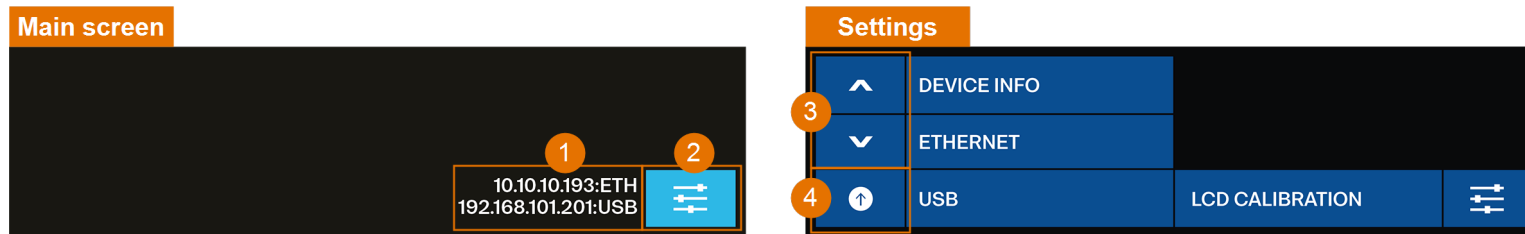
7.1 Main screen - IP address

On the main screen you can view the **IP address** of the instrument:

1. Instrument Ethernet and/or USB IP address are displayed.

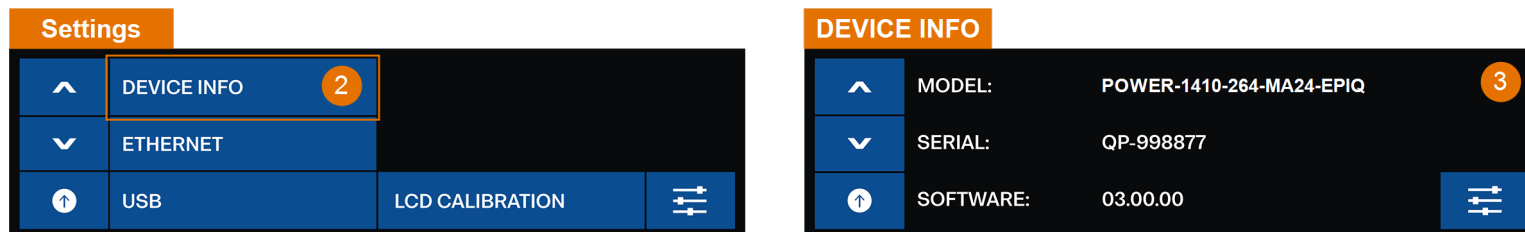
To navigate the touchscreen display:

2. Tap the **Settings icon** to go to the **Settings** screen.
3. Scroll up and down a screen.
4. Return to the previous screen.



7.2 View instrument information

1. Tap the **Settings icon** to go to the **Settings** screen.
2. Tap **DEVICE INFO**.
3. Instrument information will be displayed, for example model, serial number and software version.

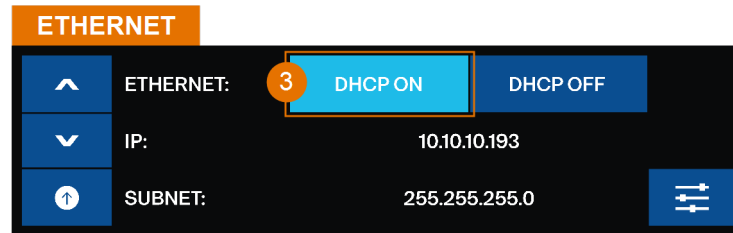
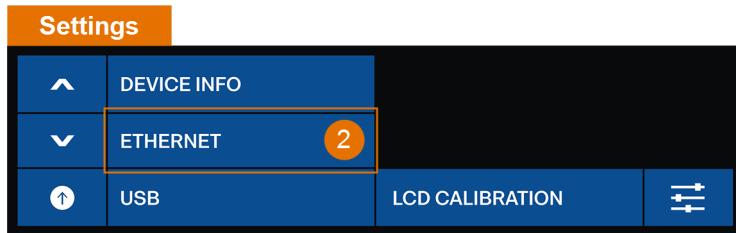


7.3 Change the Ethernet IP address

1. Tap the **Settings** icon to go to the **Settings** screen.
2. Tap **ETHERNET**.

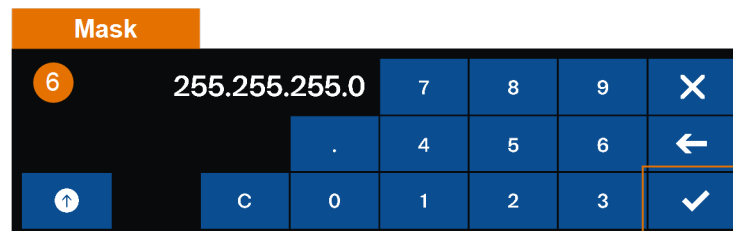
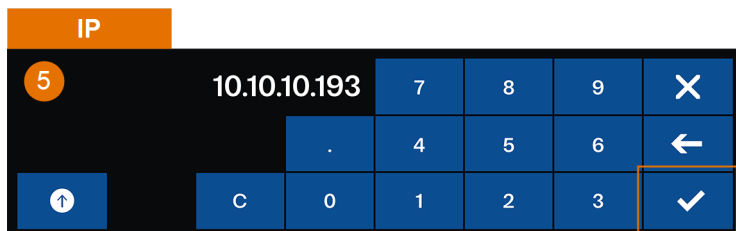
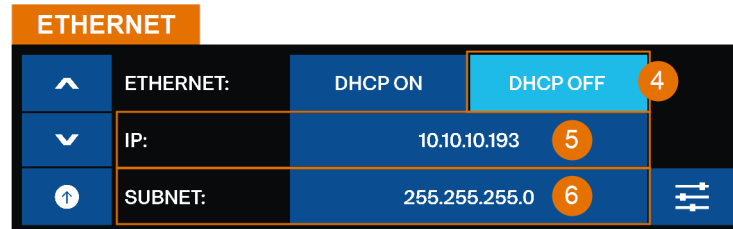
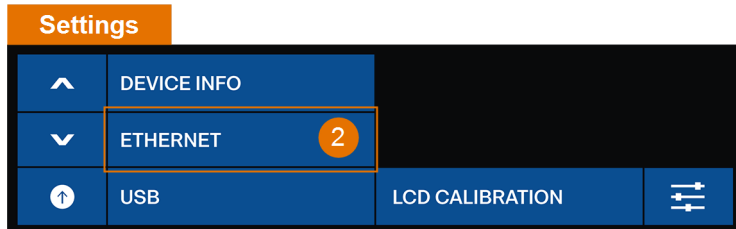
To enable the DHCP to automatically assign the Ethernet IP address (this is the default setting):

3. Select **DHCP ON**.



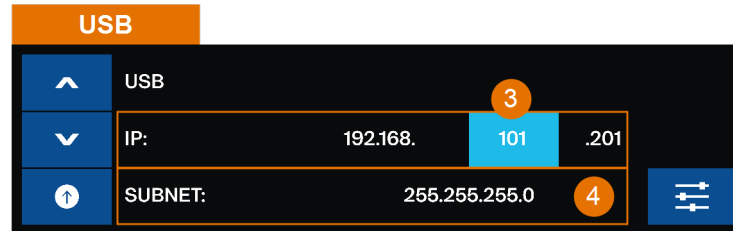
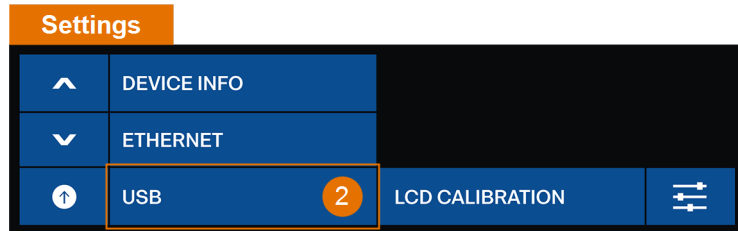
To assign a static Ethernet IP address:

4. Select **DHCP OFF**.
5. Tap **IP**, enter a valid IP address and confirm.
To avoid any addressing conflicts, make sure that this is a unique IP address that is not shared with any other instrument on the network.
6. Tap **SUBNET**, enter a valid subnet mask and confirm.



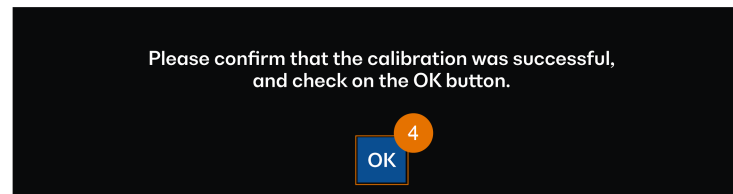
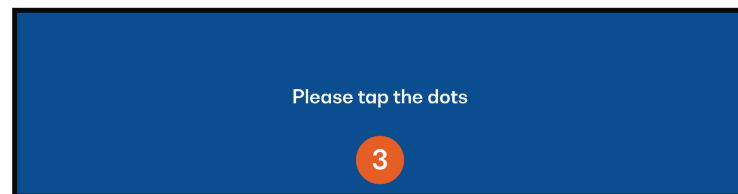
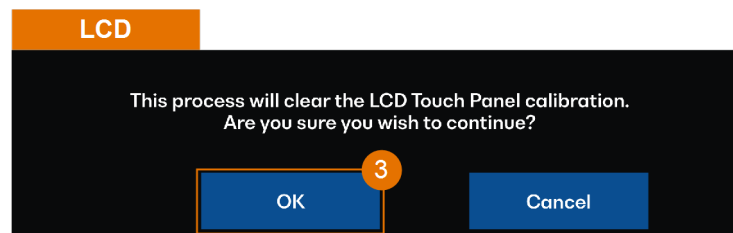
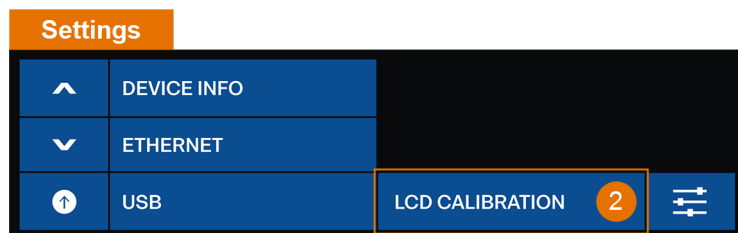
7.4 Change the USB IP address

1. Tap the **Settings** icon to go to the **Settings** screen.
2. Tap **USB**.
3. In **IP**, enter a new valid IP address by editing the 3rd octet of the IP address.
To avoid any addressing conflicts, make sure that this is a unique IP address that is not shared with any other instrument on the network.
4. In **SUBNET**, enter a valid subnet mask.



7.5 Reset / Calibrate the touchscreen display

1. Tap the **Settings** icon to go to the **Settings** screen.
2. Tap **LOCAL CALIBRATION**.
3. Tap **OK** and follow the instructions on the screen.
4. Confirm with **OK**.



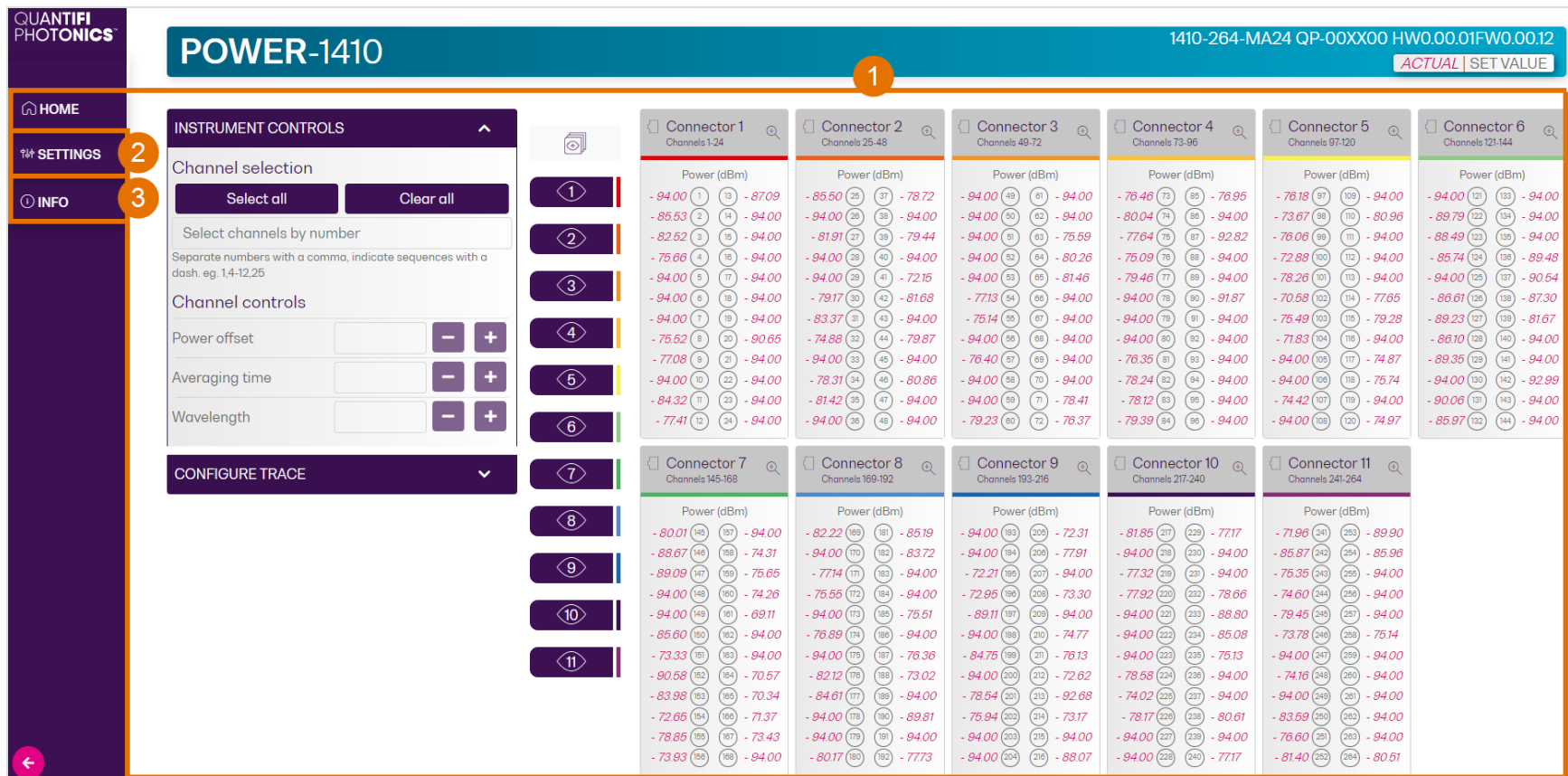
8 CohesionUI - Overview

CohesionUI is a web-based graphical interface that you can use to work with your Quantifi Photonics product.

CohesionUI is part of the EPIQ firmware package running on your Quantifi Photonics instrument.

From the menu on the left you can navigate to the following pages:

1. **HOME:** This is your main page. From here you can access all controls for your instrument
2. **SETTINGS:** Here you can change CohesionUI settings and/or instrument IP address
3. **INFO:** Here you can display instrument information, e.g. model number and firmware version



8.1 Access instruments with CohesionUI

You can open CohesionUI for Quantifi Photonics MATRIQ and EPIQ instruments:

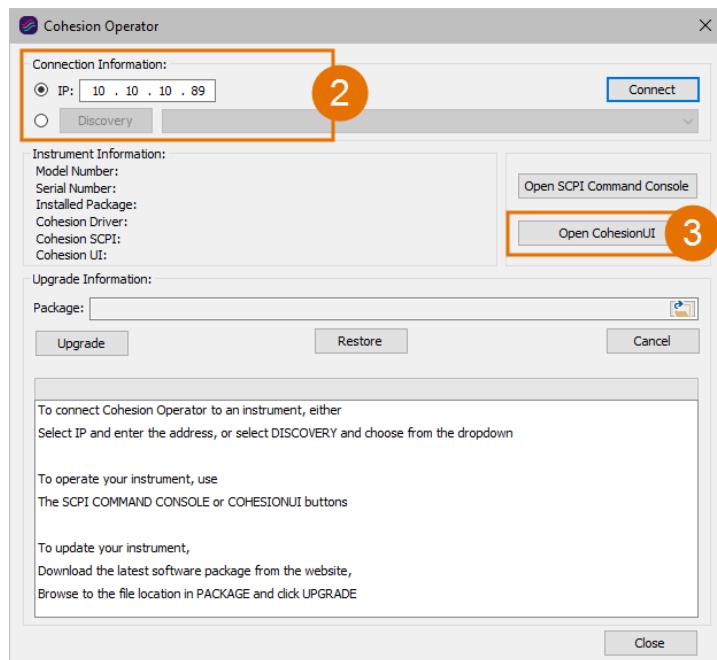
- from Cohesion Operator, or
- in a supported browser by entering the instrument IP in the address bar.

To open CohesionUI, you need the IP address of the instrument. For details, refer to the Instrument IP address section.

► To open CohesionUI from Cohesion Operator:

1. Open **Cohesion Operator** on a client computer, for example by double-clicking the Cohesion Operator desktop icon
2. Select the instrument by entering its **IP address** or by selecting it from the **Discovery** dropdown.
3. Click **Open CohesionUI**.

CohesionUI will open in your standard browser.



► To open CohesionUI in a browser:

1. Launch a supported **browser**.
2. Enter the instrument **IP address** in the address bar.
CohesionUI will launch in the browser.



8.2 Manage CohesionUI settings

On the **SETTINGS** page you can configure CohesionUI settings and unit preferences.

► To view all settings and unit preferences and adjust as required:

1. Click **SETTINGS**.
2. Change settings or unit preferences as required, for example temperature units.
Please note that the units displayed on this page are not always relevant for each product.
3. **Step size** refers to the amount by which a value is increased or decreased when clicking the + or - button.

The screenshot displays the 'SETTINGS' page of the Quantifi Photonics interface. The left sidebar contains navigation links: 'HOME' and 'SETTINGS' (highlighted with an orange circle 1), and 'INFO'. The main content area is divided into three sections:

- POWER**: A slider for 'POWER' with units 'dBm' and 'mW'.
- SPECTRUM**: A slider for 'SPECTRUM' with units 'THz' and 'nm'.
- TEMPERATURE**: A slider for 'TEMPERATURE' with units '°F', 'K', and '°C' (highlighted with an orange circle 2).

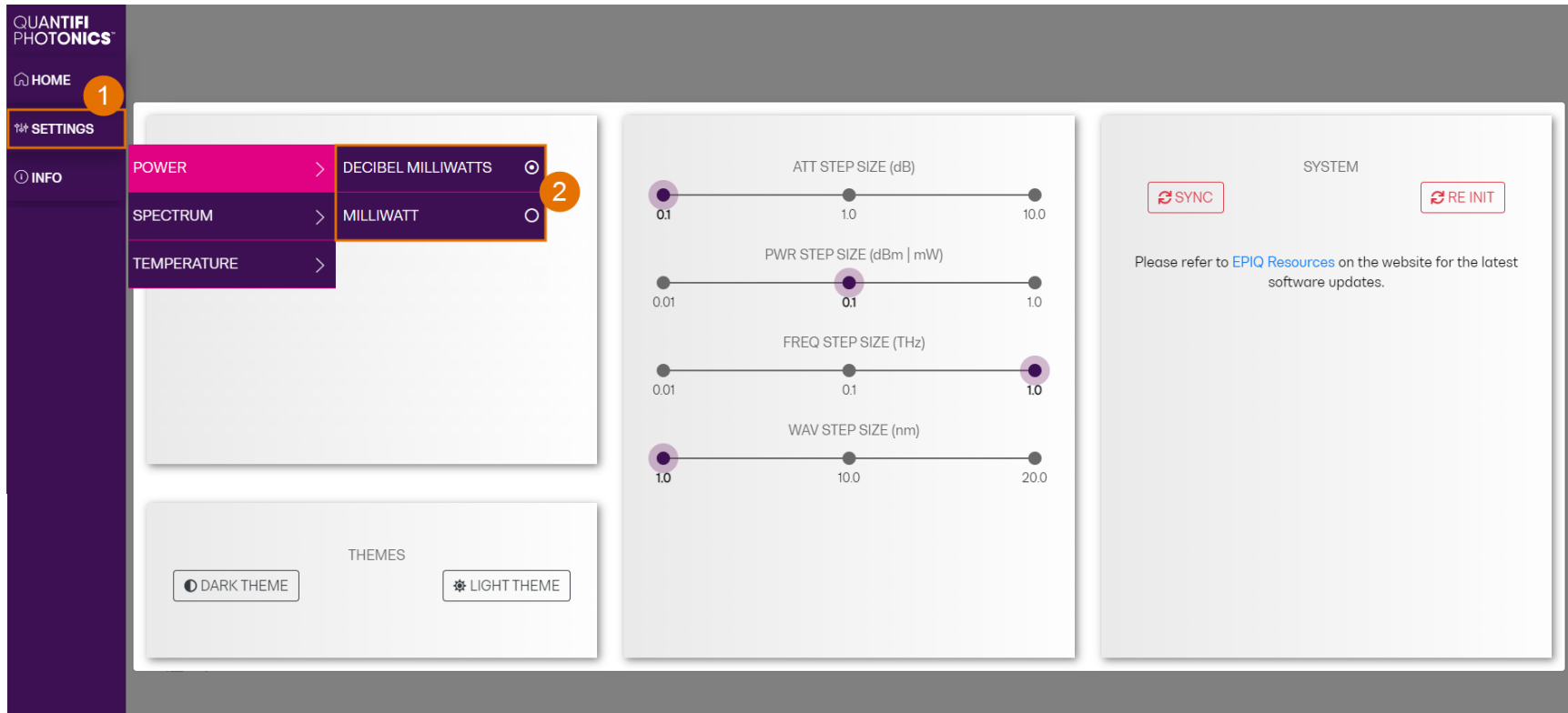
Below these sliders is a 'THEMES' section with two buttons: 'DARK THEME' and 'LIGHT THEME'.

The right section, highlighted with an orange circle 3, contains four sliders for step sizes:

- ATT STEP SIZE (dB)**: A slider with values 0.1, 1.0, and 10.0.
- PWR STEP SIZE (dBm | mW)**: A slider with values 0.01, 0.1, and 1.0.
- FREQ STEP SIZE (THz)**: A slider with values 0.01, 0.1, and 1.0.
- WAV STEP SIZE (nm)**: A slider with values 1.0, 10.0, and 20.0.

The far right section, labeled 'SYSTEM', contains two buttons: 'SYNC' and 'RE INIT'. Below these buttons is a text prompt: 'Please refer to [EPIQ Resources](#) on the website for the latest software updates.'

- To adjust unit preferences one at a time:
1. Hover over **SETTINGS**.
 2. Select a unit from the dropdown, for example the power unit.



8.3 Change the instrument IP address

Your instrument can have two different IP addresses depending on your chosen connection method (USB or Ethernet):

- The default **USB IP address** is **192.168.101.201**. This is a static address set during instrument calibration.
- The default **Ethernet IP address** is dynamically assigned by the DHCP.

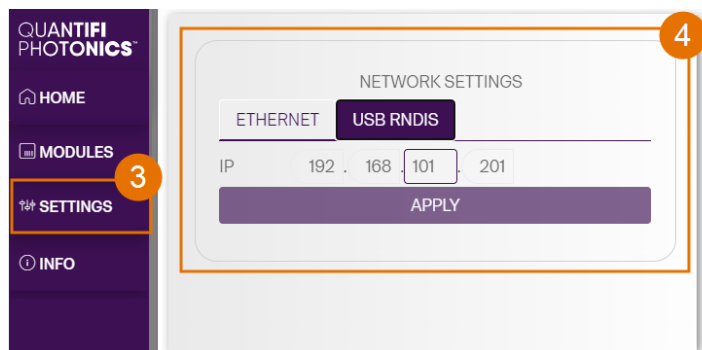
You can change the instrument's static USB IP address, and assign a static Ethernet IP address if required.

Multi-instrument control

If you have several Quantifi Photonics instruments with static IP addresses on your network, make sure to assign a unique IP address to each instrument before connecting.

► To change the **USB IP address**:

1. Connect with the instrument from a client computer via USB. Ensure that this is the only Quantifi Photonics instrument currently connected via USB.
2. Open CohesionUI using the currently assigned USB IP address.
3. Go to **SETTINGS**.
4. In **NETWORK SETTINGS > USB RNDIS** tab:
 - The currently assigned IP address is displayed. Enter the new IP address by changing the **3rd octet** of the IP address. To avoid any addressing conflicts, make sure that this is a unique IP address that is not shared with any other instrument on the network.
 - Click **APPLY**. The new IP address will show in CohesionUI and on the display.



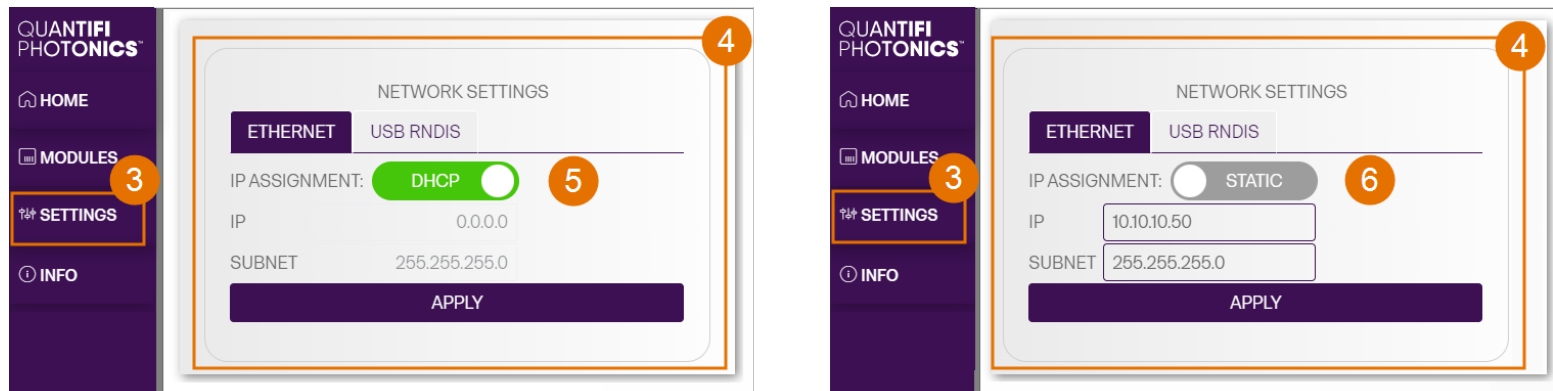
► To change the **Ethernet IP address**:

1. Connect with the instrument from a client computer via USB. Ensure that this is the only Quantifi Photonics instrument currently connected via USB.
2. Open CohesionUI using the currently assigned USB IP address.
3. Go to **SETTINGS**.
4. In **NETWORK SETTINGS > ETHERNET** tab:
5. Toggle **IP ASSIGNMENT** to **DHCP** to enable the DHCP to automatically assign the Ethernet IP address (this is the default setting) and click **APPLY**.

OR

6. Toggle **IP ASSIGNMENT** to **STATIC** to assign a static Ethernet IP address.
Enter the new **IP address** and **SUBNET mask** and click **APPLY**.
To avoid any addressing conflicts, make sure that this is a unique IP address that is not shared with any other instruments on the network.

The new IP address will show in CohesionUI and on the display.

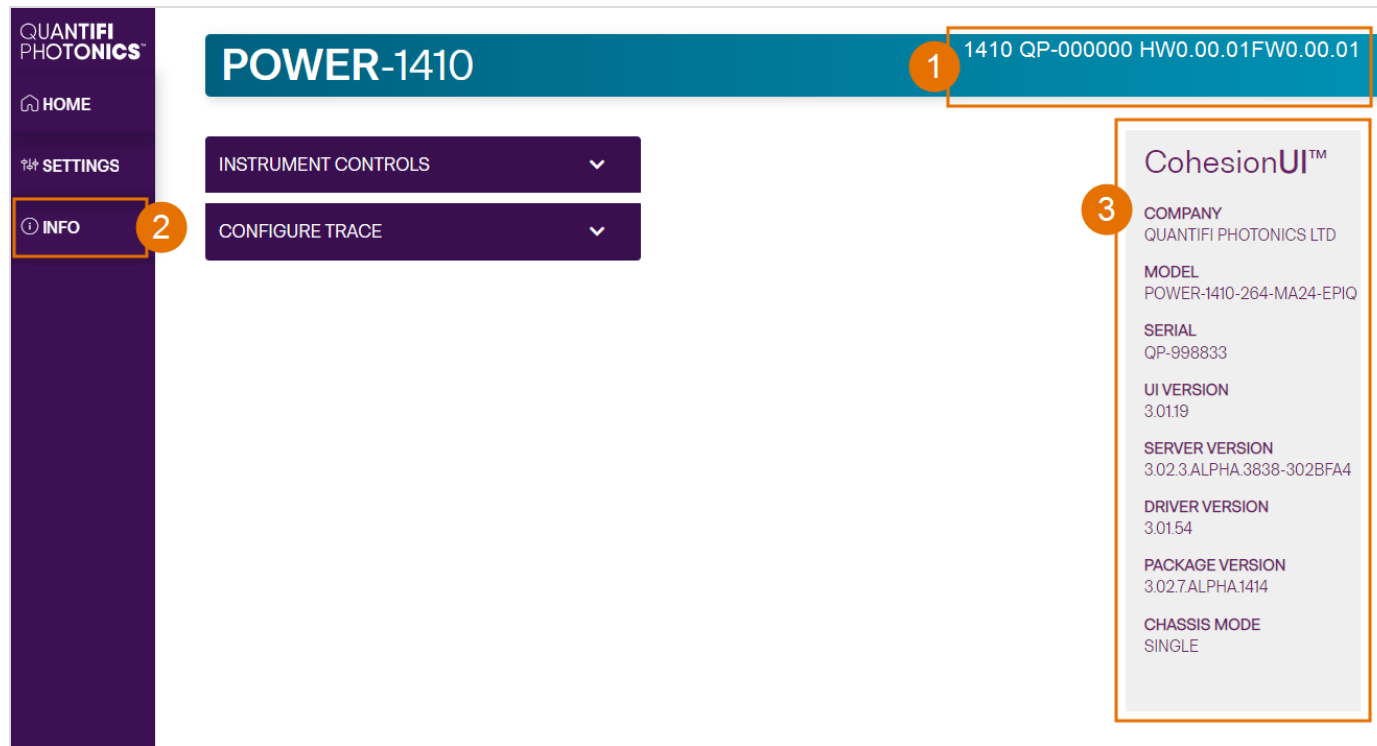


8.4 View system information

You can easily access instrument information, for example the model number and firmware version.

► To display instrument information in CohesionUI:

1. Refer to the top right corner in CohesionUI.
2. For more details, click **INFO** to display the information panel.
3. The information panel lists the instrument's serial number, and software and firmware versions.

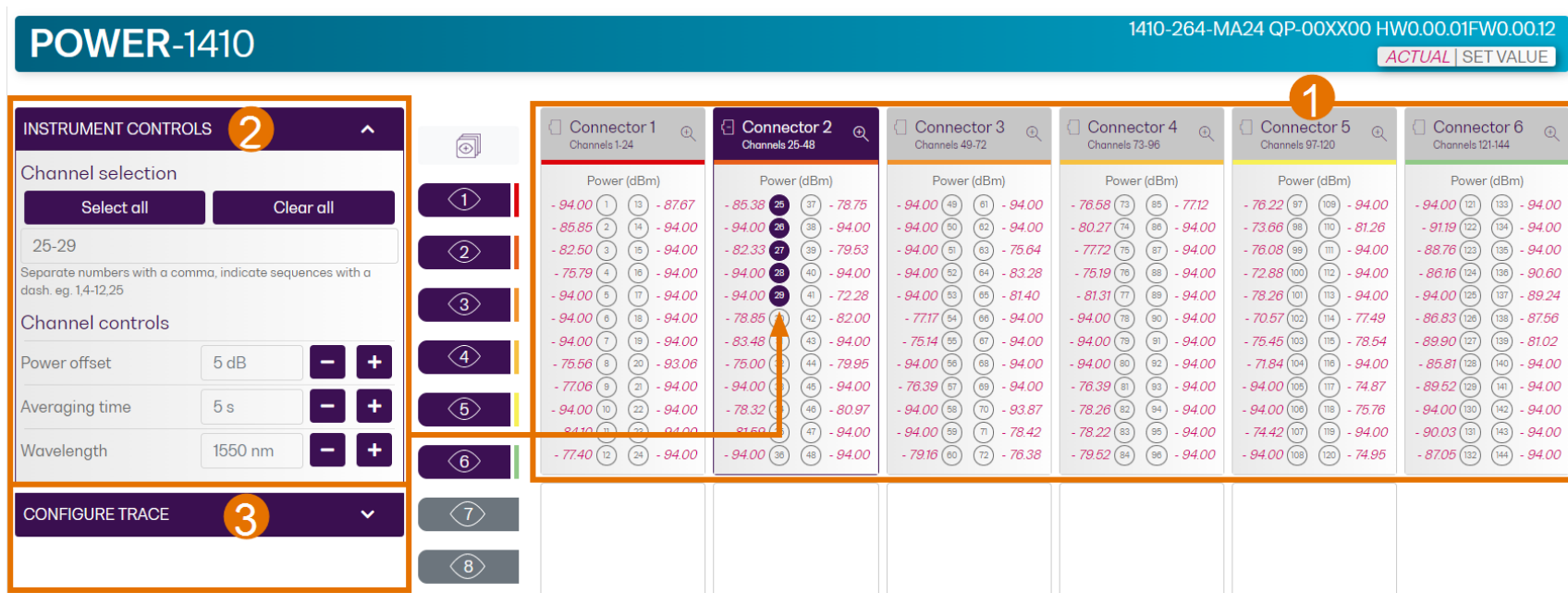


9 Controlling your POWER instrument with CohesionUI

You can use Quantifi Photonics' graphical user interface CohesionUI to work with your POWER instrument. For details on how to get started with CohesionUI, refer to [CohesionUI - Overview](#).

In CohesionUI you can:

1. **Monitor power readings.**
Customize your view of channels and their power readings by showing / hiding connectors as required.
2. **Set parameters for selected channels.**
Power Offset, Averaging Time, Wavelength.
3. **Acquire Traces.**



9.1 Monitor power readings

You can customize your view of channels and power readings by displaying the channels of **all connectors** or by displaying **some connectors** only.

► Use the following options:

1. Click the **ALL connectors** icon to show / hide ALL connectors.
2. Click one of the **connector** icons to show / hide this connector.
3. Zoom in for a detailed view of a connector.
4. The detailed view shows the power reading and set parameters for each channel of the connector.

Click a **connector** icon (2) to switch between connectors, or click the **ALL Connectors** icon (1) to zoom out.

POWER-1410

1410-264-MA24 QP-00XX00 HW0.00.01FW0.00.12

ACTUAL | SET VALUE

INSTRUMENT CONTROLS

Channel selection

Select all Clear all

Select channels by number

Separate numbers with a comma, indicate sequences with a dash. eg. 1,4-12,25

Channel controls

Power offset 5 dB - +

Averaging time 5 s - +

Wavelength 1550 nm - +

CONFIGURE TRACE

1

2

3

4

5

6

7

8

9

10

11

Connector 1
Channels 1-24

Power (dBm)

-94.00	1	13	-87.57
-85.39	2	14	-94.00
-82.70	3	15	-94.00
-75.83	4	16	-94.00
-94.00	5	17	-94.00
-94.00	6	18	-94.00
-94.00	7	19	-94.00
-75.60	8	20	-90.99
-77.13	9	21	-94.00
-94.00	10	22	-94.00
-84.31	11	23	-94.00
-77.51	12	24	-94.00

Connector 2
Channels 25-48

Power (dBm)

-85.11	25	37	-78.90
-94.00	26	38	-94.00
-82.53	27	39	-79.60
-94.00	28	40	-94.00
-94.00	29	41	-72.38
-78.67	30	42	-82.14
-83.57	31	43	-94.00
-75.09	32	44	-79.96
-94.00	33	45	-94.00
-78.51	34	46	-81.15
-81.50	35	47	-94.00
-94.00	36	48	-94.00

25 Channel

POWER

-85.14 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

26 Channel

POWER

-94 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

27 Channel

POWER

-82.74 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

28 Channel

POWER

-94 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

29 Channel

POWER

-94 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

30 Channel

POWER

-79.6 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

31 Channel

POWER

-83.85 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

32 Channel

POWER

-75.17 dBm

Power offset 5 dB

Averaging time 5 s

Wavelength 1550 nm

9.2 Set parameters for selected channels

You can set the following parameters per channel:

Power offset	A compensation factor that will be applied to the actual measured optical power.
Averaging time	The amount of time the optical power is logged for before calculating an average power reading
Wavelength	The wavelength of the input light. This is used to set the correct responsivity for calculating optical input power.

► To set channel parameters:

1. **Select channel(s)**. For details, refer to [How to select and deselect channels](#).
2. In **Channel Controls**, current parameter values for the selected channel(s) are displayed.

Varied indicates that the value for this parameter differs across selected channels.

Enter new values as required and confirm with the **Enter** key. For details, refer to [How to edit parameter values](#).

3. **The new values will be applied to all selected channels** - unselected channels remain unchanged.

POWER-1410
1410-264-MA24 QP-00XX00 HW0.00.01FW0.00.12
ACTUAL | SET VALUE

INSTRUMENT CONTROLS

Channel selection

Select all Clear all

Select channels by number

Separate numbers with a comma, indicate sequences with a dash. eg. 1,4-12,25

Channel controls

Power offset: 5 dB

Averaging time: Varied

Wavelength: 1550 nm

CONFIGURE TRACE

1

2

3

4

5

6

7

8

Connector 1
Channels 1-24

Power (dBm)		
-94.00	1	-86.97
-85.38	2	-94.00
-82.49	3	-94.00
-75.92	4	-94.00
-94.00	5	-94.00
-94.00	6	-94.00
-94.00	7	-94.00
-75.66	8	-92.37
-77.16	9	-94.00
-94.00	10	-94.00
-81.35	11	-94.00
-77.56	12	-94.00

Connector 2
Channels 25-48

Power (dBm)		
-85.47	25	-78.77
-94.00	26	-94.00
-82.35	27	-94.00
-94.00	28	-94.00
-94.00	29	-72.38
-80.02	30	-82.13
-83.87	31	-94.00
-75.11	32	-79.97
-94.00	33	-94.00
-78.61	34	-81.09
-81.09	35	-94.00
-94.00	36	-94.00

Connector 3
Channels 49-72

Power (dBm)		
-94.00	49	-94.00
-94.00	50	-94.00
-94.00	51	-75.82
-94.00	52	-80.89
-94.00	53	-81.56
-77.44	54	-94.00
-75.31	55	-94.00
-94.00	56	-94.00
-76.56	57	-94.00
-94.00	58	-94.00
-94.00	59	-78.56
-79.46	60	-76.43

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How to select and deselect channels

► Use the following options:

1. Click the channel number to select or deselect this channel.
2. Click a connector header to select or deselect all channels of the connector.
3. In **Channel selection**, click **Select all** / **Clear all** buttons or enter channel numbers.
4.  selected channel
5.  not-selected channel

POWER-1410
1410-264-MA24 QP-00XX00 HW0.00.01FW0.00.12
ACTUAL | SET VALUE

INSTRUMENT CONTROLS

Channel selection

Select all

Clear all

Select channels by number
Separate numbers with a comma, indicate sequences with a dash. eg. 1,4-12,25

Channel controls

Power offset:

- +

Averaging time:

- +

Wavelength:

- +

CONFIGURE TRACE

1

2

3

4

5

6

7

8

Connector 1

Channels 1-24

Power (dBm)	
-94.00	1
-85.44	2
-82.54	3
-76.03	4
-94.00	5
-94.00	6
-94.00	7
-75.63	8
-77.16	9
-94.00	10
-84.28	11
-77.54	12
-94.00	13
-94.00	14
-94.00	15
-94.00	16
-94.00	17
-94.00	18
-94.00	19
-94.00	20
-94.00	21
-94.00	22
-94.00	23
-94.00	24

Connector 2

Channels 25-48

Power (dBm)	
-85.21	25
-94.00	26
-82.29	27
-94.00	28
-94.00	29
-80.56	30
-83.78	31
-75.06	32
-94.00	33
-94.00	34
-84.28	35
-94.00	36
-94.00	37
-94.00	38
-94.00	39
-94.00	40
-72.34	41
-82.05	42
-94.00	43
-79.90	44
-94.00	45
-94.00	46
-94.00	47
-94.00	48

Connector 3

Channels 49-72

Power (dBm)	
-94.00	49
-94.00	50
-94.00	51
-94.00	52
-94.00	53
-77.43	54
-75.24	55
-94.00	56
-76.56	57
-94.00	58
-94.00	59
-94.00	60
-94.00	61
-94.00	62
-75.81	63
-81.21	64
-81.36	65
-94.00	66
-94.00	67
-94.00	68
-94.00	69
-94.00	70
-78.54	71
-76.44	72

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How to edit parameter values

For selected channels, the currently set parameter values are displayed in **Channel Controls**.

Varied indicates that the value of this parameter varies between selected channels.

► To set a value for **selected channels**:

1. In **Channel Controls**, click on a parameter field, enter a value in the default unit and press the Enter key.
2. To enter the minimum, maximum or default value, enter **min**, **max** or **def** and press the Enter key.
3. Alternatively, you can use **+** and **-** to increase or decrease the value.

You can change the step size in the **SETTINGS** menu (refer to [Manage CohesionUI settings](#)).

4. **The new values will be applied to all selected channels** - unselected channels remain unchanged.

POWER-14101410-264-MA24 QP-00XX00 HW0.00.01FW0.00.12ACTUAL | SET VALUE

INSTRUMENT CONTROLS

Channel selection

Select allClear all

Select channels by number

Separate numbers with a comma, indicate sequences with a dash. eg. 1,4-12,25

Channel controls

Power offsetmax-+2

Averaging time5 s-+3

Wavelength1550-+1

CONFIGURE TRACE

1

2

3

4

5

6

7

8

Connector 1
Channels 1-24

Power (dBm)

-94.00	1	13	-87.28
-85.61	2	14	-94.00
-82.53	3	15	-94.00
-75.87	4	16	-94.00
-94.00	5	17	-94.00
-94.00	6	18	-94.00
-94.00	7	19	-94.00
-75.63	8	20	-90.94
-77.15	9	21	-94.00
-94.00	10	22	-94.00
-84.44	11	23	-94.00
-77.50	12	24	-94.00

Connector 2
Channels 25-48

Power (dBm)

-85.51	25	37	-78.75
-94.00	26	38	-94.00
-82.17	27	39	-79.60
-94.00	28	40	-94.00
-94.00	29	41	-72.30
-78.73	30	42	-82.07
-83.51	31	43	-94.00
-75.03	32	44	-79.96
-94.00	33	45	-94.00
-78.54	34	46	-94.00
-81.79	35	47	-94.00
-94.00	36	48	-94.00

Connector 3
Channels 49-72

Power (dBm)

-94.00	49	61	-94.00
-94.00	50	62	-94.00
-94.00	51	63	-75.76
-94.00	52	64	-80.70
-94.00	53	65	-81.41
-77.46	54	66	-94.00
-75.26	55	67	-94.00
-94.00	56	68	-94.00
-76.56	57	69	-94.00
-94.00	58	70	-94.00
-94.00	59	71	-78.50
-79.35	60	72	-76.43

9.3 Acquire Traces

You can simultaneously trace up to three channels per connector, **one channel per eight-channel block**, for example channels 2, 11 and 16 in connector 1.

In the image below, each block is highlighted with a different color.

Connector 1	
1	13
2	14
3	15
4	16
5	17
6	18
7	19
8	20
9	21
10	22
11	23
12	24

You can set the following trace parameters and trigger events:

Sample points	Number of trace buffer data elements / points			
Samples per second	Trace buffer sampling rate			
Trigger delay	Trigger delay			
Trigger event	Event that will initiate trace acquisition	STOPPED		Disable/Cancel triggering
		IMMEDIATE		Start sampling immediately
		HWRISING	Hardware triggering - connect a suitable trigger source to the trigger input.	Start sampling on signal rising edge
		HWFALLING		Start sampling on signal falling edge
		HWEDGE		Start sampling on either rising or falling signal edge
		CLKRISING	Clocked hardware triggering - connect a suitable trigger source to the trigger input.	Start sampling on clock rising edge
		CLKFALLING		Start sampling on clock falling edge
		CLKEDGE		Start sampling on either rising or falling clock edge

10 Controlling your POWER instrument with SCPI commands

Remote communication with the CohesionSCPI service is achieved through the Standard Commands for Programmable Instruments (SCPI).

Support for VISA I/O API over TCP/IP is provided by the VXI-11 compliant CohesionSCPI service. With VISA communication drivers installed on the client, the implementation of VISA programming within environments such as MATLAB becomes available.

This section details the programming and measurement conventions to follow while executing the commands for the CohesionSCPI service.

NOTE

In NI-MAX a RIO interface will show up, however there are no communication methods available or implemented on this interface. Quantifi Photonics products are **ONLY** accessible through the **VISA TCPIP INSTR** interface provided by the CohesionSCPI service installed on the system.

10.1 Programming conventions

This section details the programming and measurement conventions to follow while executing the commands for the CohesionSCPI service.

Parameter	Default Unit	Alternative Units
Power	DBM	DBM
Power Offset	DB	
Wavelength	NM	NM, PM
Time	S	MS, NS

Argument	Data Format
<wsp>	Specifies whitespace character (0116 – 0916, 0B16 – 2016).
<value>	Is numerical data, an integer, a decimal, exponential (10e-9 or 5.8e6) or string.
[VALUE1 VALUE2]	A parameter choice. The ' ' separates the unique parameters available, only one of the choices can be used. In the example, either the input parameter [VALUE1] or [VALUE2] can be used, but not both. Some commands may have more than two choices available. This parameter can be omitted where the command has a default defined in the command description.

10.2 Index addressing of modules (slot, source) and units (channel)

When executing commands, it is almost always necessary to provide the index of a specific module or an index of a specific installed unit.

For the commands that require index values:

- <module> is the slot (or module) index, this is an integer <1 to 18>
- <channel> is the channel index; this is an integer <1 to 288>
- <connector> is the connector index; this is an integer <1 to 12>

Message queues

Information is exchanged in the form of messages. These messages are held in input and output queues.

The output queue stores responses to query commands. The CohesionSCPI service transmits any data in the output queue when a read request is received. Unless specified, all output response data is transmitted in ASCII format.

10.3 Status and event registers

10.3.1 Standard Event Status Register

The Standard Event Status Register (SESR) is modified by the Quantifi Photonics product with the results of the command operations.

Bit	Description
7 (MSB), 6	Not used
5	Is set when a Command Error event has been detected
4	Is set when a command Execution Error has been detected
3	Is set when a Device Dependent Error event has been detected
2	Is set when there a Query Error event has been detected
1	Not used
0 (LSB)	Is set when an Operation Complete event has been generated

10.3.2 Standard Event Status Enable Register (Mask)

The Standard Event Status Enable Register (SESR Mask) is used to build the Event Status Bit (ESB) within the Status Byte Register (STB). To ignore any of the events detected and set in the SESR, set the corresponding bit within the SESR Mask to 0. The STB can then be queried and the value of the ESB can be used to determine service request requirements based on the SESR Mask applied.

NOTE

The 0 (LSB) value within the SESR Mask is 0.

10.3.3 Status Byte Register

The Status Byte Register (STB) is built from all other status registers and masks. This register can be used in queries to determine if an event has been detected and where that event has been detected.

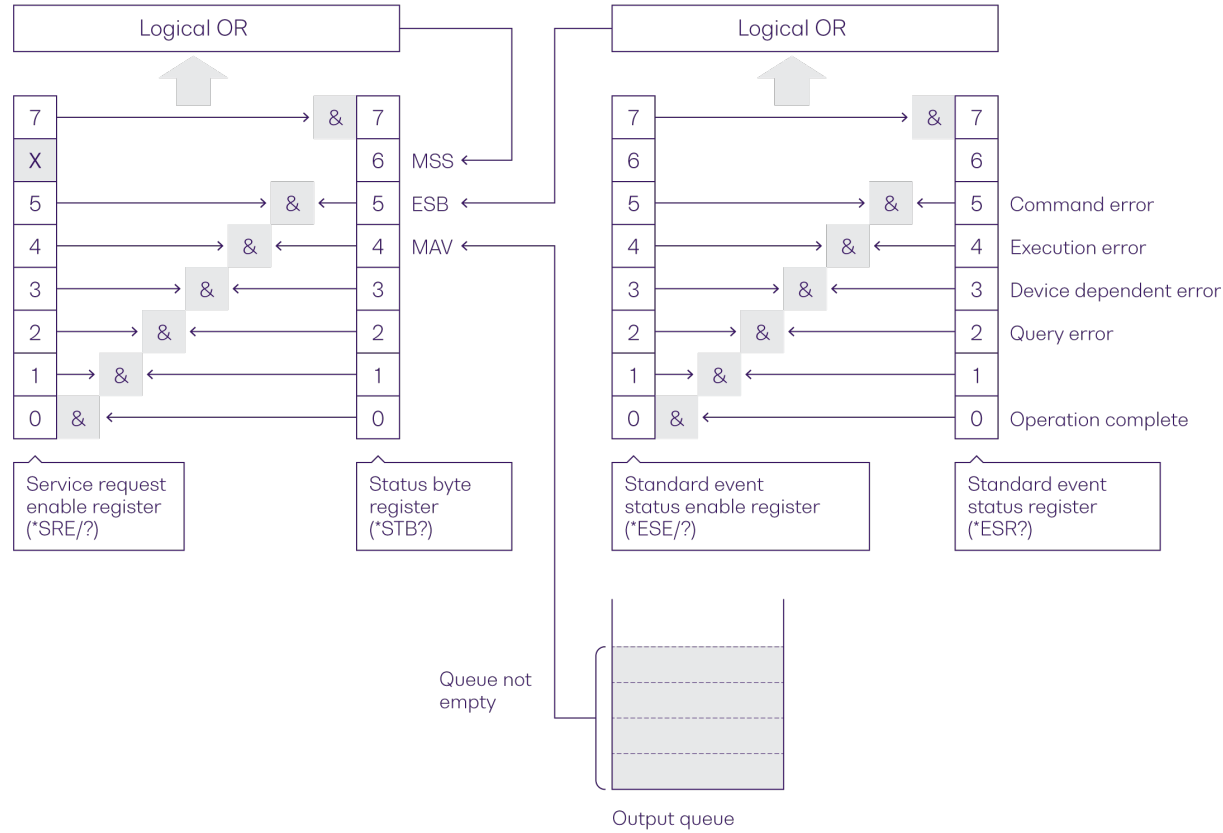
Bit	Description
7 (MSB)	Not used
6	The Master Summary Status (MSS) bit is set from the STB and SRE Mask
5	The Event Status Bit (ESB) is set from the SESR and the SESR Mask
4	Message Available (MAV) is set when there is data in the output queue
3, 2, 1, 0 (LSB)	Not used

10.3.4 Service Request Enable Register (Mask)

The Standard Request Enable Register (SRE Mask) is used to build the Master Summary Status Bit (MSS) within the Status Byte Register (STB). To ignore any of the events detected and set in the STB register itself, set the corresponding bit within the SRE Mask to 0. The STB can then be queried and the value of the MSS can be used to determine the type of service request required based on the SRE Mask applied.

Bit	Description
7 (MSB)	Not used
6	The Master Summary Status (MSS) bit is set from the STB and SRE Mask
5	The Event Status Bit (ESB) is set from the SESR and the SESR Mask
4	Message Available (MAV) is set when there is data in the output queue
3, 2, 1, 0 (LSB)	Not used

10.3.5 Status and event registers diagram



10.4 Command summary

10.4.1 Common commands

Common commands	Description
*IDN?	Query the instrument identification >>
*CLS	Clear session message queues >>
*OPT?	Query the modules installed in the instrument >>
*OPC?	Query the Operation Complete Status >>
*ESR?	Query the Standard Event Status Register >>
*ESE?	Query the Standard Event Status Enable Register (Mask) >>
*ESE	Set the Standard Event Status Enable Register >>
*TST?	Query the instrument self-test status >>
*RST	Reset instrument to default power-on settings >>

10.4.2 System commands

System commands	Description
:SYSTem	
:INFO?	Query the version of services >>
:PLATform?	Query the instrument platform >>
:MODUles?	Query the number of modules installed in the instrument >>
:MAC?	Query the MAC address of the instrument >>
:PRESet	Restore instrument settings to power-on default values >>

10.4.3 Module commands

Module commands	Description
:MODULE<module>	
:TeST?	Query the module self-test status >>
:ReSeT?	Reset the module to default power-on settings >>
:OPC?	Query the Operation Complete Status of the module >>
:IDN?	Query the module identification >>
:OPTions?	Query installed modules >>
:TEMPerature?	Query the module temperature >>
:CONFig?	Query the number of connectors and channels >>
:PRESet	Restore instrument settings to power-on default values >>
:POWer	
:RESolution?	Query resolution of the power value >>
:RESolution	Set resolution of the power value to an integer number of decimal places >>

10.4.4 Configuration commands (channel parameters)

You can query power readings and set/query channel parameters:

- for **ALL** channels
- per **channel**
- per **connector**
- per **channel mask**

	Configuration commands	Description
ALL channels	:SENSe<module>	
	:POWER?	Query the measured power >>
	:POWER	
	:OFFSet?	Query the power measurement offset >>
	:OFFSet	Set the power measurement offset >>
	:AVERagingtime?	Query the measurement averaging time >>
	:AVERagingtime	Set the measurement averaging time >>
	:NULLing	Perform dark current nulling >>
	:TIMEnulling?	Query the amount of time remaining for dark current nulling to complete >>
	:WAVelength?	Query the optical wavelength configuration >>
	:WAVelength	Set the optical wavelength configuration >>
per channel	:SENSe<module>	
	:CHANnel<channel>	
	:POWER?	Query the measured power >>
	:POWER	
	:OFFset?	Query the power measurement offset >>
	:OFFset	Set the power measurement offset >>
	:AVERagingtime?	Query the measurement averaging time >>
	:AVERagingtime	Set the measurement averaging time >>
	:NULLing	Perform dark current nulling >>
	:TIMEnulling?	Query the amount of time remaining for dark current nulling to complete >>
	:WAVelength?	Query the optical wavelength configuration >>
	:WAVelength	Set the optical wavelength configuration >>

	Configuration commands	Description
per connector	:SENSe<module>	
	:CONNeCtor<connector>	
	:CONFIg?	Query the channels in the connector >>
	:POWeR?	Query the measured power >>
	:POWeR	
	:OFFSet?	Query the power measurement offset >>
	:OFFSet	Set the power measurement offset >>
	:AVERagingtime?	Query the measurement averaging time >>
	:AVERagingtime	Set the measurement averaging time >>
	:NULLing	Perform dark current nulling >>
	:TIMEnulling?	Query the amount of time remaining for dark current nulling to complete >>
	:WAVelength?	Query the optical wavelength configuration >>
	:WAVelength	Set the optical wavelength configuration >>

10.4.5 Configuration commands (Trace functionality)

You can simultaneously acquire traces on up to 3 channels per connector (1 channel per 8-channel block).

You can set/query trace settings and trigger events:

- for **ALL** channels
- per **channel**
- per **connector**
- per **channel mask**

	Configuration commands	Description
ALL channels	:SENSe<module>	
	:TRACe?	Query the Trace buffer >>
	:TRACe	
	:PointS	Set the number of trace buffer data elements >>
	:PointS?	Query the number of trace buffer data elements >>
	:RATE	Set the trace buffer sampling rate in the frequency default unit >>
	:RATE?	Query the trace buffer sampling rate >>
	:TRIGger	Set the trace trigger event >>
	:TRIGger?	Query the trace trigger event >>
	:CoMPlete?	Query trace completion status >>
	:ENABle?	Query channels enabled for Trace acquisition >>
	:ENABle	Enable/Select channels for Trace acquisition >>
	:ENABle	
	:MASK	Enable/Select channels for Trace acquisition >>
	:TRIGger	
	:DELay?	Query the trigger delay >>
	:DELay	Set the trigger delay >>

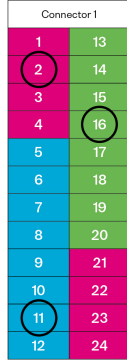
	Configuration commands	Description
per channel	:SENSe<module>	
	:CHANnel<channel>	
	:TRACe?	Query the Trace buffer >>
	:TRACe	
	:ENABle?	Query channels enabled for Trace acquisition >>
	:ENABle	Enable/Select channels for Trace acquisition >>
per connector	:SENSe<module>	
	:CONNector<connector>	
	:TRACe?	Query the Trace buffer >>
	:TRACe	
	:ENABle?	Query channels enabled for Trace acquisition >>
	:ENABle	Enable/Select channels for Trace acquisition >>
	:ENABle	
	:MASK	Enable/Select channels for Trace acquisition >>

10.5 Command descriptions

NOTE

- **<module>**: For instruments of the POWER 1400 EPIQ Series, **<module>** always equals **1** and can be omitted as only one module is installed in the instrument.
- Some configuration commands enable you to apply **channel masks** (**cnx**, **channel_mask**) to connectors. Channel masks can have **hexadecimal** or **decimal** values and are used to specify an arbitrary selection of the 24 channels of a connector.

For example:

hexadecimal	#h8402	
decimal	33794	
binary	1000 0100 0000 0010	

- When addressing all channels using channel masks, you have to define a channel mask for **each connector** of your instrument. If your instrument has **11 connectors**, you have to use **11 channel masks**, for example:
:SENSE1:POWER:OFFSET 5.0,#h8402,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0
- The number of connectors on your instrument can vary depending on your model. To confirm the number of connectors on your instrument, use this query: **:MODULE:CONFIg?**

10.5.1 Common commands

Command	*IDN?	Summary >>
Syntax	*IDN?	
Description	Query the instrument identification	
Parameters	N/A	
Response	Comma separated string with the <manufacturer>,<part number>,<serial number>,<hardware version><firmware version>	
Example	*IDN? -> Quantifi Photonics Ltd,POWER-1410-264-MA24-EPIQ,QP-000000,HW0.00.00SW3.02.3	

Command	*CLS	Summary >>
Syntax	*CLS	
Description	Clear session message queues	
Parameters	N/A	
Response	N/A	
Example	*CLS	

Command	*OPT?	Summary >>
Syntax	*OPT? [<wsp><MODULES>]	
Description	Query the modules installed in the instrument	
Parameters	N/A	
Response	Comma separated string of the installed modules in the instrument	
Example	*OPT? -> POWER-1410-264-MA24	

Command	*OPC?	Summary >>
Syntax	*OPC?	
Description	Query the Operation Complete Status	
Parameters		
Response	1 : ready to execute commands 0 : commands to execute are still in the input queue NOTE: Any commands sent to the module when :MODULE<slot>:OPC? is NOT equal 1, may not execute or return an error.	
Example	*OPC? -> 1	

Command	*ESR?			Summary >>
Syntax	*ESR?			
Description	Query the Standard Event Status Register			
Parameters	N/A			
Response	Unsigned integer 8 bit value for the register <0 to 255>, as a string.			
	Bit	Description	Decimal Value	
	7 (MSB)	Not used	0	
	6	Not used	0	
	5	Command error	32	
	4	Execution Error	16	
	3	Device dependent Error	8	
	2	Not used	0	
	1	Not used	0	
	0 (LSB)	Operation Complete	1	
Example	*ESR? -> 8			
	*ESR? -> 32			

NOTE

We recommend that you use the *ESR? query after every command that is sent to the device. The *ESR? query will be able to catch:

- **Device dependent Error** – the device is reporting an error in operation.
- **Execution Error** – SCPI was unable to execute the given command.
- **Command Error** – SCPI was unable to parse the given command, likely due to an incorrect command.

Command	*ESE?	Summary >>
Syntax	*ESE?	
Description	Query the Standard Event Status Enable Register (Mask)	
Parameters	N/A	
Response	Unsigned integer 8 bit value for the register <0 to 255>, as a string.	
Example	*ESE? -> 254	

Command	*ESE	Summary >>
Syntax	*ESE<wsp><value>	
Description	Set the Standard Event Status Enable Register	
Parameters	N/A	
Response	N/A	
Example	*ESE 254	

Command	*TST?	Summary >>
Syntax	*TST?	
Description	Query the instrument self-test status	
Parameters	N/A	
Response	1: error 0: no error	
Command	*TST? -> 0	

Command	*RST	Summary >>
Syntax	*RST	
Description	Reset instrument to default power-on settings	
Parameters	N/A	
Response	N/A	
Example	*RST	

10.5.2 System commands

Command	:SYSTem:INFO?	Summary >>
Syntax	:SYSTem:INFO?<ws><ALL SERVER DRIVER PACKAGE>	
Description	Query the version of services	
Parameters	SERVER: Returns CohesionSCPI version DRIVER: Returns CohesionDriver version PACKAGE: Returns firmware package version ALL: Returns versions of all services in the order: SERVER, DRIVER, PACKAGE	
Response		
Example	:SYSTem:INFO? ALL -> DRIVER, 3.01.66 SERVER, 3.02.3 PACKAGE, 3.02.7	

Command	:SYSTem:PLATform?	Summary >>
Syntax	:SYSTem:PLATform?	
Description	Query the instrument platform	
Parameters	N/A	
Response	Instrument platform, for example EPIQ or MATRIQ	
Example	:SYSTem:PLAT? -> EPIQ	

Command	:SYSTem:MODUles?	Summary >>
Syntax	:SYSTem:MODUles?	
Description	Query the number of modules installed in the instrument	
Parameters	N/A	
Response		
Example		

Command	:SYSTem:MAC?	Summary >>
Syntax	:SYSTem:MAC?	
Description	Query the MAC address of the instrument	
Parameters	N/A	
Response		
Example	:SYSTem:MAC? -> 00:d0:69:50:b5:80	

Command	:SYSTEM:PRESet	Summary >>
Syntax	:SYSTEM:PRESet	
Description	Restore instrument settings to power-on default values Disables triggering by setting the trace trigger mode to STOPped. Disables Trigger ARM by setting the Trigger ARMed state to DISABLE.	
Parameters	N/A	
Response	N/A	
Example	:SYSTEM:PRES	

10.5.3 Module commands

Command	:MODULE<module>:TeSt?	Summary >>
Syntax	:MODULE<module>:TeSt?	
Description	Query the module self-test status	
Parameters	N/A	
Response	Functional readiness status of the module. A non-zero response reports an error.	
Example	:MODU1:TST? -> 0	

Command	:MODULE<module>:ReSeT	Summary >>
Syntax	:MODULE<module>:ReSeT	
Description	Reset the module to default power-on settings	
Parameters	N/A	
Response	N/A	
Example	:MODULE1:RST	

Command	:MODULE<module>:OPC?	Summary >>
Syntax	:MODULE<module>:OPC?	
Description	Query the Operation Complete Status of the module	
Parameters	N/A	
Response	1 : the module is ready to accept a new command 0 : the module is busy performing a previous operation NOTE: Any commands sent to the module when :MODULE<slot>:OPC? is NOT 1, may not execute or return an error.	
Description	:MODULE1:OPC? -> 1	

Command	:MODULE<module>:IDN?	Summary >>
Syntax	:MODULE<module>:IDN?	
Description	Query the module identification	
Parameters	N/A	
Response	A comma-separated string containing <Company Name>,<Model Name>,<Serial Number>,<Hardware Version><Firmware version>. Note that the hardware and firmware versions are not comma separated.	
Example	:MODULE1:IDN? -> Quantifi Photonics Ltd,POWER-1410-264-MA24-EPIQ,QP-000000,HW0.00.01FW0.00.01	

Command	:MODULE<module>:OPTions?	Summary >>
Syntax	:MODULE<module>:OPTions?	
Description	Query installed modules	
Parameters	N/A	
Response	A comma separated array, or a single integer value based on the arguments given	
Example	:MODULE1:OPTions? -> 1,1,1,...,1,1,1	

Command	:MODULE<module>:TEMPerature?	Summary >>
Syntax	:MODULE<module>:TEMPerature?	
Description	Query the module temperature	
Parameters	N/A	
Example	Module temperature in the default unit	
Syntax	:MODULE1:TEMPerature? -> 28.6	

Command	:MODULE<module>:CONFig?	Summary >>
Syntax	:MODULE<module>:CONFig?	
Description	Query the number of connectors and channels	
Parameters	CONNECTors : Returns quantity of connectors CHANnels : Returns quantity of channels LIST : Returns connector and channel numbers: <Connector>:<first channel>,<last channel> None : Returns <quantity of connectors>,<quantity of channels>	
Response	A single value, or a comma-separated array	
Example	:MODULE:CONFig? -> 11,264 :MODULE:CONFig? LIST -> 1:1,24 2:25,48 3:49,72 4:73,96 5:97,120 6:121,144 7:145,168 8:167,192 9:193,216 10:217,240 11:241,264	

Command	:MODULE<module>:PRESet	Summary >>
Syntax	:MODULE<module>:PRESet	
Description	Restore instrument settings to power-on default values Disables triggering by setting the trace trigger mode to STOPped. Disables Trigger ARM by setting the Trigger ARMed state to DISABLE.	
Parameters	N/A	
Response	N/A	
Example	:MODU1:PRES	

Command	:MODULE<module>:POWER:RESolution?	Summary >>
Syntax	:MODULE<module>:POWER:RESolution? [<wsp><MIN MAX DEF SET ALL>]	
Description	Query resolution of the power value	
Parameters	MIN : Returns the minimum value MAX : Returns the maximum value DEF : Returns the default value SET : Returns the set value ALL : Returns all above values in a comma-separated string None: Returns the set value	
Response	Returns an integer number of decimal places	
Example	:MODU1:POW:RES? DEF -> 2	

Command	:MODULE<module>:POWER:RESolution	Summary >>
Syntax	:MODULE<module>:POWER:RESolution<wsp><value MIN MAX DEF>	
Description	Set resolution of the power value to an integer number of decimal places	
Parameters	<value> : Sets this value MIN : Sets the minimum value MAX : Sets the maximum value DEF : Sets the default value	
Response	N/A	
Example	:MODU1:POW:RES DEF	

10.5.4 Configuration Commands (channel parameters)

Connector configuration:

Command	:CONFIg?	Summary >>
Syntax	:SENSe<module>:CONNeCtor<connector>:CONFIg?	
Description	Query the channels in the connector	
Parameters	N/A	
Response	number of channels in the connector, first channel, last channel	
Example	:SENS1:CONN1:CONF? -> 24,1,24 :SENS1:CONN6:CONF? -> 24,121,144	

Power readings:

Command		:POWer?	Summary >>
Syntax	all channels	:SENSe<module>:POWer? [<wsp><MIN MAX ACT ALL UNIT>]	
	per channel	:SENSe<module>:CHANnel<channel>:POWer? [<wsp><MIN MAX ACT ALL UNIT>]	
	per connector	:SENSe<module>:CONNeCtor<connector>:POWer? [<wsp><MIN MAX ACT ALL UNIT>]	
Description		Query the measured power	
Parameters		MIN : Returns the minimum power that can be measured	
		MAX : Returns the maximum power that can be measured	
		ACT : (default) Returns the actual measured power	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<ACT>	
		UNIT : Returns the default power unit	
Response		A single value, or a comma separated array in the default power unit.	
Example	all channels	:SENS1:POW? ALL -> 1:-60.00,22.00,-99.00 2:-60.00,22.00,-99.00 3:-60.00,22.00,-86.65 ... 286:-60.00,22.00,-99.00 287:-60.00,22.00,-83.72 288:-60.00,22.00,-99.00	
	per channel	:SENS1:CHAN64:POW? MIN -> -60.00	
	per connector	:SENS1:CONN7:POW? ACT -> -84.54,-89.94,-91.73,...,-99.00,-99.00,-84.92	

Power offset:

Command		:OFFSet?	Summary >>
Syntax	all channels	:SENSe<module>:POWer:OFFSet? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:OFFSet? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
	per connector	:SENSe<module>:CONNector<connector>:POWer:OFFSet? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
Description		Query the power measurement offset	
Parameters		MIN : Returns the minimum power offset that can be applied	
		MAX : Returns the maximum power offset that can be applied	
		DEF : Returns the default power offset that can be applied	
		SET : Returns the currently set power offset	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>	
		UNIT : Returns the power offset unit	
		STEP : Returns the resolution for power offset.	
Response		A single value, or a comma separated array in the default power unit.	
Example	all channels	:SENSE1:POW:OFFS? UNIT -> dB	
	per channel	:SENS1:CHAN64:POW:OFFS? ALL -> -100.0,100.0,0.0,0.0	
	per connector	:SENS1:CONN7:POW:OFFS? ALL -> 145:-100.0,100.0,0.0,0.0 146:-100.0,100.0,0.0,0.0 147:-100.0,100.0,0.0,0.0 ... 166:-100.0,100.0,0.0,0.0 167:-100.0,100.0,0.0,0.0 168:-100.0,100.0,0.0,0.0	

Command		:OFFSet	Summary >>
Syntax	all channels	:SENSe<module>:POWer:OFFSet<wsp><value MIN MAX DEF>	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:OFFSet<wsp><value MIN MAX DEF>	
	per connector	:SENSe<module>:CONNector<connector>:POWer:OFFSet<wsp><value MIN MAX DEF>	
	per channel mask	:SENSe<module>:POWer:OFFSet<wsp><value MIN MAX DEF>,<cn0,cn1,..., cn10,cn11>	
		:SENSe<module>:CONNector<connector>:POWer:OFFSet<wsp><value MIN MAX DEF>,<channel_mask>	
Description		Set the power measurement offset	
Parameters		value : Set the power offset to this value.	
		MIN : Set the power offset to the minimum value.	
		MAX : Set the power offset to the maximum value.	
		DEF : Set the power offset to the default value.	
Response		N/A	
Example	all channels	:SENS1:POW:OFFS 5.0	
	per channel	:SENS1:CHAN64:POW:OFFS MAX	
	per connector	:SENS1:CONN7:POW:OFFS 5.0	
	per channel mask	:SENS1:POW:OFFS MIN,#h8402,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0	
		:SENS1:CONN7:POW:OFFS DEF,33794	

Averaging time:

Command		:AVERagingtime?	Summary >>
Syntax	all channels	:SENSe<module>:POWer:AVERagingtime? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:AVERagingtime? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
	per connector	:SENSe<module>:CONNector<connector>:POWer:AVERagingtime? [<wsp><MIN MAX DEF SET ALL UNIT STEP>]	
Description		Query the measurement averaging time	
Parameters		MIN : Returns the minimum averaging time value that can be applied	
		MAX : Returns the maximum averaging time value that can be applied	
		DEF : Returns the default averaging time value that can be applied	
		SET : Returns the currently set averaging time value	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>	
		UNIT : Returns the default averaging time unit	
Response		A single value, or a comma separated array in the default unit.	
Example	all channels	:SENS1:POW:AVER? DEF -> 0.100,0.100,0.100,...,0.100,0.100,0.100	
	per channel	:SENS1:CHAN64:POW:AVER? MAX -> 10.000	
	per connector	:SENS1:CONN7:POW:AVER? UNIT -> s	

Command		:AVERagingtime	Summary >>
Syntax	all channels	:SENSe<module>:POWer:AVERagingtime<wsp><value MIN MAX DEF>	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:AVERagingtime<wsp><value MIN MAX DEF>	
	per connector	:SENSe<module>:CONNector<connector>:POWer:AVERagingtime<wsp><value MIN MAX DEF>	
	per channel mask	:SENSe<module>:POWer:AVERagingtime<wsp><value MIN MAX DEF>,<cn0,cn1,...,cn10,cn11> :SENSe<module>:CONNector<connector>:POWer:AVERagingtime<wsp><value MIN MAX DEF> ,<channel_mask>	
Description		Set the measurement averaging time	
Parameters		value : Set the averaging time to this value in the default averaging time unit	
		MIN : Set to the minimum averaging time value	
		MAX : Set to the maximum averaging time value	
		DEF : Set to the default avaraging time value	
Response		N/A	
Example	all channels	:SENS1:POW:AVER MAX	
	per channel	:SENS1:CHAN64:POW:AVER MIN	
	per connector	:SENS1:CONN7:POW:AVER MIN	
	per channel mask	:SENS1:POW:AVER 5.0,33794,0,0,0,0,0,0,0,0,0,0 :SENS1:CONN7:POW:AVER 0.5,33794	

Nulling, Timenulling:

Command		:Nulling	Summary >>
Syntax	all channels	:SENSe<module>:POWer:NULling	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:NULling	
	per connector	:SENSe<module>:CONNector<connector>:POWer:NULling	
	per channel mask	:SENSe<module>:POWer:NULling<wsp><cn0,cn1,...,cn10,cn11> :SENSe<module>:CONNector<connector>:POWer:NULling<wsp><channel_mask>	
Description		Perform dark current nulling	
Parameters		N/A	
Response		N/A	
Example	all channels	:SENS1:POW:NULL	
	per channel	:SENS1:CHAN64:POW:NULL	
	per connector	:SENS1:CONN7:POW:NULL	
	per channel mask	:SENS1:POW:NULL #h8402,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0 :SENS1:CONN7:POW:NULL 33794	

Command		:TIMEnulling?	Summary >>
Syntax	all channels	:SENSe<module>:POWer:TIMEnulling? [<wsp><MAX ACT ALL UNIT>]	
	per channel	:SENSe<module>:CHANnel<channel>:POWer:TIMEnulling? [<wsp><MAX ACT ALL>]	
	per connector	:SENSe<module>:CONNector<connector>:POWer:TIMEnulling? [<wsp><MIN MAX ACT ALL>]	
Description		Query the amount of time remaining for dark current nulling to complete	
Parameters		MIN : when complete will be this	
		MAX : time it can take	
		ACT : time remaining	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<ACT>	
		UNIT : Returns the unit	
Response			
Example	all channels	:SENS1:POW:TIME? ACT -> 0.00,0.00,0.00,...,0.00,0.00,0.00	
	per channel	:SENS1:CHAN64:POW:TIME? UNIT -> S	
	per connector	:SENS1:CONN7:POW:TIME? MAX -> 10.00,10.00,10.00,...,10.00,10.00,10.00	

Wavelength

Command		:WAVelength?	Summary >>
Syntax	all channels	:SENSe<module>:WAVelength? [<wsp><MIN MAX DEF SET ALL STEP UNIT>]	
	per channel	:SENSe<module>:CHANnel<channel>:WAVelength? [<wsp><MIN MAX DEF SET ALL STEP UNIT>]	
	per connector	:SENSe<module>:CONNector<connector>:WAVelength? [<wsp><MIN MAX DEF SET ALL STEP UNIT>]	
Description		Query the optical wavelength configuration	
Parameters		MIN : Returns the minimum wavelength that can be set	
		MAX : Returns the maximum wavelength that can be set	
		DEF : Returns the default wavelength that can be set	
		SET : Returns the currently set wavelength	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>	
		STEP : Returns the resolution	
		UNIT : Returns the default wavelength unit	
Response		A single value, or a comma separated array in the default wavelength unit.	
Example	all channels	:SENS1:WAV? STEP -> 1.000000	
	per channel	:SENS1:CHAN64:WAV? SET -> 1550	
	per connector	:SENS1:CONN7:WAV? ALL -> 145:1271,1611,1550,1550 146:1271,1611,1550,1550 147:1271,1611,1550,1550 ... 166:1271,1611,1550,1550 167:1271,1611,1550,1550 168:1271,1611,1550,1550	

Command		:WAVelength	Summary >>
Syntax	all channels	:SENSe<module>:WAVelength<wsp><value MIN MAX DEF>	
	per channel	:SENSe<module>:CHANnel<channel>:WAVelength<wsp><value MIN MAX DEF>	
	per connector	:SENSe<module>:CONNector<connector>:WAVelength<wsp><value MIN MAX DEF>	
	per channel mask	:SENSe<module>:WAVelength<wsp><value MIN MAX DEF>,<cn0,cn1, ... , cn10,cn11>	
		:SENSe<module>:CONNector<connector>:WAVelength<wsp><value MIN MAX DEF>,<channel_mask>	
Description		Set the optical wavelength configuration	
Parameters		value : Set the wavelength to this value in the default wavelength unit	
		MIN : Set to the minimum wavelength value	
		MAX : Set to the maximum wavelength value	
		DEF : Set to the default wavelength value	
Response		N/A	
Example	all channels	:SENS1:WAV 1550	
	per channel	:SENS1:CHAN64:WAV MIN	
	per connector	:SENS1:CONN7:WAV MAX	
	per channel mask	:SENS1:WAV 1550 ,#h8402 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0 ,#h0	
		:SENS1:CONN7:WAV 1550 ,33794	

10.5.5 Configuration commands (Trace functionality)

Command		:TRACe?	Summary >>
Syntax	all channels	:SENSe<module>:TRACe?	
	per channel	:SENSe<module>:CHANnel<channel>:TRACe?	
	per connector	:SENSe<module>:CONNector<connector>:TRACe?	
Description		Query the Trace buffer NOTE: Wait for :SENS:TRAC:CMP to complete before using this command. NOTE: This command will error out if no sample points have been triggered, or give a result of "None".	
Parameters		N/A	
Response		A comma separated list of values for each channel.	
Example	all channels	:SENS1:TRAC? -> 1:-0.00,0.01,0.05,...,0.05,0.01,-0.00 2:0.01,0.01,-0.00,...,0.05,0.01,0.01 3:-0.00,0.05,0.05,...,0.01,0.01,0.01 ... 10:0.05,0.01,0.05,...,-0.00,0.01,-0.00 11:-0.00,0.05,0.05,...,0.01,0.01,0.01 12:-0.00,0.01,0.05,...,0.05,0.01,-0.00	
	per channel	:SENS1:CHAN64:TRAC? -> 0.04	
	per connector	:SENS1:CONN7:TRAC? -> 7:-0.00,0.01,0.05,...,0.05,0.01,-0.00	

Command		:PoinTS	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:PoinTS<wsp><value MIN MAX DEF>	
Description		Set the number of trace buffer data elements	
Parameters		value: Set the number of points to be sampled per trigger event to this value.	
		MIN: Set the number of points to the minimum value.	
		MAX: Set the number of points to the maximum value.	
		DEF: Set the number of points to the default value.	
Response		N/A	
Example	all channels	:SENS1:TRAC:PTS 512	

Command		:PointS?	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:PointS? [<wsp><MIN MAX DEF SET ALL>]	
Description		Query the number of trace buffer data elements	
Parameters		MIN : Returns the minimum number of points.	
		MAX : Returns the maximum number of points.	
		DEF : Returns the default number of points.	
		SET : Returns the currently set number of points.	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>	
Response		The number of points captured after each trigger.	
Example	all channels	:SENS1:TRAC:PTS? ALL -> 1,1024,1024,1024	

Command		:RATE	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:RATE<wsp><value MIN MAX DEF>	
Description		Set the trace buffer sampling rate in the frequency default unit	
Parameters		value : Set the sample rate to this value.	
		MIN : Set the sample rate to the minimum value.	
		MAX : Set the sample rate to the maximum value.	
		DEF : Set the sample rate to the default value.	
Response		N/A	
Example	all channels	:SENS1:TRAC:RATE DEF	

Command		:RATE?	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:RATE? [<wsp><MIN MAX DEF SET ALL UNIT>]	
Description		Query the trace buffer sampling rate	
Parameters		MIN : Returns the minimum sampling rate.	
		MAX : Returns the maximum sampling rate.	
		DEF : Returns the default sampling rate.	
		SET : Returns the currently set sampling rate.	
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>	
		UNIT : Returns the default unit.	
Response		The sample rate for the trace per sample in the frequency default unit.	
Example	all channels	:SENS1:TRAC:RATE? MIN -> 0.100	

Command		:TRIGger	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:TRIGger<wsp> <value STOP IMMEDIATE FORCE HWEDGE HWRISING HWFALLING CLKRISING CLKFALL CLKEDGE>	
Description		Set the trace trigger event NOTE: :SENSe<n>:PTS samples is required before :SENSe<n>:TRACe:CMp? is complete.	
Parameters		value : Set the trigger event to this numerical value. To query the numerical values use command :SENS1:TRAC:TRIG? INFO	
		STOP : Cancel triggering in progress.	
		IMMEDIATE : (default) Start sampling immediately, aligned to internal clock.	
		FORCE : (default) Start sampling immediately, aligned to internal clock.	
		HWEDGE : Start sampling on either rising or falling signal edge.	
		HWRISING : Start sampling on signal rising edge.	
		HWFALLING : Start sampling on signal falling edge.	
		CLKRISING : Start sampling on clock rising edge.	
		CLKFALL : Start sampling on clock falling edge.	
		CLKEDGE : Start sampling on either rising or falling clock edge.	
Response		N/A	
Example	all channels	:SENS1:TRAC:TRIG HWRISING	

Command		:TRIGger?	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:TRIGger? [<wsp><SET DEF INFO>]	
Description		Query the trace trigger event	
Parameters		SET : Returns the currently set trigger event.	
		DEF : Returns the default trigger event.	
		INFO : Returns available trigger events as numerical values.	
Response		The trace trigger event.	
Example	all channels	:SENS1:TRAC:TRIG? INFO -> 0:STOPPED 1:IMMEDIATE 6:HWRISING 7:HWFALLING 8:HWEDGE 9:CLKRISING 10:CLKFALLING 11:CLKEDGE	

Command		:ENABle	Summary >>
Syntax	all channels	:SENSe<module>:TRACe:ENABle:<wsp><0 OFF>	
	per channel	:SENSe<module>:CHANnel<channel>:TRACe:ENABle<wsp><0 OFF 1 ON DEF>	
	per connector	:SENSe<module>:CONNector<connector>:TRACe:ENABle<wsp><0 OFF>	
	per channel mask	:SENSe<module>:TRACe:ENABle:MASK<wsp><cn0,cn1, ... ,cn10,cn11> You have to define a channel mask for each connector of your instrument. The number of connectors on your instrument can vary depending on your model. To confirm the number of connectors , use this query: :MODUle:CONFig?	
Description		Enable/Select channels for Trace acquisition	
Parameters		0 OFF : Disable channel for Trace acquisition.	
		1 ON : Enable channel for Trace acquisition.	
		DEF : Set default state.	
Response		N/A	
Example	per channel	:SENS1:CHAN64:TRAC:ENAB ON	
	per channel mask	:SENS1:TRAC:ENAB:MASK #h8402,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0,#h0	

NOTE

You can enable up to 3 channels per connector, for details refer section [Acquiring Traces](#).

An invalid channel selection will result in an execution error.

Once an execution error has occurred, disable all channels for Trace acquisition before enabling channels with a valid command.

Command		:DELaY? Summary >>
Syntax	all channels	:TRIGger:DELaY? [<wsp><MIN MAX DEF SET ALL STEP UNIT>]
Description		Query the trigger delay
Parameters		MIN : Returns the minimum trigger delay.
		MAX : Returns the maximum trigger delay.
		DEF : Returns the default trigger delay.
		SET : Returns the currently set trigger delay.
		ALL : Returns all the above parameters in a comma-separated string: <MIN>,<MAX>,<DEF>,<SET>
		STEP : Returns the resolution.
		UNIT : Returns the default unit.
Response		N/A
Example	all channels	:TRIG1:DEL? ALL -> 0,21474836470,0,0

Command		:DELaY Summary >>
Syntax	all channels	:TRIGger:DELaY? [<wsp><MIN MAX DEF SET ALL STEP UNIT>]
Description		Set the trigger delay
Parameters		value : Set the trigger delay to this value.
		MIN : Set the trigger delay to the minimum value.
		MAX : Set the trigger delay to the maximum value.
		DEF : Set the trigger delay to the default value.
Response		N/A
Example	all channels	:TRIG1:DEL 0

10.6 Acquiring Traces

You can simultaneously trace up to three channels per connector, **one channel** per **eight-channel block**, e.g. channels 2, 11 and 16 in connector 1.

In the image below, each block is highlighted with a different color:

An invalid channel selection will result in an execution error.

Once an execution error has occurred, disable all channels for Trace acquisition before enabling channels with a valid command.

Connector 1		Connector 2		Connector 3		Connector 4		Connector 5		Connector 6	
1	13	25	37	49	61	73	85	97	109	121	133
2	14	26	38	50	62	74	86	98	110	122	134
3	15	27	39	51	63	75	87	99	111	123	135
4	16	28	40	52	64	76	88	100	112	124	136
5	17	29	41	53	65	77	89	101	113	125	137
6	18	30	42	54	66	78	90	102	114	126	138
7	19	31	43	55	67	79	91	103	115	127	139
8	20	32	44	56	68	80	92	104	116	128	140
9	21	33	45	57	69	81	93	105	117	129	141
10	22	34	46	58	70	82	94	106	118	130	142
11	23	35	47	59	71	83	95	107	119	131	143
12	24	36	48	60	72	84	96	108	120	132	144

Connector 7		Connector 8		Connector 9		Connector 10		Connector 11		Connector 12	
145	157	169	181	193	205	217	229	241	253	265	277
146	158	170	182	194	206	218	230	242	254	266	278
147	159	171	183	195	207	219	231	243	255	267	279
148	160	172	184	196	208	220	232	244	256	268	280
149	161	173	185	197	209	221	233	245	257	269	281
150	162	174	186	198	210	222	234	246	259	270	282
151	163	175	187	199	211	223	235	247	259	271	283
152	164	176	188	200	212	224	236	248	260	272	284
153	165	177	189	201	213	225	237	249	261	273	285
154	166	178	190	202	214	226	238	250	262	274	286
155	167	179	191	203	215	227	239	251	263	275	287
156	168	180	192	204	216	228	240	252	264	276	288

10.6.1 Example: Acquiring a trace

To acquire a trace on a channel (in this example: channel 64):

```
#Set trace parameters and trigger delay:
:SENS1:TRAC:PTS 512
:SENS1:TRAC:RATE MAX
:TRIG1:DEL 0

#Start the trace / sampling:
:SENS1:TRAC:ENAB 0
:SENS1:CHAN64:TRAC:ENAB ON

#Set the trigger event to start the trace
:SENS1:TRAC:TRIG IMMEDIATE

#Monitor Trace completion status:
:SENS1:TRACE:COMP? -> 1

#Query the Trace buffer to return all 512 points of data:
:SENS1:CHAN64:TRAC? -> 0.04,0.04,0.03,...,0.03,0.03.0.04
```

10.7 Hardware Triggering

Connect a suitable trigger source to the trigger input.

You can select from these hardware triggering modes:

Trigger mode	Details	Trigger events
Hardware triggering	Use this mode to acquire a trace and start sampling once the trigger event occurs.	HWRISING HWFALLING HWEDGE
Clocked hardware triggering	Use this mode to record one sample for each event.	CLKRISING CLKFALL CLKEDGE

Find below an example for both hardware triggering and clocked hardware triggering.

10.7.1 Example: Hardware triggering

To acquire a trace on a channel (in this example: channel 64) and start sampling once the trigger event occurs:

```
#Set trace parameters and trigger delay:
:SENS1:TRAC:PTS 512
:SENS1:TRAC:RATE MAX
:TRIG1:DEL 0

#Start the trace / sampling on the channel:
:SENS1:TRAC:ENAB 0
:SENS1:CHAN64:TRAC:ENAB ON

#Set the trigger event (HWRISING, HWFALLING or HWEDGE) to start the trace
:SENS1:TRAC:TRIG HWRISING

#Monitor Trace completion status:
:SENS1:TRACE:COMP? -> 1

#Query the Trace buffer to return all 512 points of data:
:SENS1:CHAN64:TRAC? -> 0.04,0.04,0.03,...,0.03,0.03.0.04
```

10.7.2 Example: Clocked hardware triggering

To record one sample for each trigger event:

```
#Set trace parameters and trigger delay:
:SENS1:TRAC:PTS 512
:SENS1:TRAC:RATE MAX
:TRIG1:DEL 0

#Start the trace / sampling on the channel:
:SENS1:TRAC:ENAB 0
:SENS1:CHAN64:TRAC:ENAB ON

#Set the trigger event (CLKRISING, CLKFALLING or CLKEDGE) to start the trace
:SENS1:TRAC:TRIG CLKFALLING

#Monitor Trace completion status:
:SENS1:TRACE:COMP? -> 1

#Query the Trace buffer to return all 512 points of data:
:SENS1:CHAN64:TRAC? -> 0.04,0.04,0.03,...,0.03,0.03.0.04
```

10.8 Example: Working with your POWER instrument

We recommend that you use the *ESR? query after every command that is sent to the device. This enables you to debug unreceived or incorrect commands sent to the product.

The following is a simple example of how to control your POWER instrument using SCPI commands:

```
#Identify the product:
:IDN?                                #Query to confirm the instrument you are communicating with

#Configure the product:
:SENS1:CHAN64:WAV 1550               #Set the wavelength of the channel
:SENS1:CHAN64:POW:NULL               #With no optical input connected and dust cap on the optical input, run dark current nulling
:SENS1:CHAN64:POW:TIME? ACT          #Query the time remaining for nulling to be completed
:SENS1:CHAN64:POW:AVER 0.1           #Set the averaging time
:SENS1:CHAN64:POW:OFFS 5.0           #Set the power offset

#Query the channel configuration values:
:SENS1:CHAN64:WAV? SET               #Query the wavelength of the channel
:SENS1:CHAN64:POW:AVER?              #SET Query the averaging time and power offset of the channel
:SENS1:CHAN64:POW:OFFS? SET          #Query the averaging time and power offset of the channel

#Query the optical power:
:SENS1:CHAN64:POW?                   #Query the measured optical power with an optical input connected to the unit

#Configure and initiate power tracing:
:SENS1:TRAC:PTS 1000                 #Set trace parameters for all channels
:SENS1:TRAC:RATE MAX
:TRIG1:DEL 0                         #Set trigger delay for all channels
:SENS1:TRAC:ENAB 0                   #Start the trace / sampling of the channel
:SENS1:CHAN64:TRAC:ENAB ON
:SENS1:TRAC:TRIG IMMEDIATE           #Set the trigger event to start the trace

#Query the acquired power trace:
:SENS1:TRACE:COMP?                   #Monitor Trace completion status
:SENS1:CHAN64:TRAC?                  #Query the Trace buffer to return all 1000 points of data
```

10.9 SCPI Command Console

The SCPI Command Console enables you to communicate with Quantifi Photonics product via SCPI commands. You can easily test commands and verify their syntax.

For available SCPI commands, refer to the user manual of the Quantifi Photonics product you are communicating with.

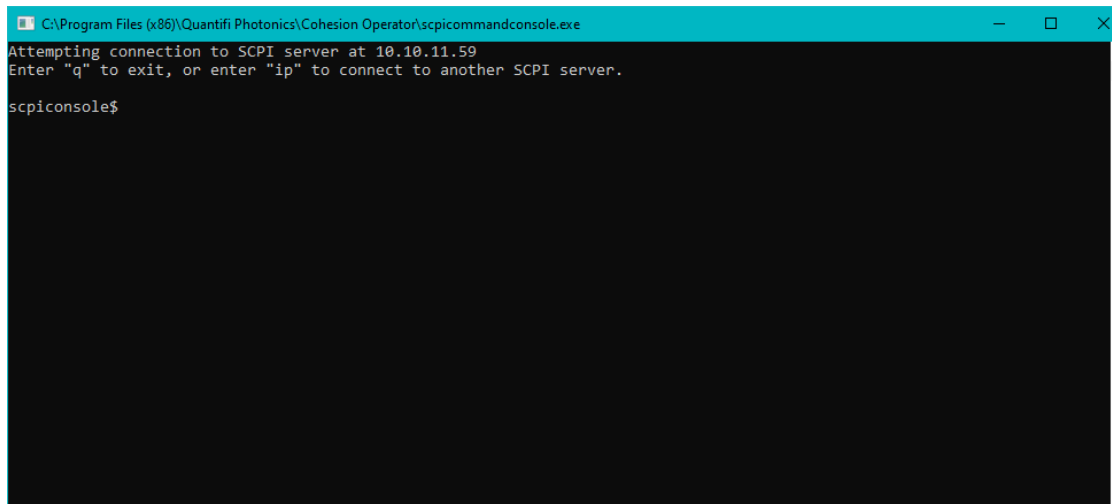
The two most common error codes are:

17: IO writer error: The command was invalid or not accepted by the instrument.

15: IO timeout: there was no response available before expiry of the reading wait time.

► To open the SCPI Command Console:

- Open the Cohesion Operator, for example by double-clicking the **Cohesion Operator** desktop icon.
- Select the instrument by entering its **IP address** or by selecting it from the **Discovery** drop down list.
- Click **Open SCPI Command Console**.



```
C:\Program Files (x86)\Quantifi Photonics\Cohesion Operator\scpicommandconsole.exe
Attempting connection to SCPI server at 10.10.11.59
Enter "q" to exit, or enter "ip" to connect to another SCPI server.
scpicomconsole$
```

1. To verify that you are communicating with the right device:

- Enter `*idn?` and press **<ENTER>**.
- The device will return identification details.

2. To switch to another Quantifi Photonics device:

- Enter `ip` and press **<ENTER>**.
- Enter the IP address of the Quantifi Photonics product you would like to switch to and press **<ENTER>**.
- Confirm that you are communicating with the right product: Enter `*idn?` and press **<ENTER>**.

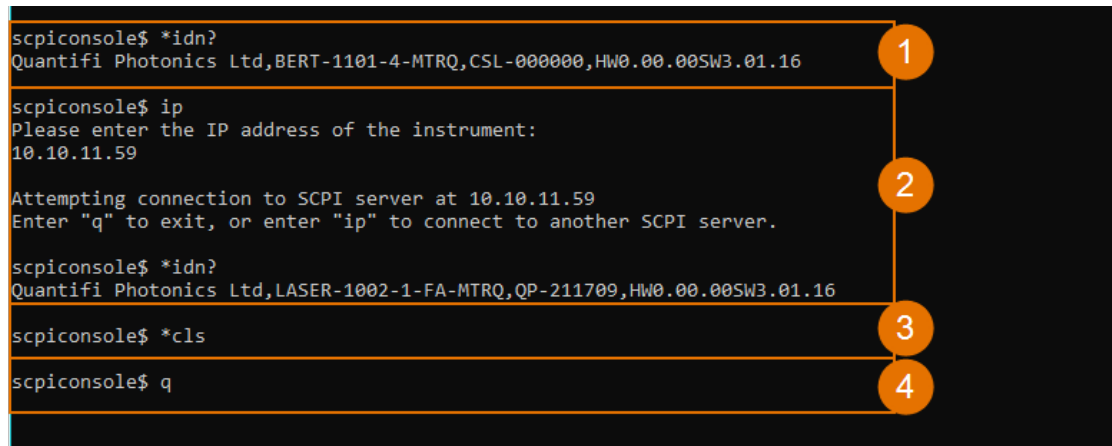
The device will return identification details

3. To send a command or query to a Quantifi Photonics device:

- Enter a command and press **<ENTER>**.
- The device will execute the command and return an action response to the console if applicable.

4. To exit the SCPI Command Console:

- Enter `q` and press **<ENTER>**.



The screenshot shows a terminal window with a black background and orange text. Four orange circles with white numbers 1, 2, 3, and 4 are positioned to the right of the terminal output, indicating the sequence of steps. Step 1 shows the command `*idn?` and the device response. Step 2 shows the command `ip`, the prompt for an IP address, the input `10.10.11.59`, and the connection attempt message. Step 3 shows the command `*idn?` and the device response. Step 4 shows the command `*cls` and the command `q`.

```
scpicomsole$ *idn?  
Quantifi Photonics Ltd,BERT-1101-4-MTRQ,CSL-000000,HW0.00.00SW3.01.16  
  
scpicomsole$ ip  
Please enter the IP address of the instrument:  
10.10.11.59  
Attempting connection to SCPI server at 10.10.11.59  
Enter "q" to exit, or enter "ip" to connect to another SCPI server.  
  
scpicomsole$ *idn?  
Quantifi Photonics Ltd,LASER-1002-1-FA-MTRQ,QP-211709,HW0.00.00SW3.01.16  
  
scpicomsole$ *cls  
  
scpicomsole$ q
```

Example: Send instrument identification query *idn?

5. Enter the command: *idn?

The instrument returns the requested information.

6. If you enter the command incorrectly, for example: *ind?

The instrument returns **error code 32**.

For details on error codes, please refer to the *ESR?command.

```
scpicontrol$ *idn?  
Quantifi Photonics Ltd,BERT-1101-4-MTRQ,CSL-000000,HW0.00.00SW3.01.16  
  
scpicontrol$ *ind?  
*ESR? -> 32  
  
scpicontrol$
```

Example: Send a WRITE only command

7. If you enter a command correctly, for example: *cls

The instrument executes the command, there will be no action response.

8. If you enter a command incorrectly, for example: *csl

The instrument returns **error code 17: IO write error**.

```
scpicontrol$ *cls  
  
scpicontrol$ *csl  
17: IO write error  
  
scpicontrol$
```

11 Programming examples and applications

Remote communication with the CohesionSCPI service is achieved through the Standard Commands for Programmable Instruments (SCPI).

Support for VISA I/O API over TCP/IP is provided by the VXI-11 compliant CohesionSCPI service. With VISA communication drivers installed on the client, the implementation of VISA programming within environments such as MATLAB becomes available.

This section details the programming and measurement conventions to follow while executing the commands for the CohesionSCPI service.

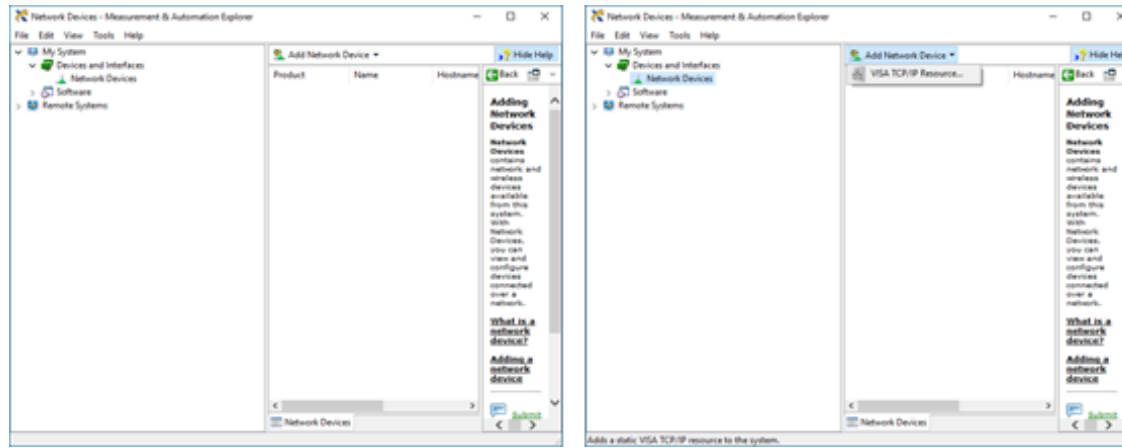
NOTE

In NI-MAX a RIO interface will show up, however there are no communication methods available or implemented on this interface. Quantifi Photonics products are **ONLY** accessible through the **VISA TCPIP INSTR** interface provided by the CohesionSCPI service installed on the system.

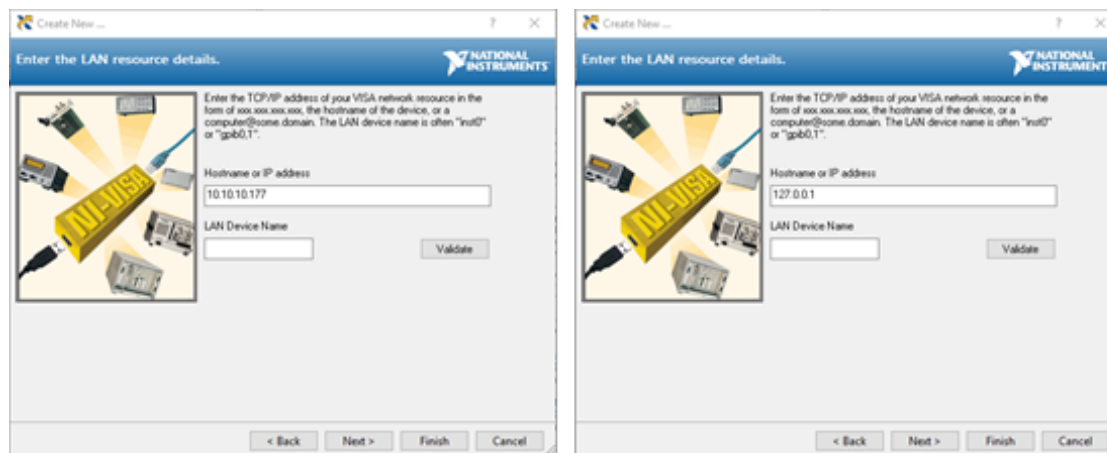
11.1 Setting up NI-MAX application

To communicate with any Quantifi Photonics product, the chassis / benchtop product must first be setup as a TCP/IP instrument.

1. After installing NI-MAX, launch the application. In the left side panel of the window, click the **Devices and Interfaces** option. A drop down of available instruments detected will show up.
2. Click on **Network Devices**, then click **Add Network Devices** and select **VISA TCP/IP Resource**.



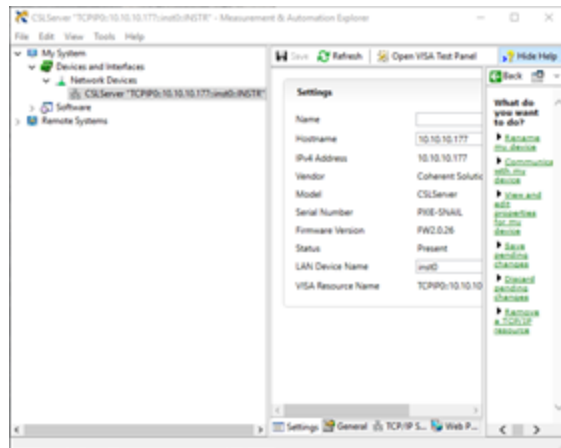
3. Select **Manual Entry of LAN Instrument**. Enter in the Hostname or IP Address.
Note when operating locally, enter in the localhost IP address of **127.0.0.1**. Click **Finish** to end the setup process.



11.2 Setting up NI-VISA application

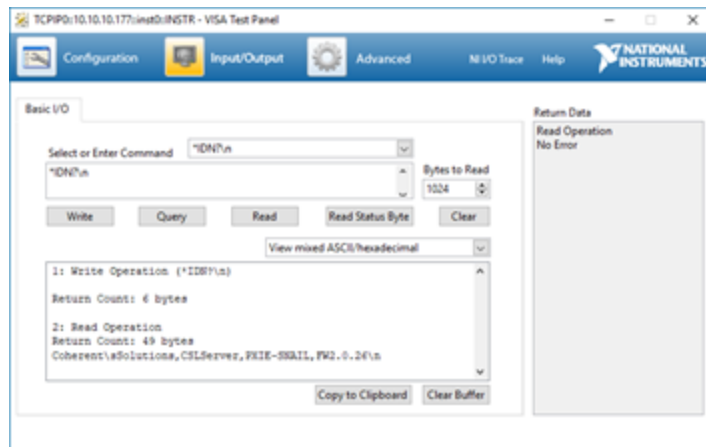
NI-VISA is used to communicate with the PXIe chassis or installed modules / instruments. The above steps must be completed before attempting to communicate using NI-VISA.

1. Launch NI-MAX. In the left-hand side menu, select an instrument from the **Network Devices** list.



2. On the right-hand side panel, select **Open VISA Test Panel**. A new window will popup. Click the **Input / Output** button from the window menu.

Valid chassis and module commands can be entered in, and their returns queried



11.3 Python® code example

The following example shows how to communicate with the Quantifi Photonics product using Python code.

```
# You can get VXi11 from pip:
# pip install python-vxi11==0.9
import vxi11
from vxi11.vxi11 import Vxi11Exception
# replace this with the IP of your device
ip = "127.0.0.1"
try:
    print("connecting to " + ip + " ... ")
    instrument = vxi11.Instrument(ip)
    print("connected")
    print("checking IDN...")
    command = "*IDN?"
    data = instrument.ask(command)
    print("IDN: " + data)
    print("checking OPT...")
    command = "*OPT?"
    data = instrument.ask(command)
    print("OPT: " + data)
    # replace this with a valid command for your device (read # the programming guide section for examples)
    command = ""
    print("writing a specific command")
    instrument.write(command)
    print("checking ESR")
    command = "*ESR?"
    data = instrument.ask(command)
    print("*ESR?: " + data)
except Vxi11Exception as e:
    # pass
    print("ERROR" + str(e) + ", command: " + str(command))
```

11.4 MATLAB® code example

To communicate with the Quantifi Photonics product in MATLAB® the installation of a VISA IO driver is required. These drivers enable the creation of the Interface Object for instrument communication.

If developing locally on the PXIE Platform, then these will already be installed. However, if development is on a remotely connected system the VISA Libraries, e.g. National Instruments NI-VISA will have to be installed.

NOTE

MATLAB 2010x or later with the Instrument Control Toolbox is required to execute the code detailed in this section.

The following example shows how to communicate with a Quantifi Photonics product using MATLAB code.

```
% Find a VISA-TCPIP object. This is if the VISA object has already been
% created with tmtool or has been removed from the workspace without
% first being closed (cleanly disconnected).
PXIE_Chassis = instrfind('Type', 'visa-tcpip', ...
    'RsrcName', 'TCPIP0::10.10.10.89::inst0::INSTR', 'Tag', '');
% Create the 'agilent' VISA-TCPIP object if it does not exist
% otherwise use the object that was found.
if isempty(PXIE_Chassis)
    PXIE_Chassis = visa('agilent', 'TCPIP0::10.10.10.89::inst0::INSTR');
else
    fclose(PXIE_Chassis);
    PXIE_Chassis = PXIE_Chassis (1);
end
% Open the connection to the VISA object.
fopen(PXIE_Chassis);
% Query the PXIE_Chassis.
response = query(PXIE_Chassis, '*IDN?');
disp('The *IDN query response:');
disp(response);
response = query(PXIE_Chassis, '*OPT?');
disp('The *OPT query response:');
disp(response);
% Replace this with a valid command for your device (read the programming
% guide section for examples)
command = ''
% Close the connection to the object.
```

12 Working with optical fibers

Quantifi Photonics products are equipped with high quality optical connectors in compliance with EIA-455-21A standards.

CAUTION

Keep connectors clean and in good condition to ensure maximum power and to avoid erroneous readings. Quantifi Photonics is not responsible for damage or errors caused by bad fiber cleaning or handling.

- Always inspect fiber end faces for cleanliness using a fiber inspection probe before inserting them into a port..
- If required, clean fibers and faces as detailed below.

NOTE

- To avoid damaging ferrules or fiber faces due to mismatched connectors, always check ports and connector type information before inserting a connector. All Quantifi Photonics units are labeled with connector type information.
- Failing to align and/or connect fiber-optic cables properly will result in significant signal loss and reflection.

► When connecting a fiber-optic cable to a port:

1. Visually inspect the fiber end face using a fiber inspection microscope.
2. If a **connector end face** is dirty:
 - Wipe the connector end face using a reel-type cleaner and inspect again.
 - For stubborn hard to clean connectors:
 - Use lint-free fiber-cleaning wipes soaked in a fiber optic cleaning solution.
 - Wipe the connector on the soaked part.
 - Dry the connector by wiping on the dry part of the wipe, or by using a reel-type cleaner.
 - Repeat the process until connector inspection shows a clean fiber face.
3. If a **bulkhead inner connector face** is dirty:
 - Use a pen-type dry cleaner, align the cleaning tip with the port and push the cleaner until you hear the characteristic click. Inspect again.
 - For stubborn hard to clean bulkhead connectors:
 - Use a stick-type cleaner dipped in a fiber optic cleaning solution.
 - Carefully align and insert the stick into the connector and gently rotate the stick for several seconds applying light pressure.
 - Use a pen-type cleaner to dry the connector.
 - Repeat the process until connector inspection shows a clean fiber face.
4. If the fiber end face is clean:
 - Carefully align the connector and port to prevent the fiber end from touching the outside of the port or other surfaces. If the connector features a key, mate it correctly into the corresponding notch of the port bulkhead.

- Push the connector in so that the fiber-optic cable is firmly in place with adequate contact. If your connector features a screw sleeve, tighten the connector to firmly maintain the fiber in place. Do not over-tighten, as this will damage the fiber and the port bulkhead.

13 System requirements

Quantifi Photonics PXle modules

Supported browsers for working with CohesionUI	Google Chrome™ Microsoft Edge®
Chassis	PXle-compatible chassis that • supports PXle, or • contains PXI hybrid compatible slots
Recommended PXle controller operating system	Microsoft Windows® 10 (64-bit)

Quantifi Photonics MATRIQ / EPIQ instruments

Supported browsers for working with CohesionUI	Google Chrome™ Microsoft Edge®
Recommended client computer operating system	Microsoft Windows® 10 (64-bit)

14 Maintenance

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- Keep the unit free of dust.
- Store the unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, power off the chassis immediately. Remove the unit and allow to dry completely.
- To allow for sufficient air flow and avoid thermal issues, set up your instrument with a minimum clearance of 2 inches (50.8mm) around it and do not block any ventilation fans.



WARNING

The use of controls, adjustments, and procedures other than those specified herein may result in exposure to hazardous situations or impair the protection provided by this unit.

14.1 Annual calibration schedule

To ensure that the unit is performing within specification, we recommend it is re-calibrated every 12 months.

All Quantifi Photonics products are calibrated during manufacture, and each product is shipped to the customer with a Calibration Certificate. On this certificate, the calibration date, as well as the next calibration due date are mentioned.

We recommend your product is returned for re-calibration before the listed due date, to ensure continued performance of the product. For re-calibration service information, or to send in a product for re-calibration service, email support@quantifiphotonics.com.

If the Calibration Certificate has been misplaced, or the calibration due date is not known, email support@quantifiphotonics.com.

15 Technical Support

15.1 Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact Quantifi Photonics:

support@quantifiphotonics.com

To accelerate the process, please provide information such as the name and the serial number of the product (see the product identification label), as well as a description of your problem.

15.2 Transportation

Maintain a temperature range within specifications when transporting the unit.

Transportation damage can occur from improper handling.

The following steps are recommended to minimize the possibility of damage:

- Pack the product in its original packing material when shipping. If the original packaging is unavailable, use appropriate foam packaging to provide shock absorption and avoid displacement of the product inside the shipping box. Please keep all input connectors covered with the supplied anti-static plastic covers during transport and avoid any shipping material making contact with the sensitive connectors of the product.
- Avoid high humidity or large temperature fluctuations.
- Keep the product out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

16 Warranty Information

16.1 General information

Quantifi Photonics Ltd (Quantifi Photonics) warrants from the date of the original shipment (the Warranty Period) that this product will conform to specifications and will be free from defects in material and workmanship for the applicable Warranty Period. Quantifi Photonics also warrants that the equipment will meet applicable specifications under normal use.

NOTE

The warranty can become null and void if:

- The unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-Quantifi Photonics personnel.
- The warranty sticker has been removed.
- The unit has been opened, other than as explained in this guide.
- The unit serial number has been altered, erased, or removed.
- The unit has been misused, neglected, or damaged by accident.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL QUANTIFI PHOTONICS BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

For full warranty terms and conditions, please visit quantifiphotonics.com.

16.2 Liability

Quantifi Photonics shall not be liable for damages resulting from the use of the product, nor shall be responsible for any failure in the performance of other items to which the product is connected or the operation of any system of which the product may be a part.

Quantifi Photonics shall not be liable for damages resulting from improper usage, transportation or unauthorized modification of the product, its accompanying accessories and software.

The external power supply that has been supplied by Quantifi Photonics with the unit can only be used with that unit, do not use it with any other product.

16.3 Exclusions

Quantifi Photonics reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (EUI)

used with Quantifi Photonics products are not covered by this warranty.

This warranty excludes failure resulting from: Improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond the control of Quantifi Photonics.

16.4 Certification

Quantifi Photonics certifies that this equipment met its published specifications at the time of shipment from the factory.

16.5 Service and repairs

To send any equipment for service, repair or calibration please contact the Technical Support Group: support@quantifiphotonics.com.

Test. Measure. Solve.™

Quantifi Photonics is transforming the world of photonics test and measurement. Our portfolio of optical and electrical test instruments is rapidly expanding to meet the needs of engineers and scientists around the globe. From enabling ground-breaking experiments to driving highly efficient production testing, you'll find us working with customers to solve complex problems with optimal solutions.

To find out more, get in touch with us today.

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