QUANTIFI PHOTONICS™

O2E

OPTICAL TO ELECTRICAL CONVERTER

USER MANUAL

quantifiphotonics.com

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1 Conventions

Before using the instrument described in this manual, take note of the following conventions:

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

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in **component damage**. Do not proceed unless the required conditions are met and understood.

IMPORTANT

Refers to information about this product that you should not overlook.

NOTE

Indicates some information that requires your attention or some extra information for the current topic.

2 Safety information

Before using the O2E product, ensure that the following safety information has been read and understood.

2.1 Optical laser radiation precautions

WARNING

Do not install or terminate fibers while the light source is active. Care must be taken to ensure that the instrument has been **turned OFF before inspecting the end face(s) of the instrument, or any optical patch cords** connected to this instrument. Never look directly into a live fiber; ensure that your eyes are protected at all times.

CAUTION

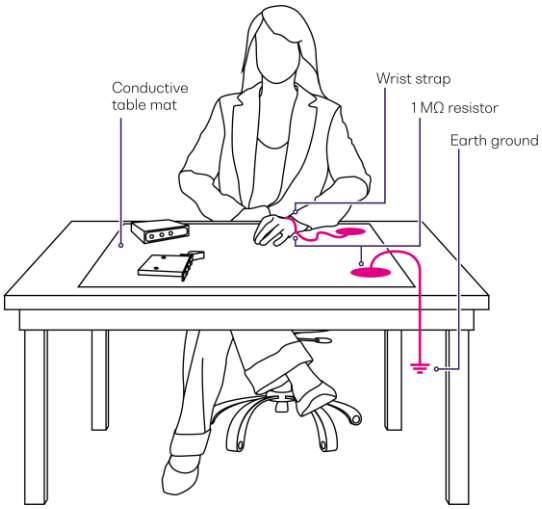
The use of controls, adjustments, and procedures other than those specified herein may result in exposure to hazardous situations involving optical radiation.

2.2 Electrostatic discharge precautions

CAUTION

The O2E product are sensitive to electrostatic discharge (ESD). Store the unused products in the original protective electrostatic packaging that the product was shipped in.

Ensure that a wrist strap and grounding table mat is used when unpacking or handling the O2E product. Proper grounding and ESD management practices should always be followed to ensure that no ESD damage is caused to the Switch product.



2.3 Electromagnetic compatibility

CAUTION

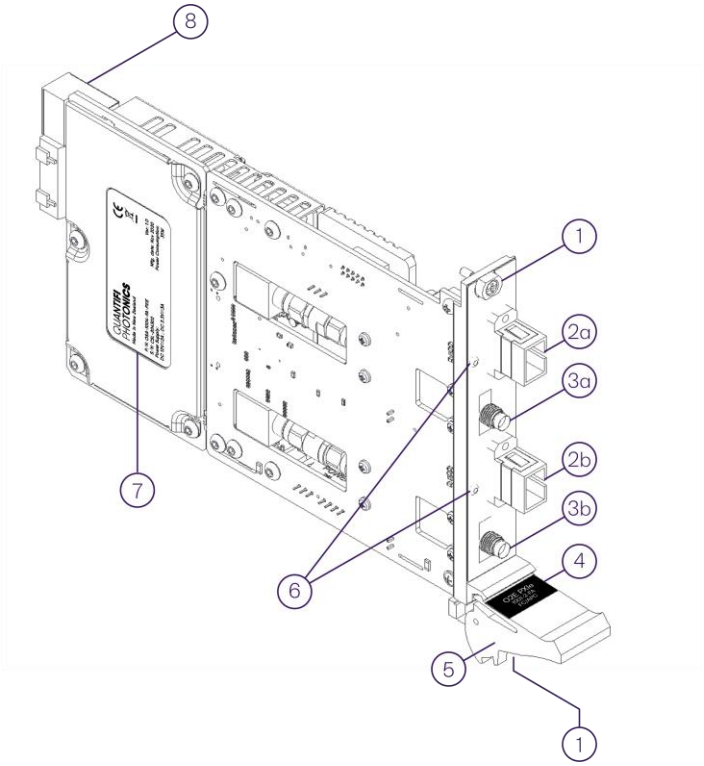
- For electromagnetic compatibility, this instrument is a **Class A** product. It is intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.
- Wherever the ⚠ symbol is printed on the unit, refer to the instructions provided in the device documentation for related safety information. Ensure that the required conditions are met and understood before using the product.

3 Introducing the O2E – Optical to electrical convertor

The O2E product is a compact high bandwidth broadband optical to electrical converter, available in a range of configurations. The O2E integrates seamlessly with NI PXI instruments to drive mixed-signal test across a wide range of applications. Generate reliable and repeatable results in manufacturing or research and development environments.

3.1 O2E PXIe module overview & features

1 Fastening screws
2a Channel 1 optical input port
2b Channel 2 optical input port
3a Channel 1 RF output port
3b Channel 2 RF output port
4 Optical connector information
5 Fastening clip
6 Status LEDs
7 O2E PXIe module information
8 PXIe headers

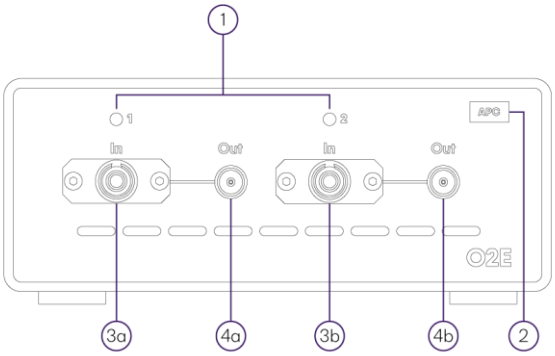


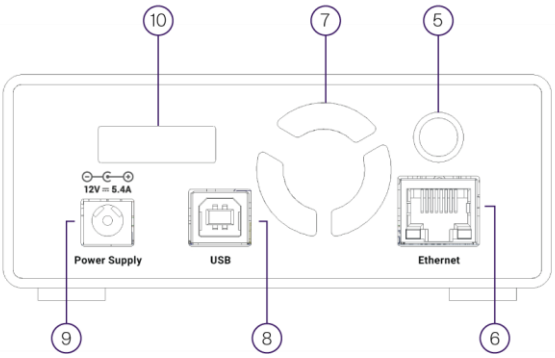
3.2 O2E MATRIQ instrument overview & features

⚠ IMPORTANT

- You must use the external power supply that has been supplied by Quantifi Photonics with the unit. Any attempt to use a different external power supply may cause product damage and will void your warranty.
- The external power supply that has been used with the unit can only be used with that unit. Do not use it with any other product.

1 Status LEDs
2 Optical connector type
3a Channel 1 optical input port
3b Channel 2 optical input port
4a Channel 1 RF output port
4b Channel 2 RF output port
5 On / Off push button
6 Ethernet port
7 Ventilation fan (DO NOT OBSTRUCT)
8 USB type B port
9 Power supply port
10 IP address LCD screen





3.3 Status LEDs

The Status LEDs are used to denote the operation state of the O2E products. There is a slightly different meaning for different O2E products.

3.3.1 For O2E 1901 & 1401 products

- **Solid green** - Indicates that the **RF amplifier is ON,** and the **product is ready** to communicate.
- **Blinking green** - Indicates that the **RF amplifier is ON,** and the **product is busy** (capturing a trace or waiting for a trigger).
- **Solid red** - Indicates that the **RF amplifier is OFF,** and the **product is ready** to communicate.
- **Blinking red** - Indicates that the **RF amplifier is OFF,** and the **product is busy** (capturing a trace or waiting for a trigger).

3.3.2 All O2E products excluding 1901 & 1401

- **Solid green** - Indicates that the **product is ready**.
- **Blinking green** - Indicates that the **product is busy** (capturing a trace or waiting for a trigger).

4 Connecting optical fibers

CAUTION

To ensure maximum power and to avoid erroneous readings always inspect fiber end faces. Make sure they are cleaned as detailed below before inserting into any port. **Quantifi Photonics is not responsible for damage or errors caused by bad fiber cleaning or handling**.

IMPORTANT

The type of optical connectors on the O2E product can be found printed on the front plate of the product. **Joining mismatched connectors will damage the ferrules and fibre faces**.

To keep connectors clean and in good condition, Quantifi Photonics strongly recommends inspection with a fiber inspection probe before connecting them. Failure to do so will result in permanent damage to the connectors and degradation of future measurements.

Quantifi Photonics uses high quality connectors in compliance with EIA-455-21A standards.

4.1 Cleaning and connecting optical fibers

To connect the fiber-optic cable to the port:

1. Inspect the fiber end using a fiber inspection microscope. If the fiber end is clean, proceed to connect it to the desired port.
2. If the fiber end is dirty, clean it as detailed below.
3. Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.
4. Use compressed air to dry completely.
5. Visually inspect the fiber end to ensure its cleanliness.
6. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces. If the connector features a key, ensure that it is correctly mated into the corresponding notch of the port bulkhead.
7. Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact. If your connector features a screw sleeve, tighten the connector enough to firmly maintain the fiber in place. **Do not over tighten, as this will damage the fiber and the port bulkhead.**

NOTE

If your fiber-optic cable is not properly aligned and/or connected, you will notice large signal loss and reflection.

5 Connecting electrical cables

CAUTION

- Electrostatic discharge (ESD) can damage or destroy electronic components. It may result in damage whenever an ESD occurs during transport, storage or use of electronic components.
- The O2E product contains ESD sensitive components. In order to reduce the damage that an ESD can cause while in storage, always store the module in the ESD safe bag that it was shipped in.
- For the **O2E 1201 & 1301** products, during initialization the **output RF DC level may exceed ± 1 V**. It is recommended that any sensitive instrumentation connected to these products be **connected / disconnected ONLY while the front panel LED is solid GREEN**.

IMPORTANT

- Always remember to short the centre and outer conductors of the output RF cable together before connecting to the RF output port on the O2E product.
- The RF output must be connected into a 50 ohm load **BEFORE** enabling the RF output. Turning on the RF output without connecting a load will damage the internal amplifier and void warranty.
- If incorrect or negligent practice is exercised while connecting or disconnecting an RF cable to the RF output port of the O2E product, this may cause internal damage to the module.

Whenever handling the O2E product, always ensure that the user is grounded and wearing a 1 MΩ resistor-isolated wrist-strap, and that the chassis and all other instruments and test devices are properly grounded, to prevent static charge build up.

6 Handling the O2E product

CAUTION

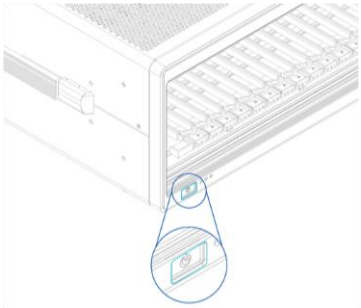
- Do not remove the O2E product from the antistatic packaging until instructed during the following installation procedure.
- **The O2E product is sensitive to ESD. Ensure you are wearing a grounded wrist strap at all times when handling the O2E product to prevent damage from electrostatic discharge .**
- Take care not to handle the optical connectors on the O2E, as once they are exposed to skin contact this may leave corrosive residue which can damage the connector.

6.1 O2E PXIe module installation

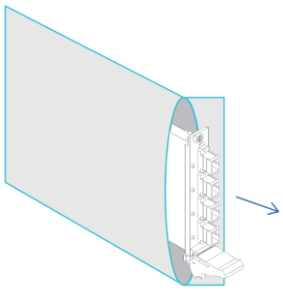
WARNING

DO NOT attempt to remove or adjust any component of the PXIe chassis while the power is on. **Ensure the chassis is powered OFF, and that the correct handling procedure detailed herein is followed when removing or installing any modules**.

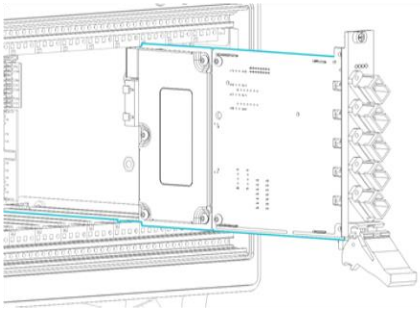
STEP 1: Power OFF the Chassis



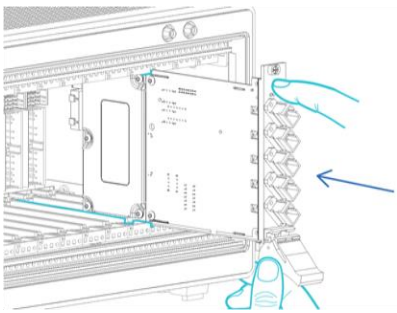
STEP 2: Remove the module from the antistatic bag. Retain bag



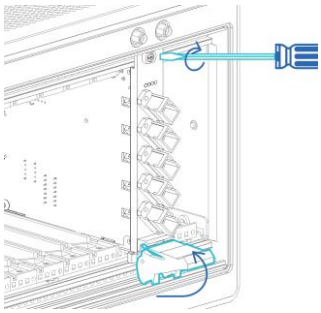
STEP 3: Align module with slot guide rails



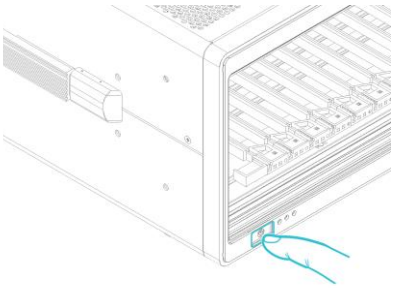
STEP 4: Push module into slot until resistance is felt from the backplane connection



STEP 5: Engage the fastening clip. Secure all fastening screws



STEP 6: Power ON the chassis

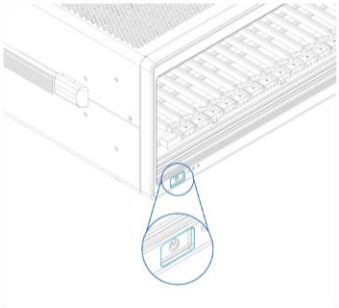


IMPORTANT

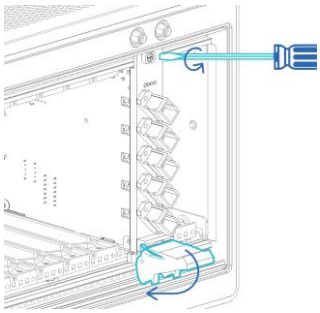
After powering on the PXIe chassis, please wait at least **2 minutes** before attempting to communicate with the instrument. This will allow the chassis enough time to finish boot procedures and initialize the communication server.

6.2 O2E PXIe module uninstallation

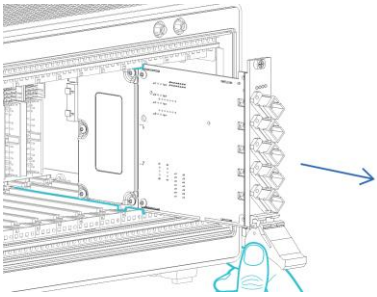
STEP 1: Power OFF the chassis



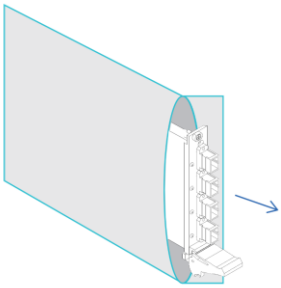
STEP 2: Unsecure the fastening screws and fastening clip



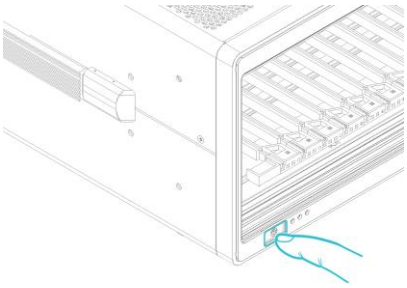
STEP 3: Pull out the module. USE THE FASTENING CLIP TO PULL. DO NOT PULL ON THE CONNECTORS



STEP 4: Store module in antistatic bag



STEP 5: Power ON the chassis



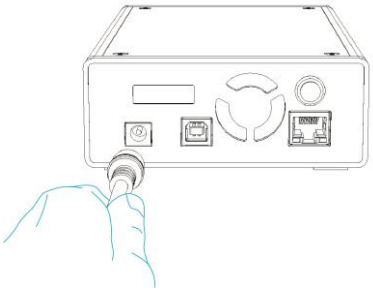
6.3 O2E MATRIQ instrument installation

⚠ IMPORTANT

- You must use the external power supply that has been supplied by Quantifi Photonics with the unit. Any attempt to use a different external power supply may cause product damage and will void your warranty.
- The external power supply that has been used with the unit can only be used with that unit. Do not use it with any other product.

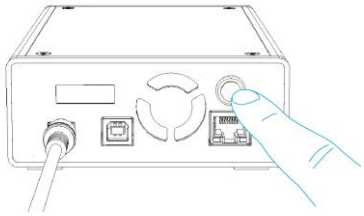
STEP 1:

Insert power cord



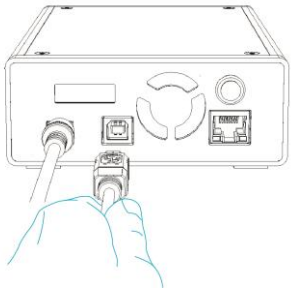
STEP 2:

Power ON the instrument



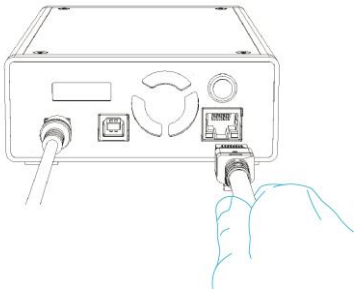
STEP 3:

via USB – Connect USB cable



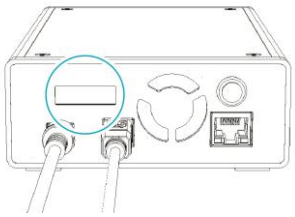
STEP 3:

via Ethernet – Connect Ethernet cable



STEP 4:

IP address will appear on the LCD screen



via USB

via Ethernet

7 Software installation information for the O2E product

⚠ IMPORTANT

The software installation process varies between the PXIe Modules (7.1) and the MATRIQ Instrument (7.3). Refer to the relevant section according to the product type.

7.1 Cohesion Installer information for PXIe modules

⚠ IMPORTANT

The software must be installed on the PXIe Controller for the PXIe Chassis in which the Quantifi Photonics modules will be installed, or the controller PC in the case of a MXI setup.

Minimum System Requirements: 64bit OS, Windows 7 or above.
Recommended System Requirements: 64bit Windows 10.

The Cohesion Installer is a **single installation package** that contains all the required drivers and software, to support and control Quantifi Photonics modules on the PXIe Platform.

7.1.1 Installation overview

For the PXIe Controller to communicate with the O2E module installed in the chassis, software and driver installations are necessary. This software is contained in the **Cohesion Installer** single installer package.

- CohesionDriver: Drivers for Quantifi Photonics PXIe Modules
- CohesionSCPI: VXI11 compliant server for remote SCPI communication
- CohesionUI: Web-based Graphical User Interface

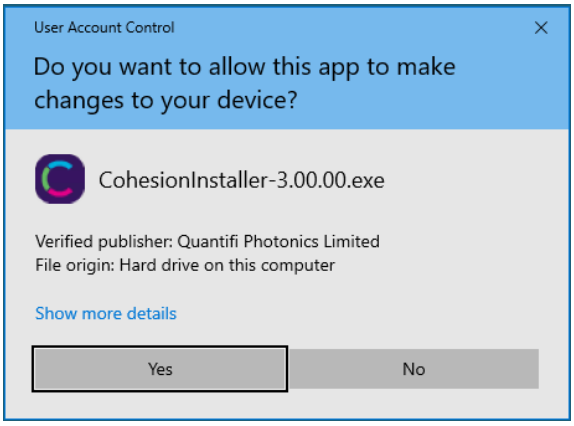
⚠ IMPORTANT

It recommended that you **save all work and close any open programs** before attempting to install the required software packages above.

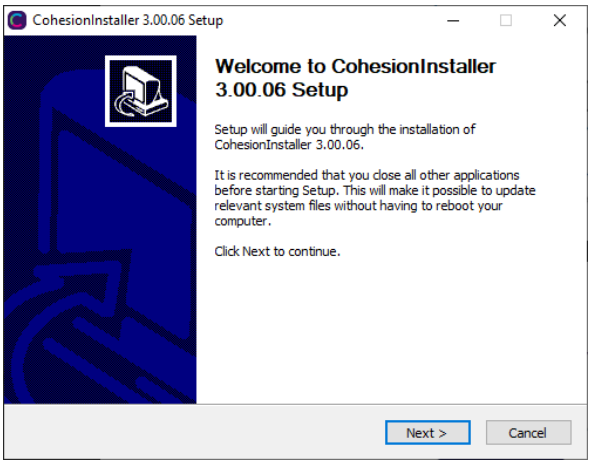
7.1.2 Installation process

Windows 10 64bit:

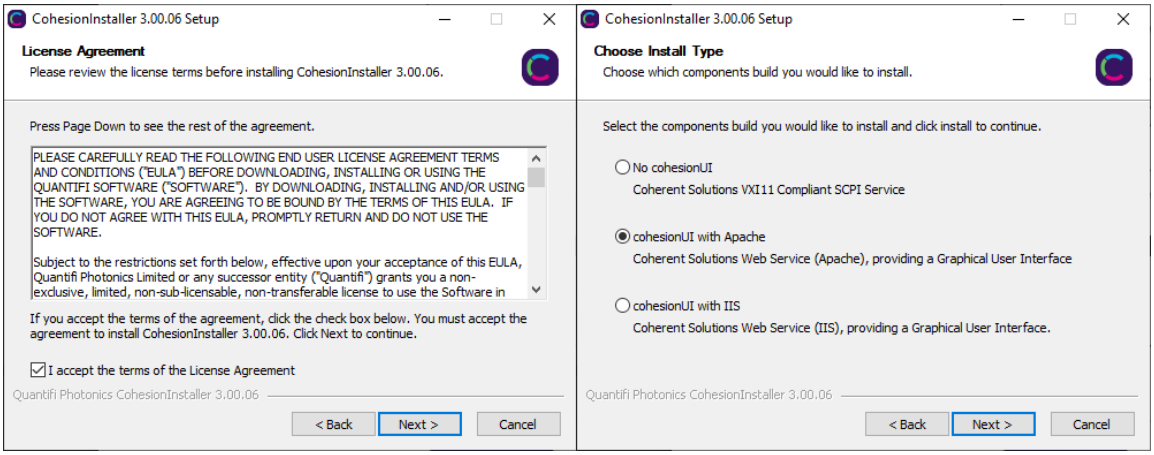
1. Locate and run the installer **CohesionInstaller-3.XX.XX.exe** from the provided USB media device (or download from the Quantifi Photonics website).



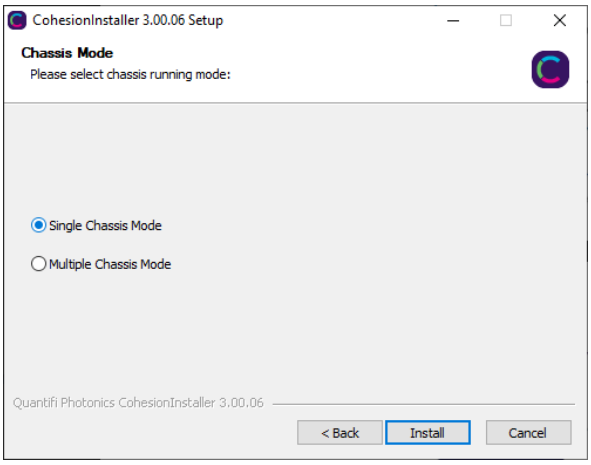
2. Follow the on-screen installation prompts.



3. Continue with the installation by following the on-screen installation prompts. Choose the default installation type – CohesionUI with Apache.



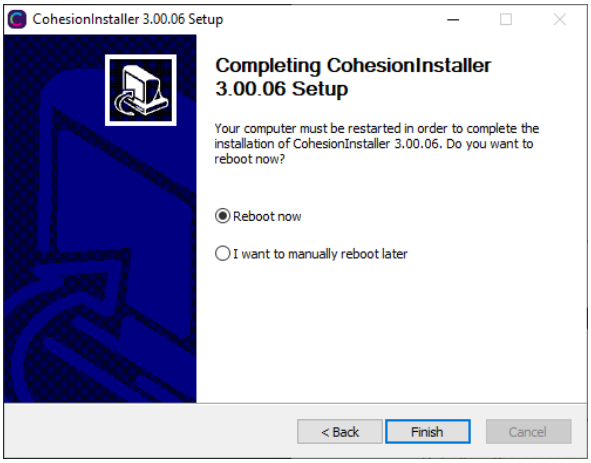
4. Installation will continue with the **Chassis Mode** selection. The default setting is **Single Chassis Mode**. If unsure, proceed with the default mode setting.



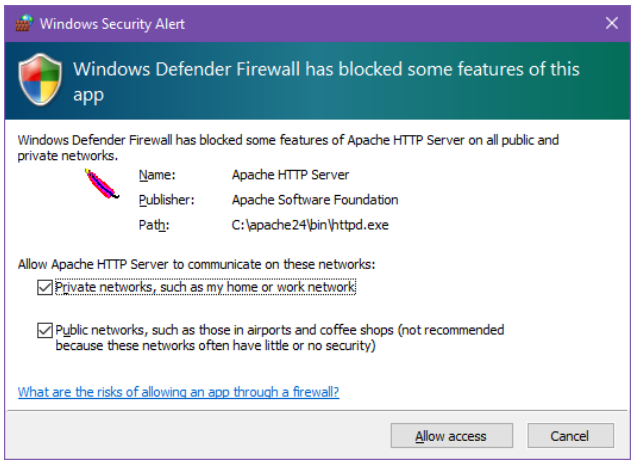
⚠ IMPORTANT

To operate in Multiple Chassis Mode, additional hardware modules are required. The Chassis Mode can be changed at any time, so it is recommended to select **Single Mode** until all other configuration requirements have been met.

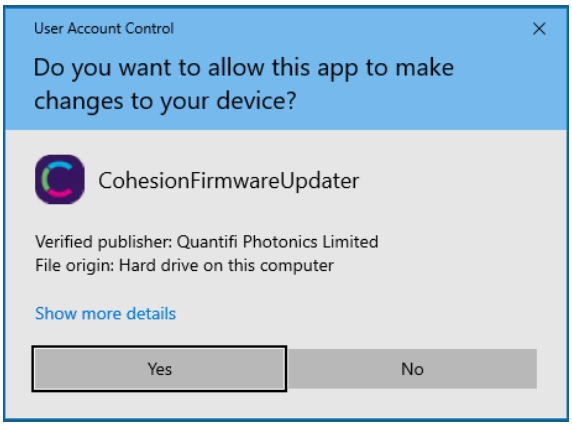
5. At the end of the installation, **it is recommended to select the Reboot now** option, and click **Finish** to complete the installation process.



6. Windows Security Alert may prompt the user for network access. It is **recommended that both options be ticked**, to allow any network configuration.



7. After rebooting the system, on startup a User Account Control prompt will be displayed to run the Cohesion Firmware Updater Utility. Click **Yes** and proceed with the application.



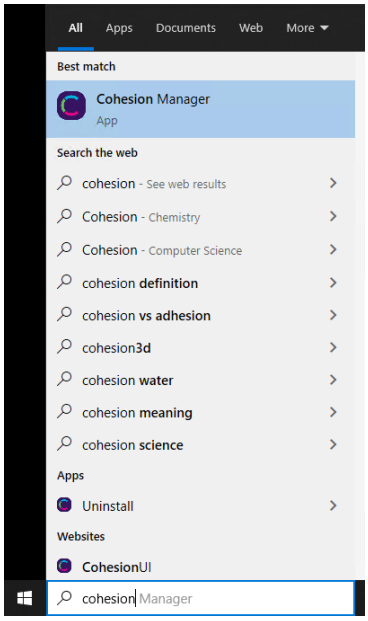
7.2 Quantifi Photonics PXIe system utility applications

Contained within the CohesionInstaller 3.XX.XX are two utility applications:

- Cohesion Manager
- Cohesion Firmware Updater

7.2.1 Cohesion Manager utility

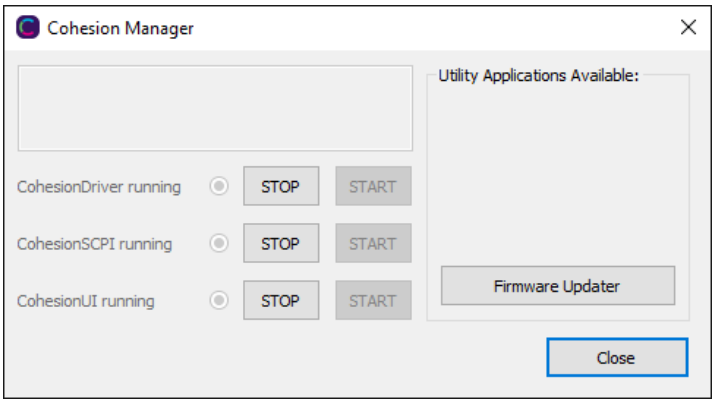
The Cohesion Manager utility serves as a single window application to give the user an overview of the status of all the Cohesion Software Services running on the system.
The Cohesion Manager can be accessed via the Windows Start Menu.



Cohesion Manager is designed as a single reference source to check the status of all the running services in one contained window. The utility also allows the user to start or stop the **CohesionDriver service, CohesionSCPI service**, or **CohesionUI service** independently.

By default, all these Cohesion Software Services will start automatically on startup of the Windows OS and need to be running to facilitate proper communication with the Quantifi Photonics PXIe modules. If there is an issue in detecting or communicating with the modules, run the Cohesion Manager to check the status of the software services.

- **(Required) CohesionDriver** – The CohesionDriver service which directly manages the installed Quantifi Photonics modules.
- **(Required) CohesionSCPI** – The CohesionSCPI service which is the VXI11 compliant SCPI interface for TCP communication with the installed Quantifi Photonics modules.
- **(Optional) CohesionUI** – An optional web service providing a graphical interface for simplified operation of the installed Quantifi Photonics modules.



⚠ IMPORTANT

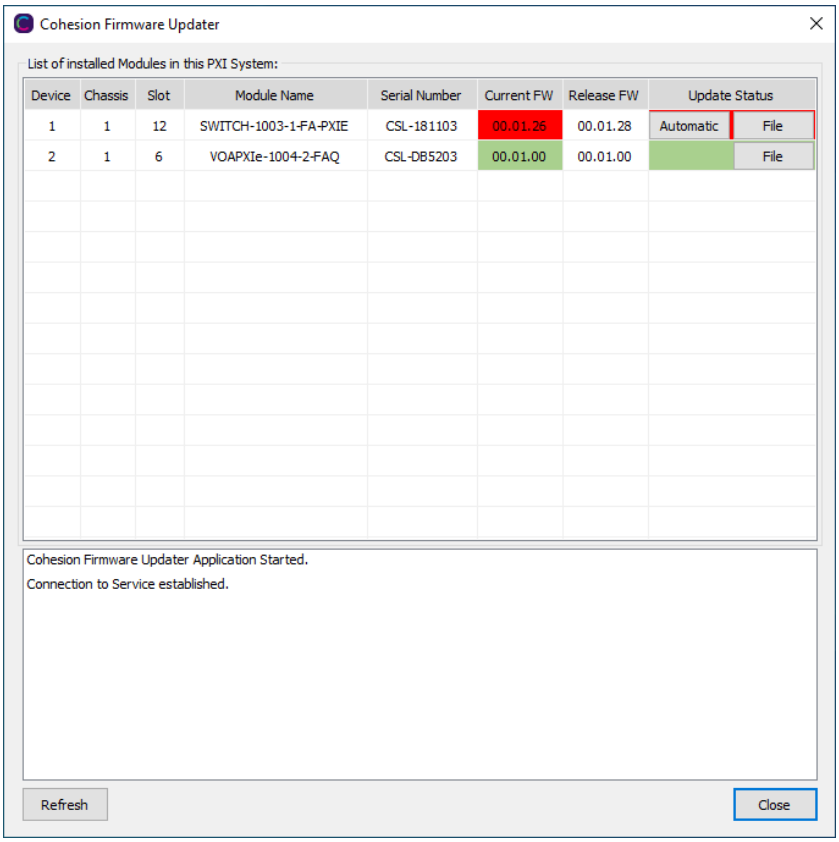
The **Driver and SCPI services** need to be running to facilitate communication with any installed Quantifi Photonics module, **therefore they are listed as REQUIRED**.

On the right side of the Cohesion Manager window a list of all the installed Quantifi Photonics system utilities is displayed.

7.2.2 Cohesion Firmware Updater utility

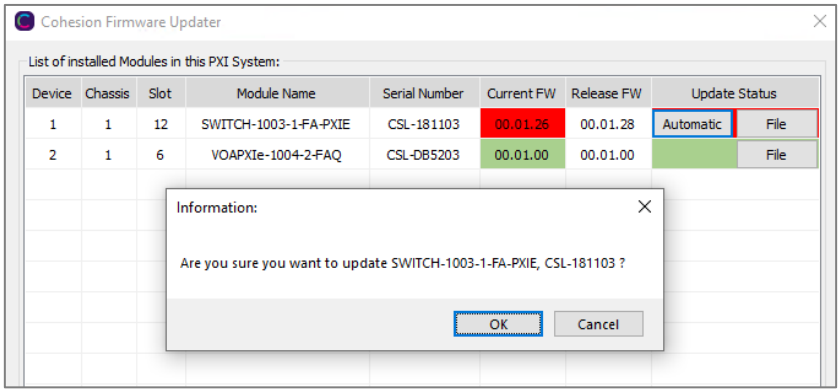
The Cohesion Firmware Updater utility serves as a single window summary application to display the current firmware status of all the Quantifi Photonics PXIe modules installed in the chassis.

The Cohesion Firmware Updater utility can be accessed via the Cohesion Manager application (see Section for more 7.2.1 information).

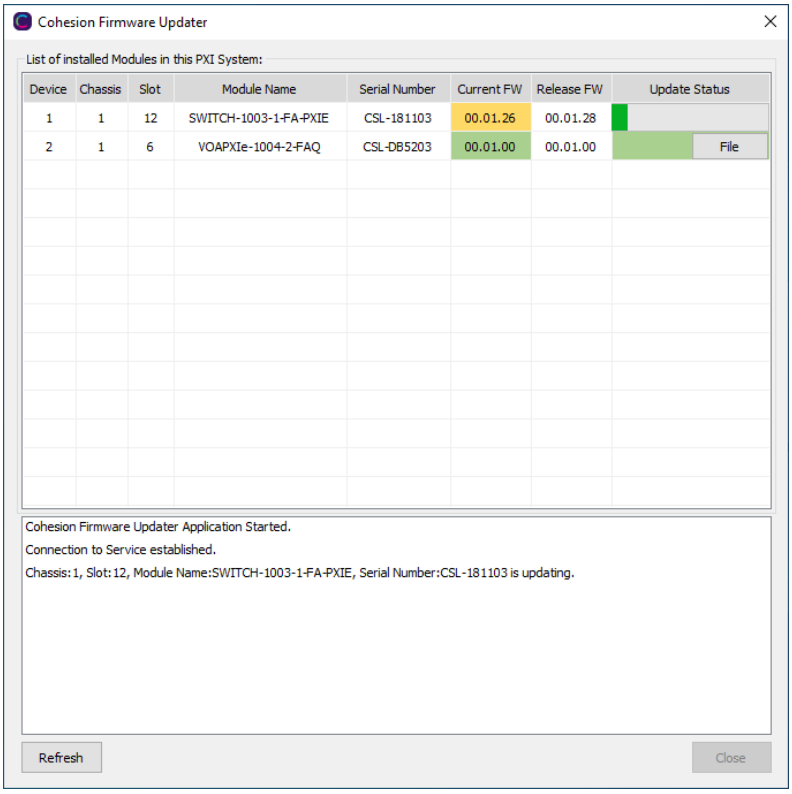


Whenever a new version of the CohesionInstaller is installed on the system, the Cohesion Firmware Updater utility will automatically launch after the system is rebooted. It will show the user the firmware status of all installed Quantifi Photonics modules and allow the user to update the firmware to a new version if applicable.

If a module's firmware is out of date, it is highly recommended to update the firmware to the new available version. Clicking the **Automatic** button will update the module(s) to the latest supported firmware for the installed packages on the system.



After clicking **OK**, the firmware update progress will be shown in the **Update Status** column.
The **File** button is reserved for updating a module to a specific firmware version if required.



7.3 Installing software for MATRIQ instruments

7.3.1 Installing Cohesion Operator on client computer(s)

Set up any computer you use to connect with the instrument by installing the latest Cohesion Operator software package. Cohesion Operator enables you to connect with Quantifi Photonics instruments on your network and manage firmware upgrades.

The 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** > **MATRIQ Series**).

> **⚠ IMPORTANT**
> If **another MATRIQ instrument is already connected** to the client computer **over USB**, consult the **Network and Update settings** section below on configuring the Ethernet / USB IP address for multi instrument control.

To install the software package on a client computer:

- (recommended) Save your work and close all programs.
- If using the USB media device, insert it on the computer.
- Double-click **CohesionOperator-<version>.exe** and follow the prompts.
  The installation wizard will install required drivers, applications, and desktop icons on the computer.

NOTE

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

To open the Cohesion Operator application:

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

From Cohesion Operator you can:

1. Select a Quantifi Photonics instrument that is available on your network.
2. Validate the IP address of the instrument and retrieve instrument information (refer 7.3.2).
3. Communicate with the instrument through the SCPI Command Console (refer 10.8).
4. Access the instrument through CohesionUI, a web-based graphical user interface (refer 8.2).
5. Upgrade instrument firmware (refer 7.3.3).
6. Restore the instrument to factory settings (refer 7.3.4).

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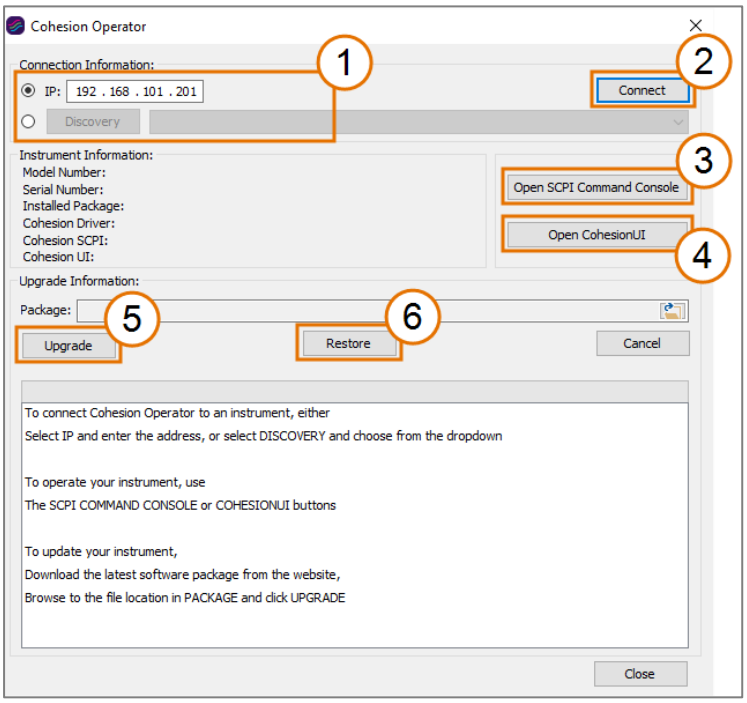
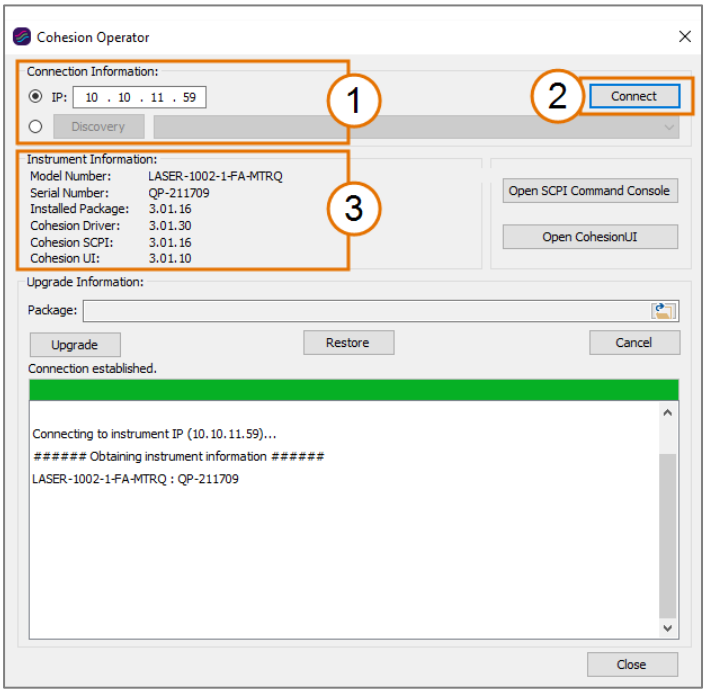


7.3.2 Checking MATRIQ firmware versions and other product information

You can check the details of a MATRIQ instrument, for example by doing one of the following:

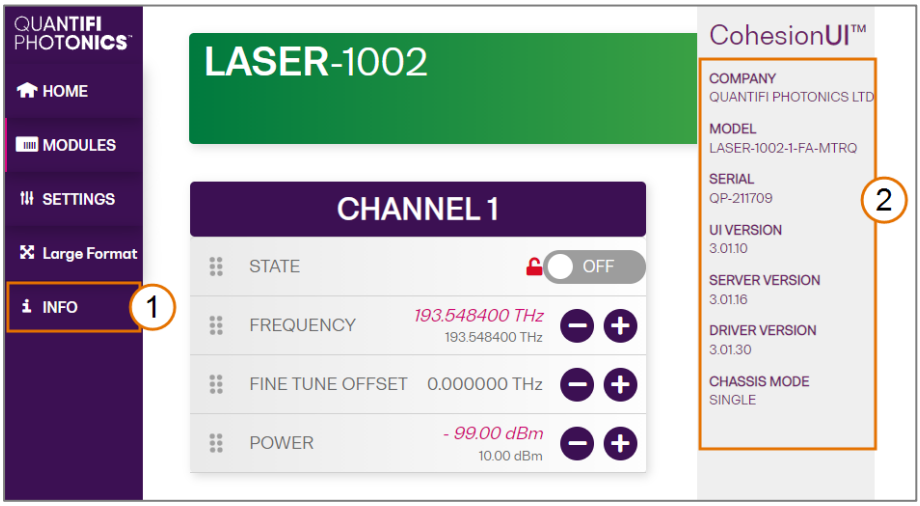
In the Cohesion Operator:

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



In CohesionUI:

1. Select **INFO** on the menu.
2. Instrument information will be displayed in the info panel.



7.3.3 Upgrading a MATRIQ instrument with the latest firmware

NOTE

The Cohesion Operator can upgrade MATRIQ instruments that currently use firmware package version 2.08.24 or greater. To upgrade MATRIQ instruments that use older software packages, refer to the user manual that came with your instrument.

To upgrade a MATRIQ instrument:

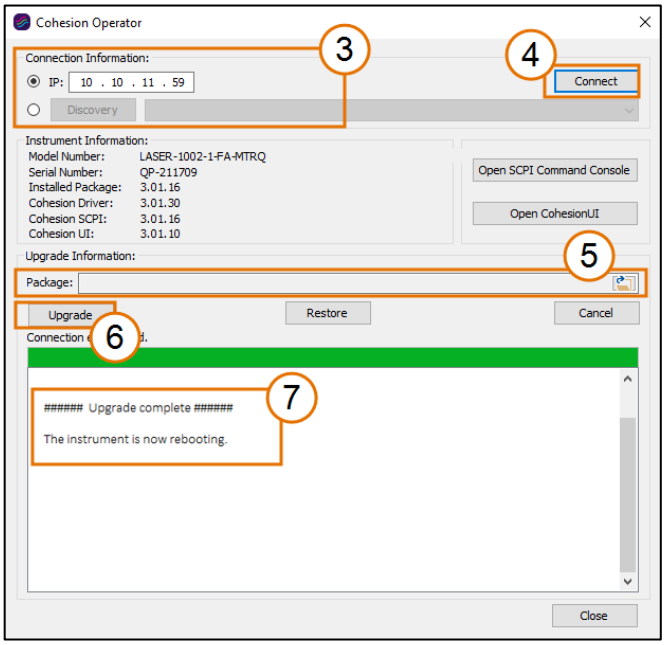
1. Get the latest MATRIQ firmware package **CohesionMTRQ-<version>.tgz**, for example by downloading it from quantifiphotonics.com (go to **Resources > Drivers, software and manuals > MATRIQ Series**), and save it to your network.
2. Open the Cohesion Operator, for example by double-clicking the **Cohesion 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.

NOTE

To confirm the new firmware version, click **Connect** to retrieve the latest instrument information.

NOTE

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



7.3.4 Restoring factory settings on a MATRIQ instrument

NOTE

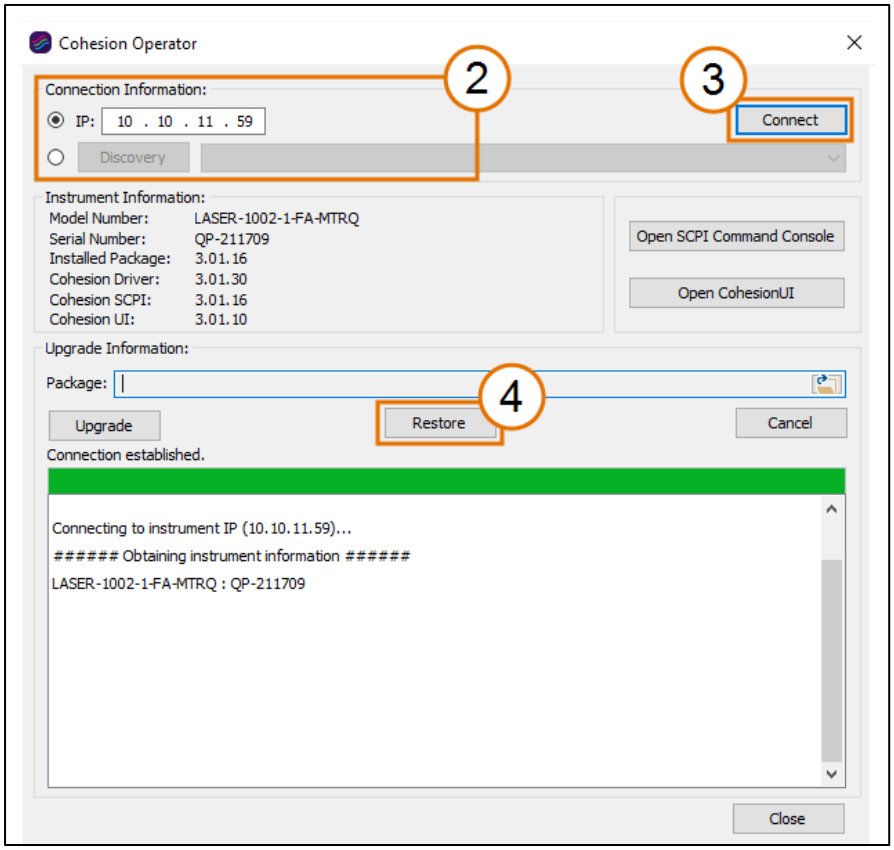
The Cohesion Operator can restore MATRIQ instruments that currently use firmware package version 2.08.24 or greater. To restore MATRIQ instruments that use older software packages, refer to the user manual that came with your instrument.

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. (optional) Retrieve instrument information, including current firmware versions, by clicking **Connect**.
4. Click **Restore**.

NOTE

IP address settings will also revert to factory settings.



8 CohesionUI

CohesionUI is a web-based application that you can use to control any O2E product from Quantifi Photonics. Its cutting-edge design offers a sleek modern interface, cross-device compatibility, multi-instrument control, customizable views, and remote access.

8.1 Accessing CohesionUI for PXIe modules

To use CohesionUI, you need the IP address of the host chassis, with which you can access the chassis either locally or remotely. For local access, use the embedded PXIe controller operating system, and for remote access, use any compatible device that is connected to the PXIe chassis via an ethernet connection.

To obtain the IP address, open the **Command Prompt** window on the chassis controller and then run the `ipconfig` command. Note down the IPv4 address that is displayed. For the local IP address, you can use `127.0.0.1` instead.

To access CohesionUI locally or remotely, open a compatible browser (Google Chrome or Microsoft Edge) and use the IP address `127.0.0.1` as the URL. Alternatively, you can double-click the desktop icon for CohesionUI or select it from the **Start** menu.

8.2 Accessing CohesionUI for MATRIQ instruments

You can open CohesionUI:

- from the Cohesion Operator application, or
- from your browser.

NOTE

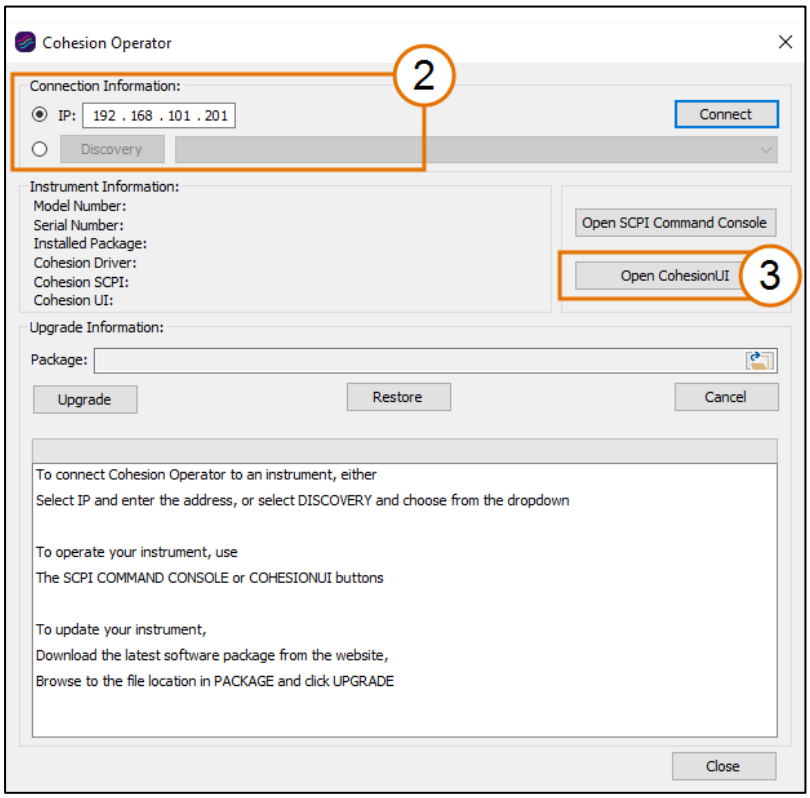
The IP address of the MATRIQ instrument is displayed on the LCD screen on the back of the instrument. When the instrument is connected via both, Ethernet and USB cables, the displayed IP address will alternate between the USB and Ethernet IP address.

NOTE

If required, the IP address can be statically assigned to the Ethernet or USB connection.

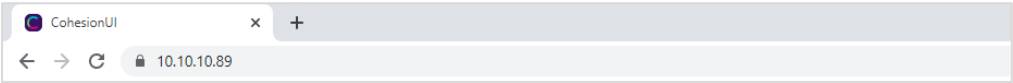
To open CohesionUI from Cohesion Operator:

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 drop down list.
3. Click Open CohesionUI.



To open CohesionUI from a browser:

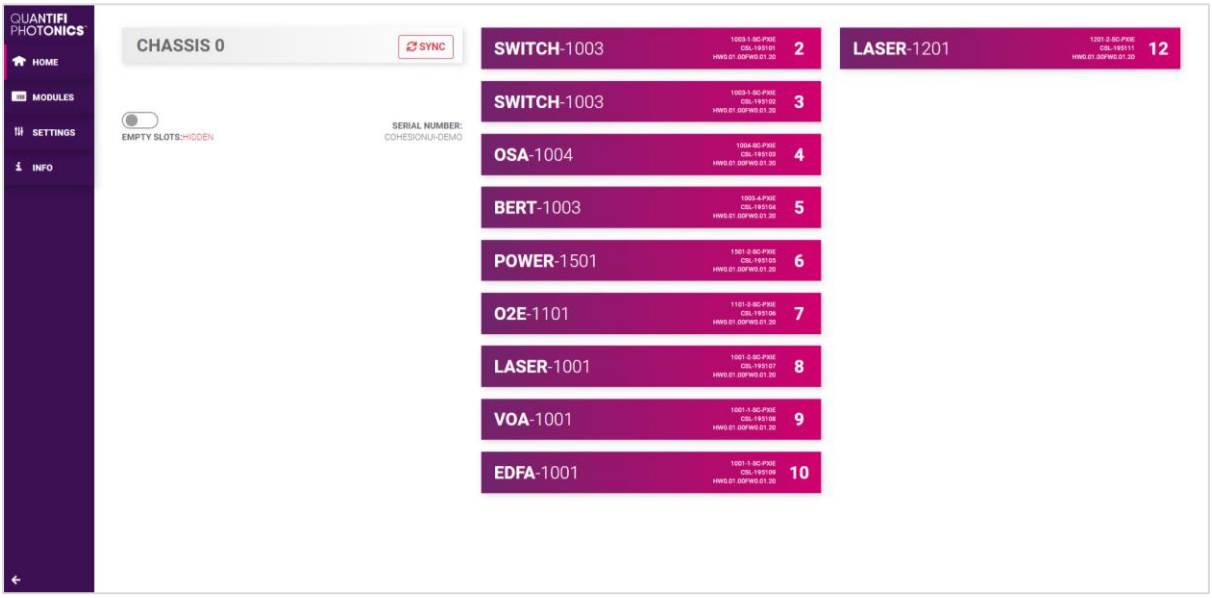
1. Launch Google Chrome or Microsoft Edge on a client computer.
2. Type in the MATRIQ instrument IP address into the address bar of the browser, e.g. **10.10.10.89**.

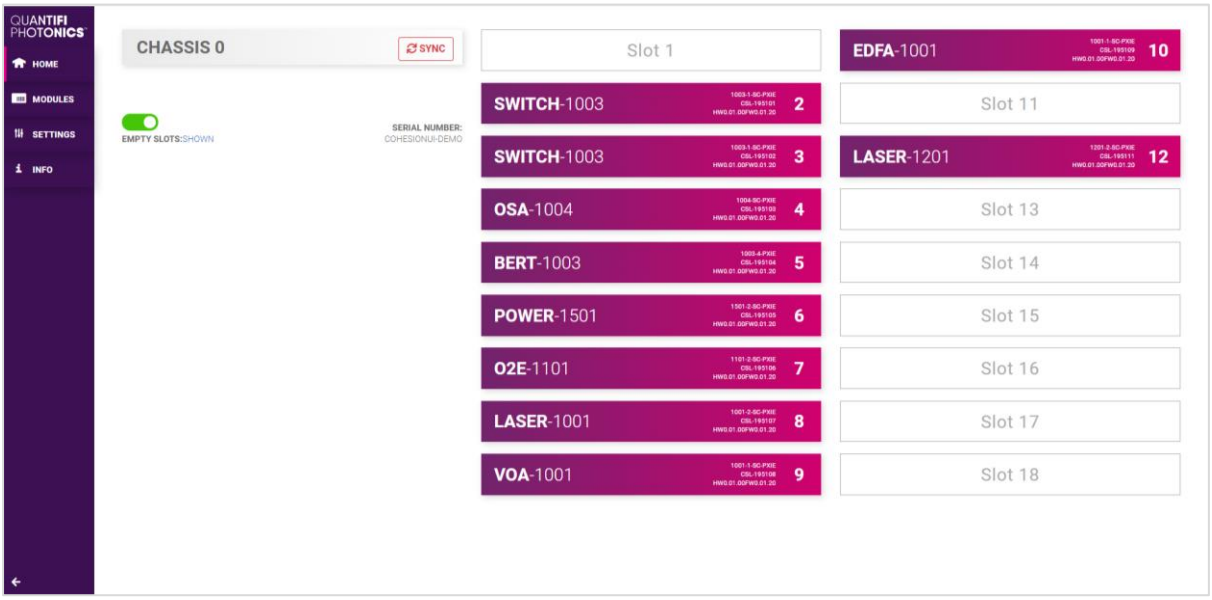


8.3 Home page

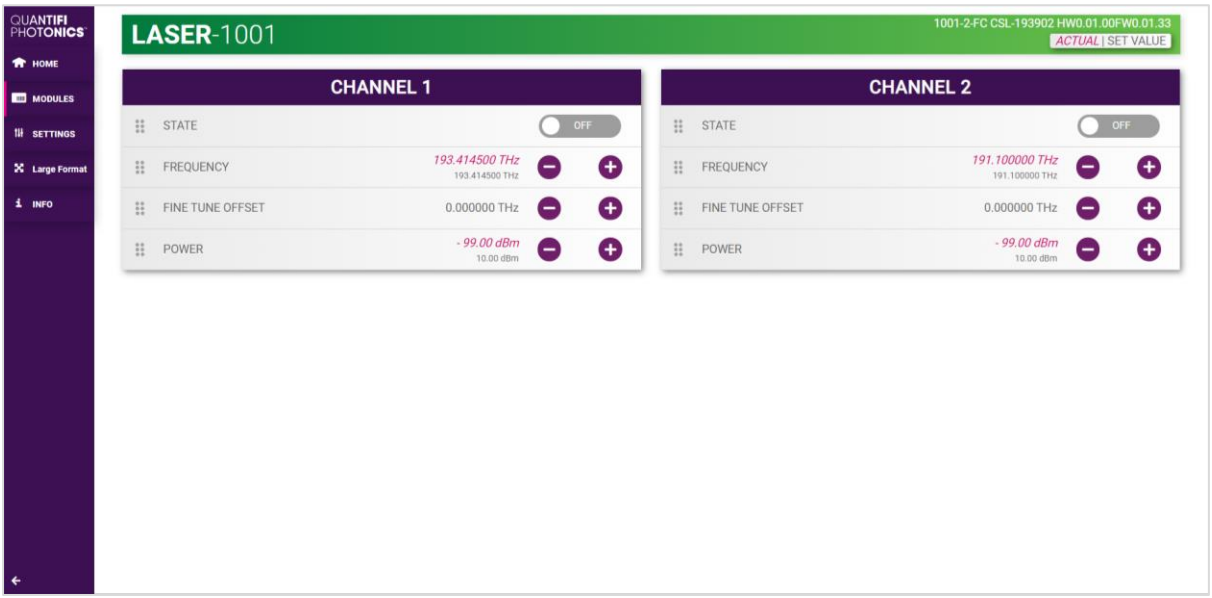
The main landing page in CohesionUI is called the **HOME** page. It displays a graphical representation of the module arrangement in the PXIe chassis or the MATRIQ instrument channels.

For PXIe modules, white numbers are displayed beside each module corresponding the slot in which they are installed. The **EMPTY SLOTS** button will toggle the page view to hide (HIDDEN), or to show (SHOWN) the empty slots in the PXIe chassis. The default setting is HIDDEN.



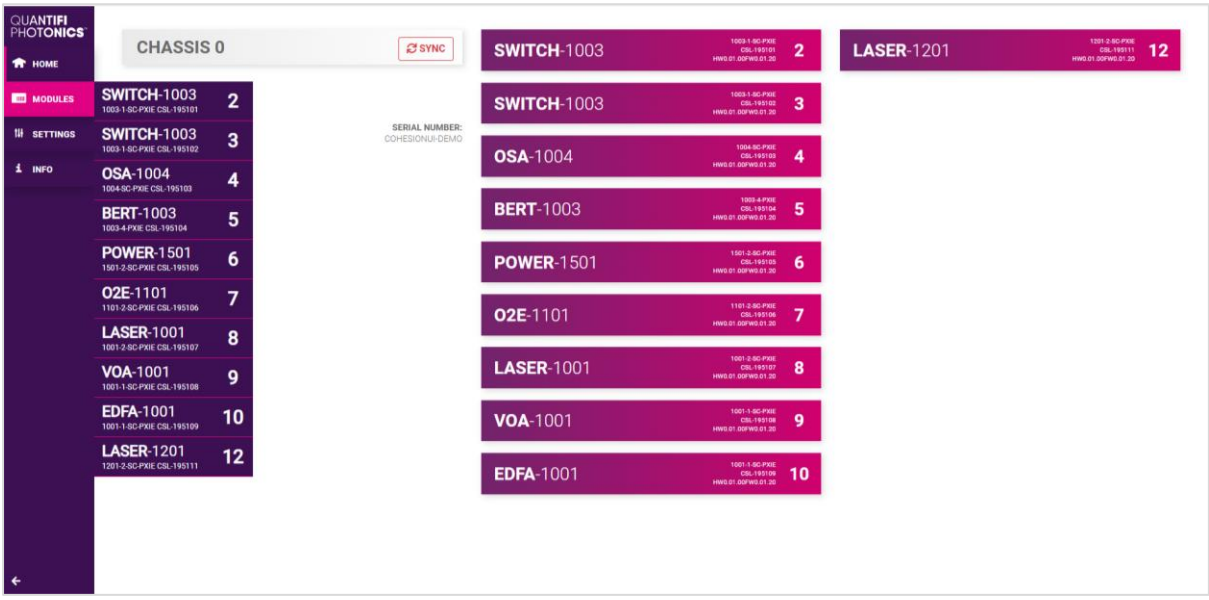


For MATRIQ instruments, all the information relating to the instrument such as the model number, serial number and firmware versions are displayed in the top right corner of the window.



8.4 Modules list

All the installed modules are displayed on the HOME page. To access the controls for a module, click the corresponding module name, or hover over the MODULES button and select a module from the displayed list. Controls for a specific module, or a channel in a module are then displayed.



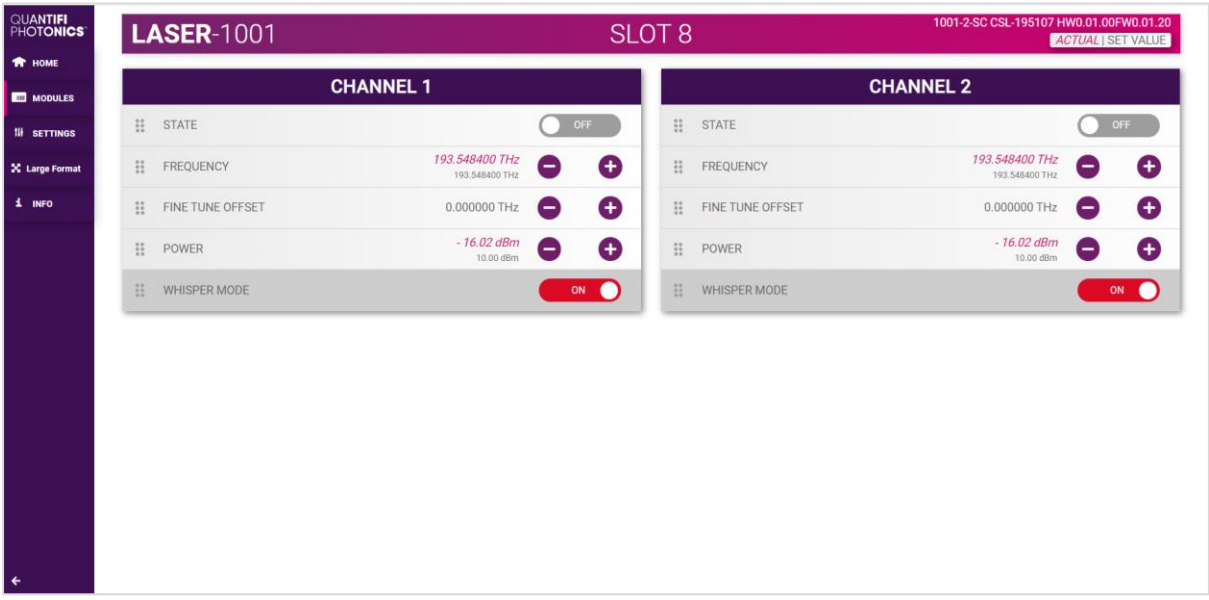
8.4.1 Set and Actual values

Some Quantifi Photonics products will allow the user to set a given parameter's value and then read that parameter (eg. Laser, VOA, O2E, etc). In order to help the user to distinguish between a set value and an actual read value, CohesionUI will format these values differently according to the legend in the top right corner of the window.

- *ACTUAL*: the actual value of the parameter, defined by querying the module
- SET: the intended value of a given parameter, defined by user input

In the following example, the POWER is SET to 10.00 dBm, but the *ACTUAL* value is *-16.02 dBm*. Thus, the user can see both the current and user defined value of a given parameter.

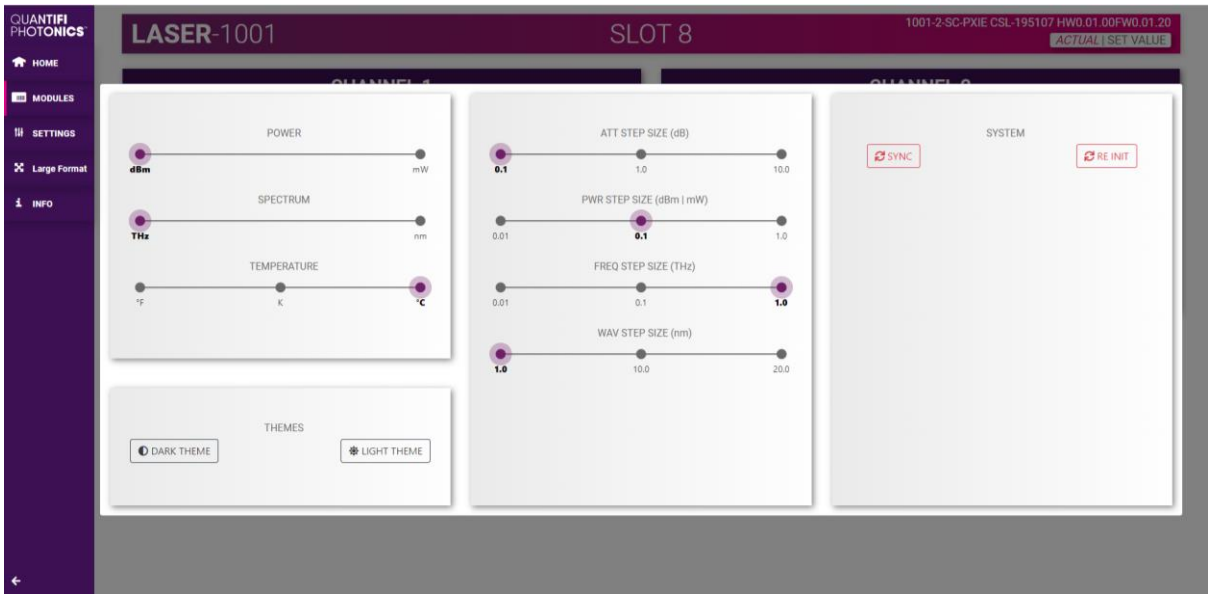
The SET and *ACTUAL* values are only displayed for appropriate parameters which require user input. For parameters that report a value and do not depend on user input, only an *ACTUAL* value is displayed.

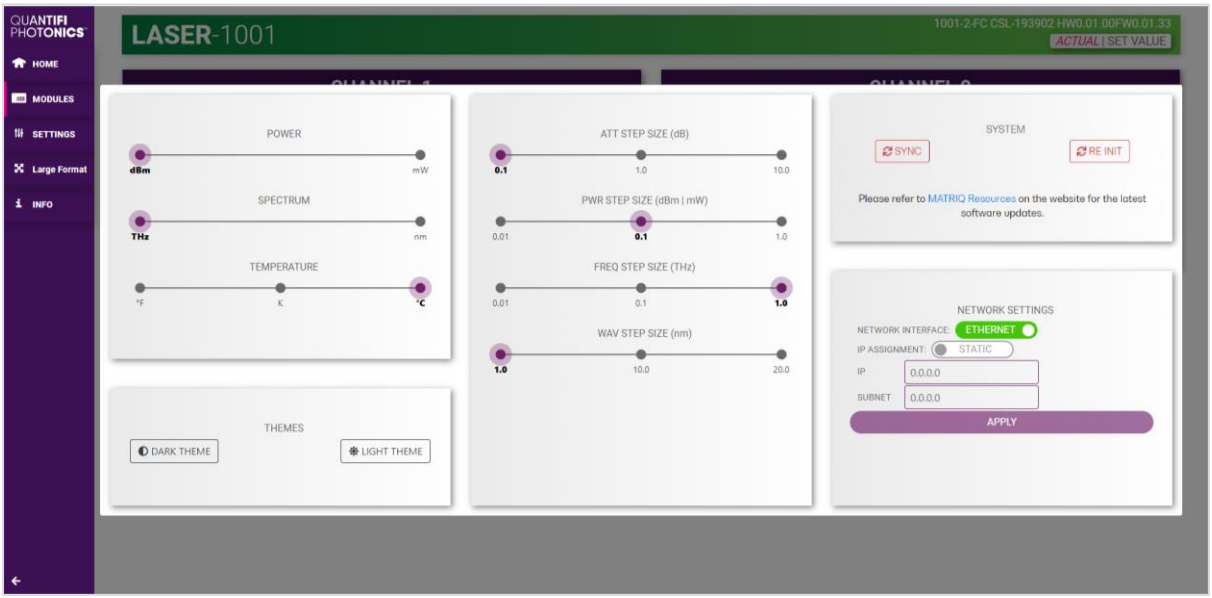


8.5 Settings page

The **SETTINGS** page is used to configure the CohesionUI settings and unit preferences or to synchronize / reinitialize the system. These controls can be accessed by clicking the **SETTINGS** button.

Step size refers to the amount by which the attenuation, frequency, or power increases / decreases when the **+** or **-** button is clicked.





NOTE

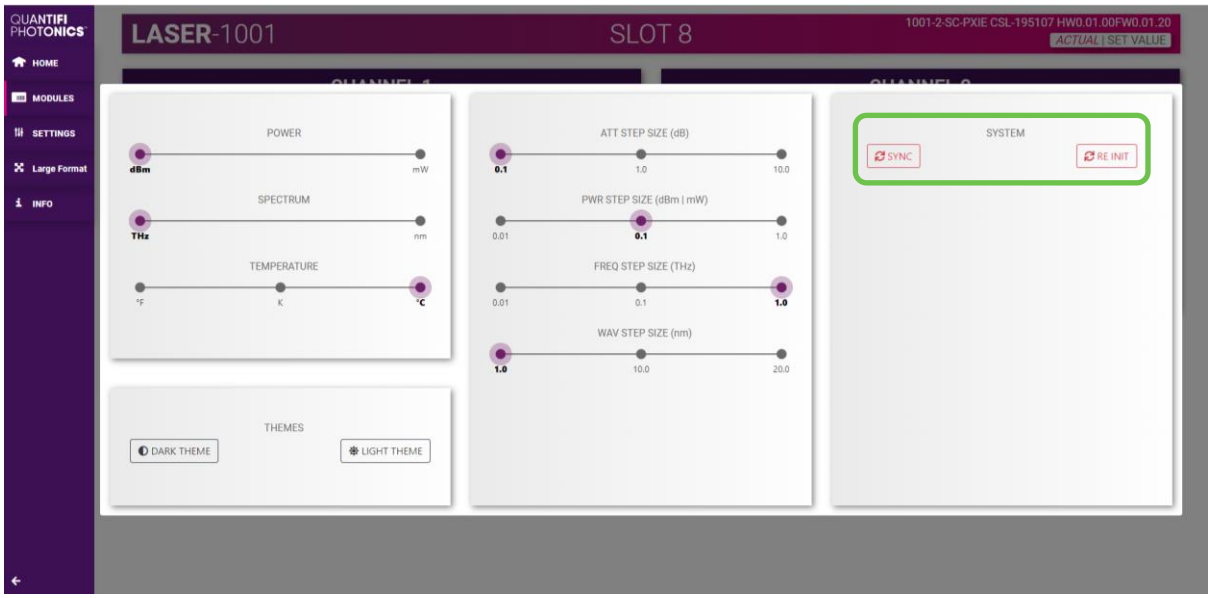
- The unit preferences and settings can be set by hovering over the **SETTINGS** button in the left side menu. This will bring up a dropdown menu that lists all settings for a quick access.
- Whenever the chassis is power cycled, CohesionUI reverts to default settings.

8.5.1 System controls for PXIe modules

On the SETTINGS window there is a SYSTEM controls section. These controls are to facilitate re-discovery of any Quantifi Photonics PXIe modules there may have been installed after initial startup, or if no modules are displayed in the CohesionUI window. This is useful for users who are operating in a multi-chassis MXI setup, instead of the standard PXIe embedded controller setup.
There are two actions in the SYSTEM controls section:

- SYNC: Synchronize CohesionUI with the latest information from the CohesionSCPI service.
- RE-INIT: Re-initialize CohesionUI by synchronizing the CohesionSCPI service with the CohesionDriver service.

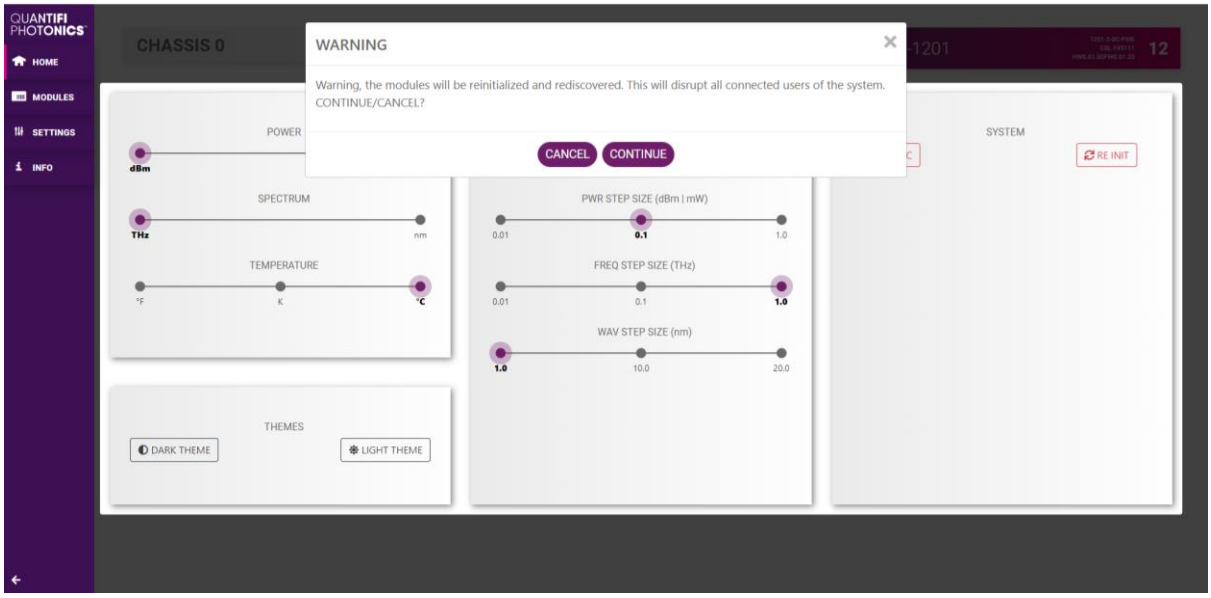
The SYNC button is also displayed on the HOME page beside every chassis in the setup. This allows any chassis to be synchronized independently. After clicking the SYNC button, CohesionUI will disable the page while it is synchronizing with the CohesionSCPI service. Once it is complete, the page will be functional again.



Clicking the RE-INIT button will bring up a prompt to continue, since this action will temporarily disconnect all modules while the re-initialization with the CohesionDriver service is in progress. Once it is complete, the page will be functional again.

NOTE

The RE-INIT action will disconnect any connected users to the PXIe system while the action is being completed. All modules will be disabled during this time.



8.5.2 Network and Update settings controls for MATRIQ instruments

The network configuration control panel enables the user to set the preferred communication interface (Ethernet or USB).

NOTE

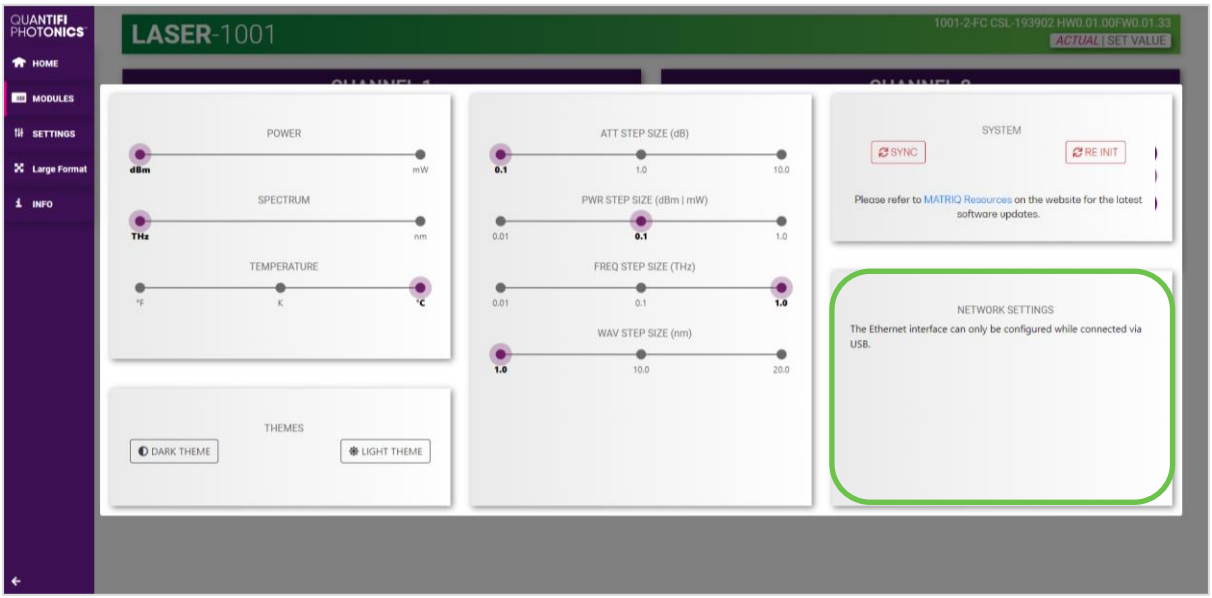
The Network interface controls are only available when connected over **USB.**

8.5.3 Configuring the Network Interface settings for MATRIQ instruments

The MATRIQ instruments can operate over either an Ethernet or USB connection. To communicate with the instrument, the IP address is required.

NOTE

The Network interface controls are **only available when connected over USB**. When connected over Ethernet the settings will be locked, as highlighted as follows.



8.5.4 Setting the USB IP address for MATRIQ instruments

When connected via USB, the default IP address is **192.168.101.201**. This is a static address set during instrument calibration. If necessary, this address can be changed. Typing the default IP address in a supported web browser will open the CohesionUI page for the instrument. The Network Interface configuration controls are available in the **SETTINGS** page.

The **value in the 3rd octet of the IP address can be changed** to any available value. It is important to make sure that any other instruments connected to the computer do not share this new IP address, as there will be an addressing conflict.

Clicking **APPLY** will write the new IP address to the instrument settings. Once set, the new IP address will be displayed on the LCD screen on the back of the instrument.

8.5.5 Setting the Ethernet IP address for MATRIQ instruments

The default Ethernet IP addressing method is dynamic, as the DHCP will automatically assign the instrument an IP address. This address can be found on the back of the instrument on the LCD screen.

While connected over USB, typing in the assigned IP address in a supported web browser will open the CohesionUI page for the instrument.

The addressing method can be changed to a static method, where the MATRIQ instrument will always have the same IP address over Ethernet. Typing in a **valid IP address and Subnet mask**, and then clicking **APPLY** will save the IP address into the settings of the instrument.

To test if the IP addressing has worked, power **OFF** the instrument, and disconnect the USB cable. Turn the unit back **ON**, and once it has finished booting, check the IP address shown on the LCD screen.

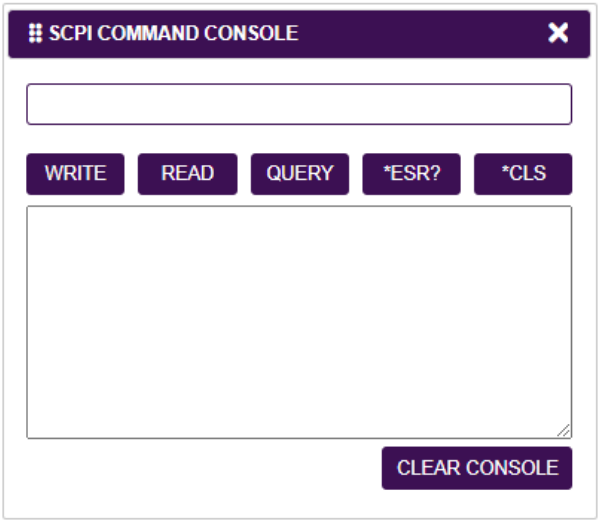
8.6 SCPI Command Console (available on PXIe modules)

The CohesionUI SCPI Command Console enables you to communicate with Quantifi Photonics PXI modules via SCPI commands. It enables you to test commands and verify their syntax.

For details on available SCPI commands, refer 10.

To open the SCPI Command Console:

- On the CohesionUI menu, click **CONSOLE**.
  The console will appear in the bottom right corner.

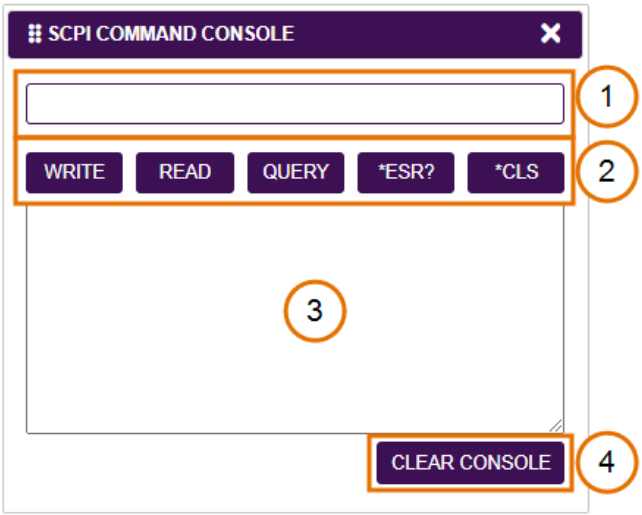


You can move the console by clicking on the title bar and dragging it to any position on the screen. On closing and re-opening, the console will re-appear at its last position.

The console remains open when navigating between different modules. It floats on top of the UI so that you can observe the effect of SCPI commands on a module in real-time.

To communicate with a module via the SCPI Command Console:

1. Enter a command.
2. Select action(s).
3. Review the action response in the output area.
4. (optional) Clear the output area.



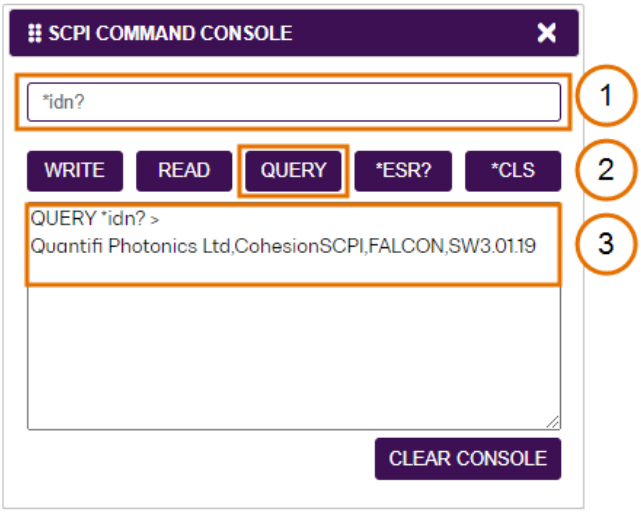
You can choose from these SCPI command actions:

Action	Meaning	FAILED response
WRITE	Send the command to the instrument	The command is invalid. Please check the command and syntax.
READ	(after WRITE) Request the response from the instrument	Response buffer is empty.
QUERY	WRITE and READ	
*ESR?	Query the status event status register (ESR) – this will give you more details and specific information about command failures. For details on error codes, please refer to 10.	
*CLS	Clear the response buffer and start fresh – useful when getting out of sync with WRITE and READ actions	

Example 1: Send instrument identification query `*idn?`

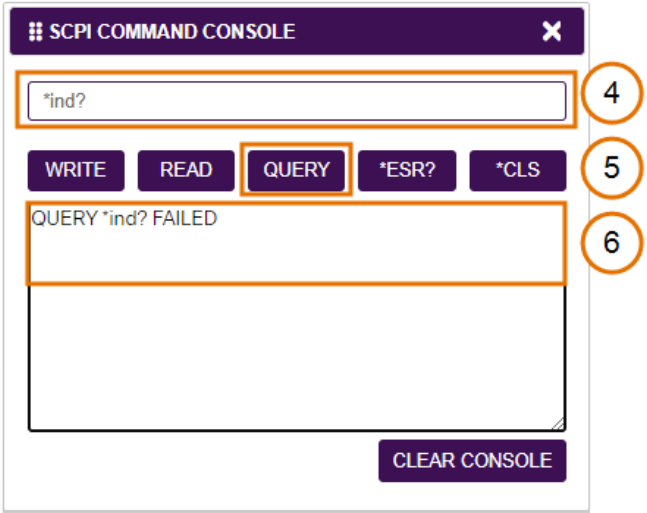
1. Enter the command: `*idn?`
2. Click **QUERY.**

3. The module returns the requested information.



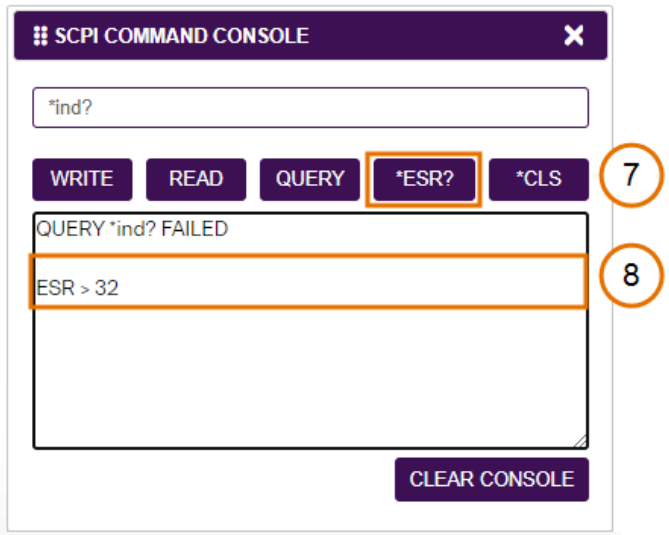
Example 2: What happens when you send an incorrect command?

4. Enter an incorrect command, for example: **`*ind?`**
5. Click **QUERY**.
6. The module returns FAILED.



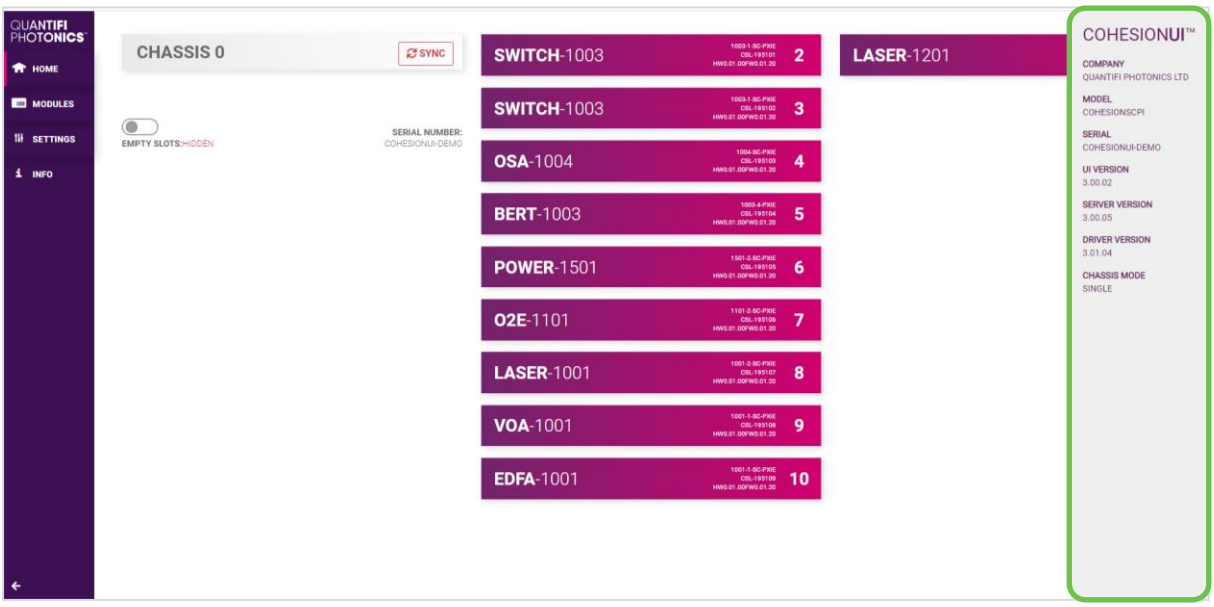
Example 3: Investigate a command failure

7. Click ***ESR?** to query the event status register and request information about the command failure.
8. The instrument returns the error code, for example 32.
   For details on error codes, please refer to the `*ESR?` command.



8.7 Info panel

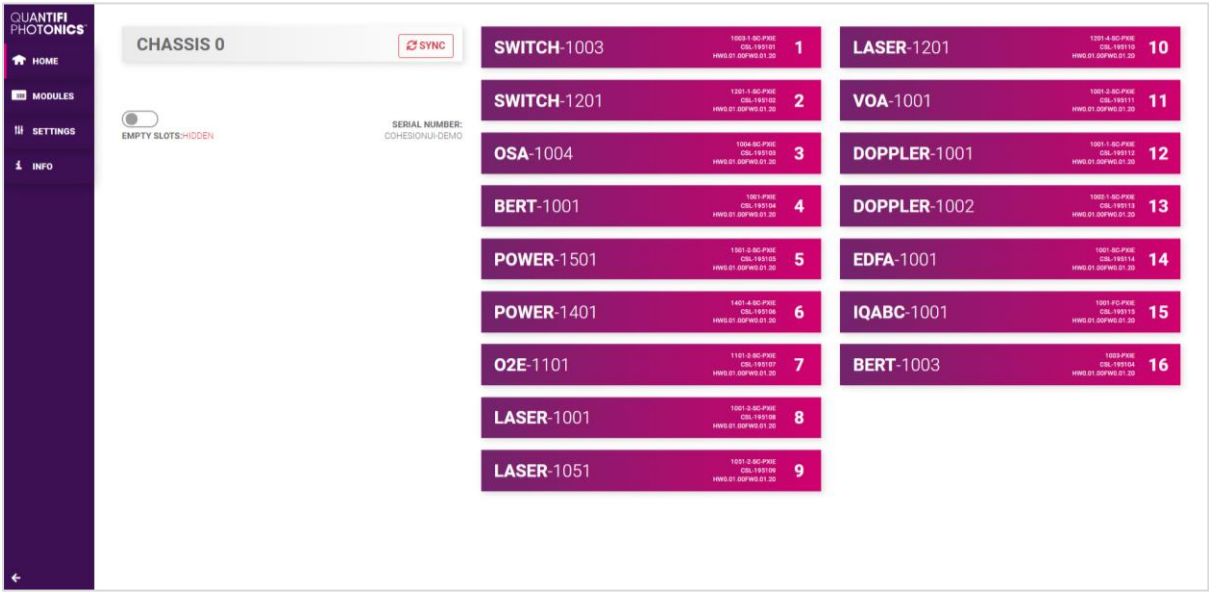
Clicking the **INFO** button will display an information panel on the right side of the page. Information such as the chassis operation mode, manufacturer, model, and serial number of the chassis, CohesionUI version number, and the version of CohesionSCPI service running on the chassis is displayed in this panel.



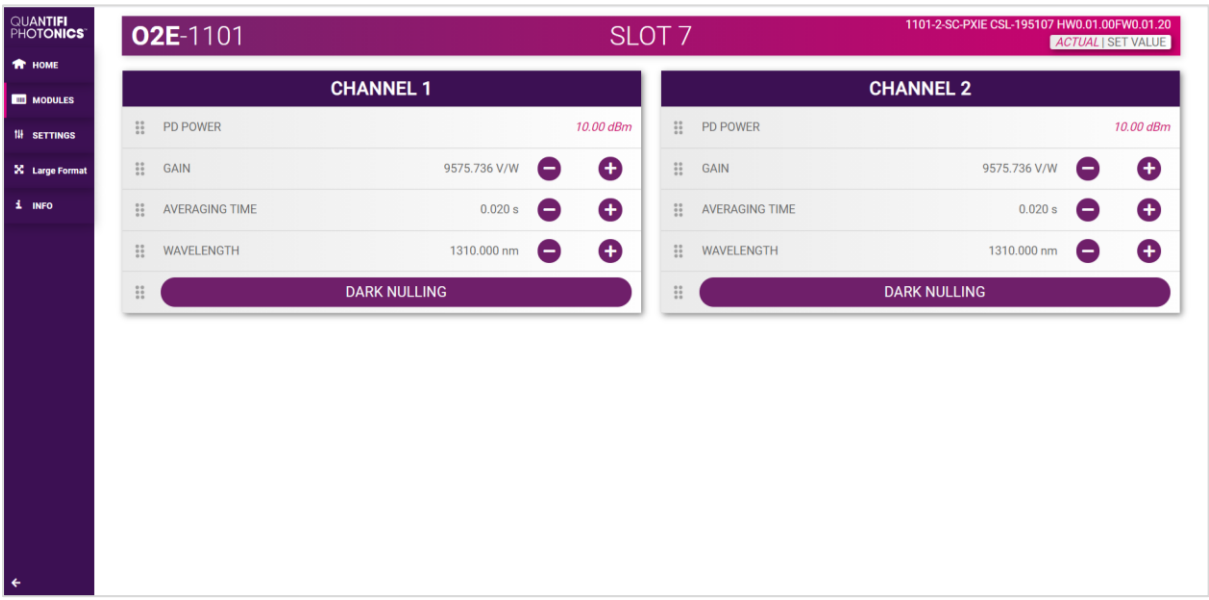
9 O2E control with CohesionUI

To control the O2E PXIe module through CohesionUI, click the desired module installed in the chassis or the desired channel. Alternatively, hovering over the **MODULES** menu button on the left will bring up a dropdown menu that the O2E module can also be selected from.

To control the O2E MATRIQ instrument, click **HOME** to display controls for all channels.



After clicking the desired O2E module, its control page is displayed. All information relating to the module such as model number, serial number and firmware versions are displayed in the top right corner of the window.



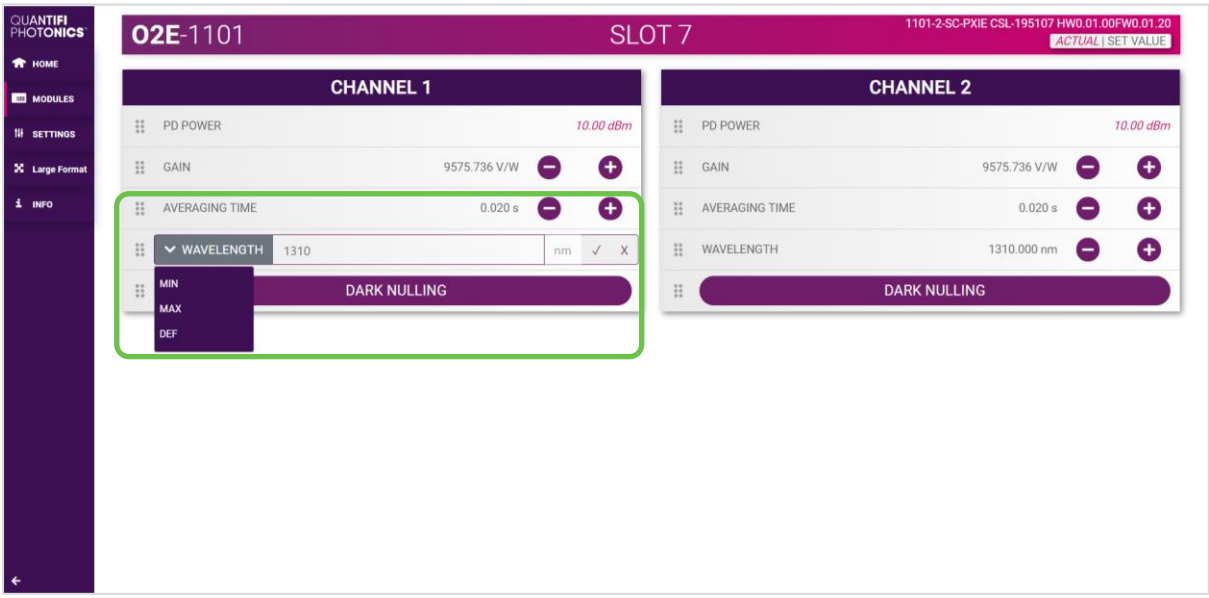
9.1 Setting channel parameter values

Specific control parameters for a given channel in the O2E product can be set by clicking the parameter button, or by using the + and – control buttons to increase or decrease the value field by a set amount. This step size is set in the SETTINGS menu.

This applies to the following parameters:

- GAIN: For O2E 1101 products, the gain level can be set in Volts per Watt. For all other products, this field displays the gain value which is fixed and calibrated at the factory.
- AVERAGING TIME: The amount of time that optical power is logged before averaging for an average power measurement.
- WAVELENGTH: Used so that the conversion gain of the O2E PXIe is appropriate for the given input optical wavelength.

Alternatively, the parameter can also be set to the MIN and MAX value by clicking the dropdown in the name of the parameter.



In the above example, the WAVELENGTH for CHANNEL 1 has been set to 1310 nm by manual input. Alternatively clicking the MIN button in the dropdown menu will set the wavelength to the minimum value. To apply the changes, click the tick mark.

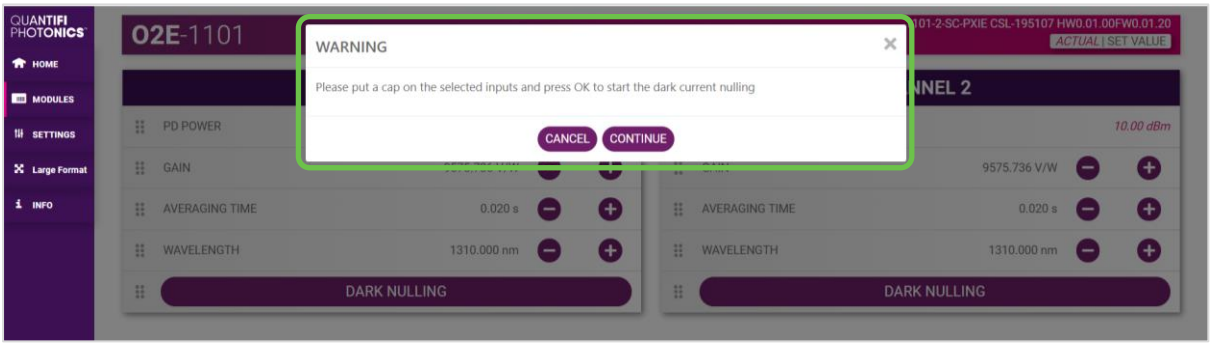
The measured optical power is shown as 10 dBm. This value corresponds to the converted optical power at the set WAVELENGTH and AVERAGING TIME, with the appropriate conversion gain applied.

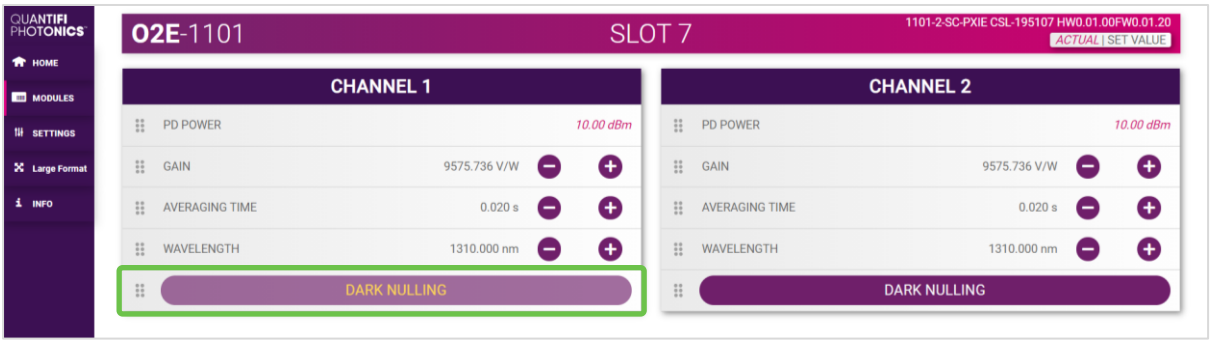
> ⚠ **IMPORTANT**
>
> The tick mark MUST be clicked in order for any changes or values that were entered to be applied successfully.

9.2 Dark current nulling

In order to get a good conversion from an optical to electrical signal, the noise of the channel must be accounted for. Users can achieve this by performing Dark Current Nulling, where the optical port is covered with a dust cap, and the noise current is measured. This value is then subtracted accordingly from any input signal, to remove the effects of the noise.

Clicking the **DARK NULLING** button will bring up a prompt to continue and instruct the user to cover the optical port of the channel with a dust cap. Clicking **CONTINUE** will proceed with the nulling, and once it is completed the DARK NULLING button will light up with a yellow border for a few seconds.

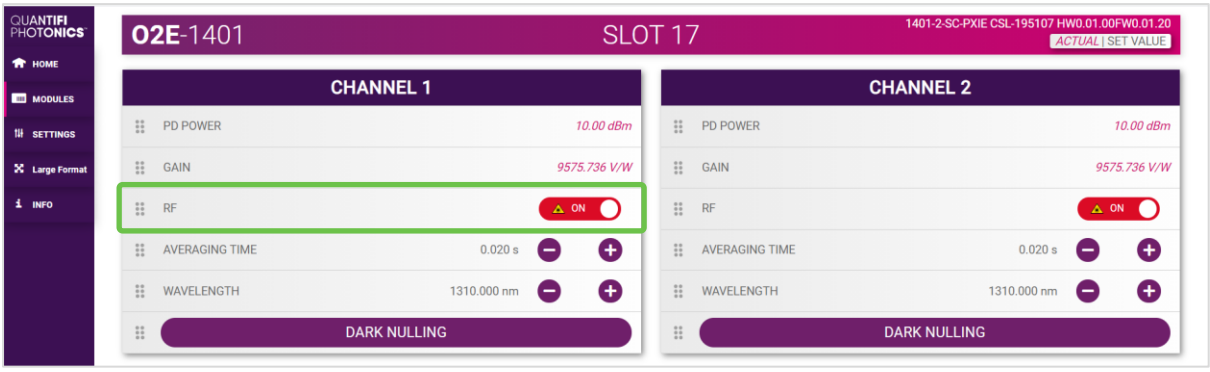




9.3 Toggling the RF amplifier on / off

On selected O2E products (14XX and 19XX) there is an onboard RF Amplifier, which can be turned **ON / OFF** using the RF control buttons.

When the RF Amplifier is ON, the button will be colored red, and when OFF it will be grey. The default state is OFF.



⚠ IMPORTANT

When the RF is toggled OFF, the RF output will be disabled. This function is only applicable with products that have an RF amplifier (14XX and 19XX).

10 Programming guide

Introduction

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 guide provides general information on the commands available to communicate with the CohesionSCPI service remotely using the VISA I/O.

On PXIe modules you can use the SCPI Command Console in CohesionUI (refer 8.6).

On MATRIQ instruments you can use the SCPI Command Console that you can access from the Cohesion Operator (refer 10.8).

> ⚠ **IMPORTANT**
> 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
Frequency	HZ	THZ, GHZ, MHZ, KHZ
Frequency Fine	HZ	THZ, GHZ, MHZ, KHZ
Wavelength	NM	NM, PM

Argument	Data Format
`<wsp>`	Specifies whitespace character (01_{16} – 09_{16}, $0B_{16}$ – 20_{16}).
`<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.

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

When executing commands, it is almost always necessary to provide the index of a specific O2E module or an index of a specific installed unit.

For the commands that require index values:

- <c>: is the chassis index in which the specific blade module is installed; this is an integer, inclusive of 0.
- <n>: is the slot (or source) index of the specific blade module, this is an integer, <1 to 18>
- <m>: is the channel index of a specific unit in the module, this is an integer, <1 to 4>.

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 explicitly specified otherwise in the command description, all output response data is transmitted in ASCII format.

10.2 Common system command summary

Common Commands	Description
`*CLS`	-Clear Status command
`*IDN?`	-Query the chassis identification
`*OPC?`	-Query the Operation Complete Status
`*OPT?`	-Query the modules managed by the CohesionSCPI service
`*ESR?`	-Query the Standard Event Status Register

10.3 Common system command descriptions

Command	`*CLS`
Syntax	`*CLS`
Description	Clear Status command
Parameters	No parameters
Response	No response
Example	`*CLS`

Command	`*ESR?`
Syntax	`*ESR?`
Description	Query the Standard Event Status Register
Parameters	No parameters
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) — Not used — 0
Example	`*ESR? -> 8` `*ESR? -> 32`

⚠ IMPORTANT

It is recommended to use the `*ESR?` command 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	`*IDN?`
Syntax	`*IDN?`
Description	Query the chassis identification
Parameters	No parameters
Response	Comma separated string with the `<manufacturer>,<server name>,<chassis controller name>,<server version>`
Example	`*IDN? -> Quantifi Photonics, CohesionSCPI service,PXIE-8133,FW2.0.15`
Command	`*OPC?`
Syntax	`*OPC?`
Description	Query the Operation Complete Status
Parameters	No parameters
Response	`1` is returned if all the modules installed in the chassis are ready to execute commands `0` is returned if any module installed in the chassis still has a command to execute in the input queue
Example	`*OPC? -> 1`

Command	`*OPT?`
Syntax	`*OPT?`
Description	Query the modules managed by the CohesionSCPI service
Parameters	No parameters
Response	Response will be a comma separated string of the installed modules in the chassis
Example	`*OPT? -> ,SwitchPXIe-1002-2-FA,SwitchPXIe-1003-1-FC,,VOAPXIe-1001-2-FA,,,,O2EPXIe-1001-1-FC,,,,,,,,,`

10.4 Specific command summary

Slot commands	Description
`:SLOT<n>`	
`:OPC?`	-Query the status of the Operation Complete bit
`:OPTions?`	-Query the modules installed on the slot
`:IDN?`	-Query the Identifier for the slot; returns the manufacturer, part number, serial number, hardware, and firmware versions
`:TRIGger<n>`	
`:DELay/?`	-Set or query the Trigger Delay
`:MODE/?`	-Set or query the Trigger Line event mode
`:SOURce/?`	-Set or query the Trigger Line(s) used for events
`:ARM/?`	-Set or query the Trigger ARMed state ready for an event
Configuration commands	Description

Slot commands	Description
:INPut<n>	
:CHANnel<m>	
:PDPower?	-Query the input optical power
:NULLing	-Perform dark current nulling
:TIMEnulling?	-Query the dark nulling time remained to complete
:AVERagingtime/?	-Set or query the power averaging time
:WAVelength/?	-Set or query the input optical wavelength configuration
:CALibration?	-Query the S21 response calibration values
:RF/?	-Query or set the RF output
:TRACE	
: CoMPlete?	-Query the status of the Trace Complete bit
:PoinTS?	-Set or query the number of trace buffer data elements
:RATE?	-Set or query the trace buffer sampling rate
:TRIGger	-Set the trace trigger mode
:TRACE<m>?	-Query the trace buffer
:OUTput<n>	
:CHANnel<m>	
:GAIN?	-Query the values for the conversion gain

10.5 Specific command descriptions

10.5.1 Slot commands

Command	:SLOT<n>:OPC?
Syntax	:SLOT<n>:OPC?
Description	Query the status of the Operation Complete bit
Parameters	No parameters
Response	1 is returned if the module is ready to execute a new operation 0 is returned if the module is busy
Example	:SLOT2:OPC? -> 1

Command	:SLOT<n>:OPTions?
Syntax	:SLOT<n>:OPTions?
Description	Query the modules installed on the slot
Parameters	No parameters
Response	The response will be a comma separated string of detectors installed in the O2E PXIe. If a module is not installed in a channel, it will not return any identification string
Example	:SLOT2:OPT? -> 1,1,,

Command	:SLOT<n>:IDN?
Syntax	:SLOT<n>:IDN?
Description	Query the Identifier for the slot; returns the manufacturer, part number, serial number, hardware and firmware versions
Parameters	No parameters
Response	Comma separated string containing the <manufacturer>, <part number>, <serial number>,<hardware version><firmware version>
Example	:SLOT2:IDN? -> Quantifi Photonics,LaserPXIe-1002-2-FA,QuantifiPhotonics-192001,HW1.0FW1.02 Hardware and firmware versions are not separated by a comma

Command	:TRIGger<n>:DELay

Syntax	`:TRIGger<n>:DELay?<wsp><value>`
Description	Set the Trigger Delay of the module (in seconds)
Parameters	<value>: A valid numerical value for the desired delay (default units of seconds)
Response	No response
Example	`:TRIG1:DEL 0.5`

Command	`:TRIGger<n>:DELay?`
Syntax	`:TRIGger<n>:DELay?<wsp>[MIN|MAX|DEF|SET|ALL]`
Description	Query the Trigger Delay of the module (in seconds)
Parameters	MIN: Returns the minimum programmable value MAX: Returns the maximum programmable value DEF: Returns the default programmable value SET: Returns the current set value ALL: Returns all the above values in a comma separated string
Response	Depending on the parameters the response will be a single value, or a comma separated string of values.
Example	`:TRIG1:DEL? -> 0.0000,10.0000,0.0000,0.5000`

⚠ IMPORTANT

Any changes to the Trigger Mode will automatically disable the current ARM state.

Command	`:TRIGger<n>:MODE`
Syntax	`:TRIGger:MODE<wsp>[OR|AND]`
Description	Set the Trigger Line event mode of the module
Parameters	OR: Any of the configured lines will trigger an event AND: Only upon all configured
Response	No response
Example	`:TRIG1:MODE OR`

Command	`:TRIGger<n>:MODE?`
Syntax	`:TRIGger:MODE?`
Description	Query the Trigger Line event mode of the module
Parameters	No parameters
Response	Response will be the current user set mode
Example	`:TRIG1:MODE? -> OR`

Command	`:TRIGger<n>:SOURce`
Syntax	`:TRIGger<n>:SOURce<wsp><<value1>[,<value2>,..,<value8>]|CLEAR>`
Description	Set the Trigger Line(s) used for events
Parameters	<value1 … 8>: Up to 8 integer values representing valid PXI trigger lines to add to the event source list CLEAR: Will remove all lines from the source list
Response	No response
Example	`:TRIG1:SOUR 0, 6, 7`

Command	`:TRIGger<n>:SOURce?`
Syntax	`:TRIGger<n>:SOURce?`
Description	Query the Trigger Line(s) used for events

Parameters	No parameters
Response	The response will be a comma separated array of the current source list
Example	`:TRIG1:SOUR? -> 0, 6, 7` `:TRIG1:SOUR? -> "NONE"` (Return if the source list is cleared)

Command	`:TRIGger<n>:ARM`
Syntax	`:TRIGger<n>:ARM<wsp><ENABLE|DISABLE>`
Description	Set the Trigger ARMed state
Parameters	ENABLE: Enable the Trigger ARM, which will trigger on the next event DISABLE: Disable the Trigger ARM
Response	No response
Example	`:TRIG1:ARM ENABLE`

Command	`:TRIGger<n>:ARM?`
Syntax	`:TRIGger<n>:ARM?`
Description	Query the Trigger ARMed state
Parameters	No parameters
Response	The response will be the current state of the Trigger ARM
Example	`:TRIG1:ARM? -> ENABLE`

10.5.2 Configuration commands

Command	`:INPut<n>:CHANnel<m>:PDPower?`
Syntax	`:INPut<n>:CHANnel<m>:PDPower?<wsp>[MIN|MAX|ACT|ALL]`
Description	Query the input optical power
Parameters	MIN: Return the minimum programmable value MAX: Return the maximum programmable value ACT: Return the current input power value ALL: Returns all of the above parameters in a comma separated string
Response	Depending on the parameters the response will be a single value, or a comma separated string of the power values for the specified channel
Example	`:INP2:CHAN1:PDP? MAX -> 5.000000`

Command	`:INPut<n>:CHANnel<m>:PDPower:NULLing`
Syntax	`:INPUT<n>:CHANnel<m>:PDPower:NULLing`
Description	Perform dark current nulling
Parameters	No parameters
Response	No response
Example	`:INP2:CHAN1:PDP:NULL`

Command	`:INPut<n>:CHANnel<m>:PDPower:TIMEnulling?`
Syntax	`:INPUT<n>:CHANnel<m>:PDPower:TIMEnulling?`
Description	Query the time remaining for dark nulling to complete
Parameters	No parameters
Response	The remaining time in s
Example	`:INP2:CHAN1:PDP:TIME? -> 0.00`

Command	`:INPut<n>:CHANnel<m>:PDPower:AVERagingtime`
Syntax	`:INPUT<n>:CHANnel<m>:PDPower:AVERagingtime<wsp>[<value>|MIN|MAX|DEF]`
Description	Set the power averaging time

Parameters	<value>: Sets the averaging time to the user value in the specified units (seconds are default) MIN: Set to the minimum programmable value MAX: Set to the maximum programmable value DEF: Set to the default programmable value
Response	No response
Example	`:INP1:CHAN1:PDP:AVER 0.5`

Command	`:INPut<n>:CHANnel<m>:PDPower:AVERagingtime?`
Syntax	`:INPUT<n>:CHANnel<m>:PDPower:AVERagingtime?<wsp>[MIN|MAX|DEF|SET|ALL]`
Description	Query the power averaging time
Parameters	MIN: Return the minimum programmable value MAX: Return the maximum programmable value DEF: Return the default programmable value SET: Return the set value ALL: Return all the above values
Response	The averaging time in s
Example	`:INP1:CHAN1:PDP:AVER? -> 0.5`

Command	`:INPut<n>:CHANnel<m>:WAVelength`
Syntax	`:INPut<n>:CHANnel<m>:WAVelength<wsp><value>[NM|M|MM|UM|PM]`
Description	Set the input optical wavelength configuration
Parameters	<value>: Set to the user wavelength of the channel by specified units (NM default)
Response	No response
Example	`:INP2:CHAN1:WAV 1310 NM`
Command	`:INPut<n>:CHANnel<m>:WAVelength?`
Syntax	`:INPut<n>:CHANnel<m>:WAVelength?<wsp>[MIN|MAX|DEF|SET|ALL]`
Description	Query the input optical wavelength configuration
Parameters	MIN: Return the minimum programmable wavelength MAX: Return the maximum programmable wavelength DEF: Return the default programmable wavelength SET: Return the current set wavelength ALL: Return all the above values
Response	Depending on the parameters the response will be a single value, or a comma separated string of values.
Example	`:INP1:CHAN1:WAV? ALL -> 1271,1550,1550,1550`

Command	`:INPut<n>:CHANnel<m>:CALibration?`
Syntax	`:INPut<n>:CHANnel<m>:CALibration?<wsp>[<value>,]<PHASE|MAG|FREQ>`
Description	Query the S21 response calibration values
Parameters	<value>: Calibration wavelength (in nm). PHASE: Return the comma separated array of values for the phase response in radians of the specified channel. MAG: Return the comma separated array of values for the magnitude response in dB of the specified channel. FREQ: Return a comma separated string containing three values to restructure a frequency array. The first value is the first item (in Hz) in array, the second value is the end item (in Hz) in the array and the third value shows the array size.
Response	The response will be a comma separated string of values where the length depends on the parameters given.
Example	`:INP2:CHAN1:CAL? PHASE -> 1.234567,1.38934, …`

CAUTION

The RF output must be connected into a 50 ohm load **BEFORE** enabling the RF output.
Turning on the RF output without connecting a load will damage the internal amplifier and void warranty.

NOTE

The RF command is applicable only in supporting O2E products with an RF amplifier (14XX, 19XX).

Command	`:INPut<n>:CHANnel<m>:RF`
Syntax	`:INPut<n>:CHANnel<m>:RF<wsp><ON|OFF>`
Description	Set the RF output
Parameters	**ON**: Enable the RF output for the specified channel **OFF**: Disable the RF output for the specified channel
Response	No response
Example	`:INP2:CHAN1:RF ON`

Command	`:INPut<n>:CHANnel<m>:RF?`
Syntax	`:INPut<n>:CHANnel<m>:RF?`
Description	Query the RF output
Parameters	No parameters
Response	The response will be the string representation of the current RF state
Example	`:INP2:CHAN1:RF? -> ON`

Command	`:INPut<n>:TRACE:CoMPlete?`
Syntax	`:INPut<n>:TRACE<m>:CoMPlete?`
Description	Query the status of the Trace Complete bit
Parameters	No parameters
Response	**1** is returned if the trace has been acquired and the buffer is ready to be read out **0** is returned if the trace acquisition is still in progress, or the buffer is not ready to be read out
Example	`:INP2:TRACE:CMP? -> 1`

Command	`:INPut<n>:TRACE:PoinTS`
Syntax	`:INPut<n>:TRACE:PoinTS<wsp>[|MIN|MAX|DEF|<value>]`
Description	Set the number of trace buffer data elements
Parameters	**MIN**: Set the minimum programmable number of points **MAX**: Set the maximum programmable number of points **DEF**: Set the default number of points which is also set at power on **<value>**: Set the desired number of points per trigger
Response	No response
Example	`:INP2:TRACE:PTS 512`

Command	`:INPut<n>:TRACE:PoinTS?`
Syntax	`:INPut<n>:TRACE:PoinTS?<wsp>[MIN|MAX|DEF|SET|ALL]`
Description	Query the number of trace buffer data elements
Parameters	**MIN**: Return the minimum programmable number of points **MAX**: Return the maximum programmable number of points **DEF**: Return the default number of points set at power on **SET**: Return the current set number of points **ALL**: Returns all the above parameters in a comma separated string
Response	Returns the number of points captured after each trigger
Example	`:INP2:TRACE:PTS? ALL -> 1,1024,1024,512`

Command	`:INPut<n>:TRACE:RATE`
Syntax	`:INPut<n>:TRACE:RATE<wsp>[<value>|MIN|MAX|DEF]`
Description	Set the trace buffer sampling rate
Parameters	**<value>**: Set the desired sample rate in samples per second (Hz) **MIN**: Set the minimum sample rate in samples per second (Hz) **MAX**: Set the maximum sample rate in samples per second (Hz) **DEF**: Set the default sample rate set at power on
Response	No response
Example	`:INP2:TRACE:RATE 5000`

Command	`:INPut<n>:TRACE:RATE?`
Syntax	`:INPut<n>:TRACE:RATE?<wsp>[MIN|MAX|DEF|SET|ALL]`
Description	Query the trace buffer sampling rate
Parameters	**MIN**: Return the minimum sample rate in samples per second (Hz) **MAX**: Return the maximum sample rate in samples per second (Hz) **DEF**: Return the default sample rate set at power on **SET**: Return the current set sample rate in samples per second (Hz) **ALL**: Returns all the above parameters in a comma separated string
Response	Sample rate for the trace in seconds per sample
Example	`:INP2:TRACE:RATE? ALL -> .183,12000.000,12000.000,5000.000`

Command	`:INPut<n>:TRACE:TRIG`
Syntax	`:INPut<n>:TRACE:TRIG<wsp>[STOP|IMMEDIATE|FORCE]`
Description	Set the trace trigger mode
Parameters	**`IMMEDIATE|FORCE:`** Software trigger, start sampling immediately (default). **`SENSE<n>:TRACE:POINTS`** samples are required before *OPC? completes.
Response	No response
Example	`:INP2:TRACE:TRIG FORCE`

⚠ IMPORTANT

The `:INP<n>:TRACE<m>?` command will return a comma separated string of values with units of mW.

Command	`:INPut<n>:TRACE<m>?`
Syntax	`:INPut<n>:TRACE<m>?`
Description	Query the Trace buffer. The user should wait for OUTP<n>:TRACE:CMP? to become ready before reading this. This command will error out if no sample points have been triggered.
Parameters	No parameters
Response	Comma separated list of values for each channel, and new line [ie '\n'] separated rows per sample.

Example	`:INP2:TRACE:PTS 10`
	`:INP2:TRACE:RATE 0.183`
	`:INP2:TRACE:TRIG`
	`:INP2:TRACE:CMP? -> 1`
	`:INP2:TRACE2? ->`
	`0.0606,0.0611,0.0615,0.0611,0.0615,0.0611,0.0606,0.0611,`
	`0.0620,0.0635,0.0611,0.0611`
	`:INP2:TRACE:TRIG`
	`:INP2:TRACE:CMP? -> 1`
	`:INP2:TRACE2? ->`
	`0.0606,0.0611,0.0615,0.0611,0.0615,0.0611,0.0606,0.0611,`

	0.0620,0.0635,0.0611,0.0611

Command	:OUTput<n>:CHANnel<m>:GAIN?
Syntax	:OUTput<n>:CHANnel<m>:GAIN?<wsp>[MIN|MAX|DEF|SET|ALL]
Description	Query the values for the conversion gain
Parameters	MIN: Return the min wavelength and associated conversion gain value MAX: Return the max wavelength and associated conversion gain value DEF: Return the default wavelength and associated conversion gain value SET: Return the set wavelength and associated conversion gain value ALL: Return all the wavelengths and associated conversion gain values
Response	Depending on the parameters this will be a single value or a comma separated list of values for the specified channel
Example	:OUTP2:CHAN1:GAIN? ALL -> 11464.500000,11464.500000,10610.890000 ,11464.500000

10.6 O2E PXIe Multi Chassis mode operation

Multiple chassis can be connected to operate in **Multi Chassis Mode.** To operate in Multi Chassis Mode, **CohesionSCPI service must be version 1.02.06** or later.

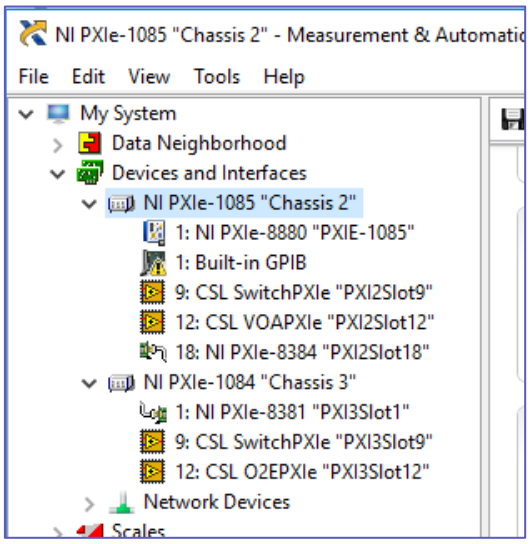
10.6.1 NI-MAX application Multi Chassis mode

⚠ IMPORTANT

The CohesionSCPI service does not manage the chassis numbers. These are controlled by the NI Platform Services (and through NI-MAX).

Even if the CohesionSCPI service is in Multi Chassis mode, if a chassis is connected but has no installed modules, it will not show up when **`*OPT?`** is run.

In the example shown below, there are two chassis connected via the PXIe-8384 to PXIe-8381 connection. Chassis #2 has the controller running CohesionSCPI service, and Chassis #3 is the 'extended' chassis.



10.6.2 SCPI Multi Chassis commands

Command	`:SYSTEM:CHASSIS?`
Syntax	`:SYSTEM:CHASSIS?<wsp>[LIST|MODE]`
Description	Query the Chassis Mode configuration
Parameters	No parameters
Response	**`LIST`**: Returns a comma separated list of valid chassis index numbers discovered by the CohesionSCPI service. These are chassis that have modules installed **`MODE`**: Returns the current Chassis Mode the CohesionSCPI service is operating in (`SINGLE` or `MULTI`) **None**: Returns the number of chassis managed by the CohesionSCPI service. If operating in SINGLE mode, this will always return `1`

Example	In Single chassis mode:
	`:SYSTEM:CHASSIS? -> 1`
	`:SYSTEM:CHASSIS? LIST -> 0`
	`:SYSTEM:CHASSIS? MODE -> SINGLE`
	In Multi chassis mode:
	`:SYSTEM:CHASSIS? -> 2`
	`:SYSTEM:CHASSIS? LIST -> 2,3`
	`:SYSTEM:CHASSIS? MODE -> MULTI`

⚠ IMPORTANT

Changing the CohesionSCPI service Chassis Mode will rediscover all Chassis and installed modules.

Command	`:SYSTEM:CHASSIS`
Syntax	`:SYSTEM:CHASSIS<wsp>[SINGLE|MULTI]`
Description	Set the Chassis Mode configuration
Parameters	SINGLE: Set CohesionSCPI service to operate in SINGLE Chassis Mode MULTI: Set CohesionSCPI service to operate in MULTI Chassis Mode
Response	No response
Example	`:SYSTEM:CHASSIS SINGLE`

In Multi chassis mode, all the commands given above in the Specific Command Summary will still work, but they must be prefixed with `:CHASSIS<c>`.

Common command example:

Single Chassis Mode	`:SLOT2:IDN?`
Multi Chassis Mode	`:CHASSIS1:SLOT2:IDN?`

Specific command example:

Single Chassis Mode	`:SOUR2:CHAN2:POW? MAX`
Multi Chassis Mode	`:CHASSIS1 SOUR2:CHAN2:POW? MAX`

10.7 Triggering example

This is an example of the commands and procedures for configuration and use of the system (or chassis) triggering features of the product.

10.7.1 System Commands

1. Set the Triggering delay for the slot. Delay is from 0 to 10 seconds, with a resolution of 0.001 seconds. Default is 0 seconds.
   ```
   :TRIGger<slot>:DELay 0
   ```
2. Set the desired Triggering Line detection Mode to AND or OR. This represents triggering upon events on single, any or specific lines/signals.
   ```
   :TRIGger<slot>:MODE OR
   ```
3. Set the desired Triggering source(s): The sources represent the product trigger lines (integer values from 0 to 7) that the module can be configured for events.
   ```
   :TRIGger<slot>:SOURce 0
   ```
4. Arm the triggering in preparation for the next event.
   ```
   :TRIGger<slot>:ARM ENABLE
   ```

10.7.2 Module Commands

The following is the example of a O2E PXIe installed in Slot 3

1. Once the above system commands are configured. Set the module to the desired Trigger event mode. The following is for the sampling to be started upon a PXI trigger line event and samples aligned to the PXI Clock.
   ```
   :INP3:TRACE1:TRIGGER SWEXT
   ```
2. Monitor the Trace completion status.
   ```
   :INP3:TRACE1:COMPLETE? -> 1
   ```
3. Query (Read) the Trace buffer once populated (data elements depend on trace configuration).
   ```
   :INP3:TRACE1? -> "x1,x2,x3,….,xn"
   ```

Name	Trigger Event	Sampling Event	Description
STOP	None	None	Triggering is disabled (or cancelled), no events will occur
FORCED | IMMEDIATE	Software	Internal Clock	Triggered upon command execution and sampling aligned to internal timer
SWEXT | SWEXTERNAL	Software	PXI Clock	Triggered upon command execution and sampling aligned to PXI Clock
HWINT | HWINTERNAL	PXI Line	Internal Clock	Triggered upon PXI Line edge and sampling aligned to internal timer
HWEXT | HWEXTERNAL	PXI Line	PXI Clock	Triggered upon PXI Line edge and sampling aligned to PXI Clock
HWCLK	PXI Line	PXI Line	Triggered upon command execution and sampling aligned to PXI Line edge

10.8 SCPI Command Console (available on MATRIQ instruments)

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

NOTE

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

NOTE

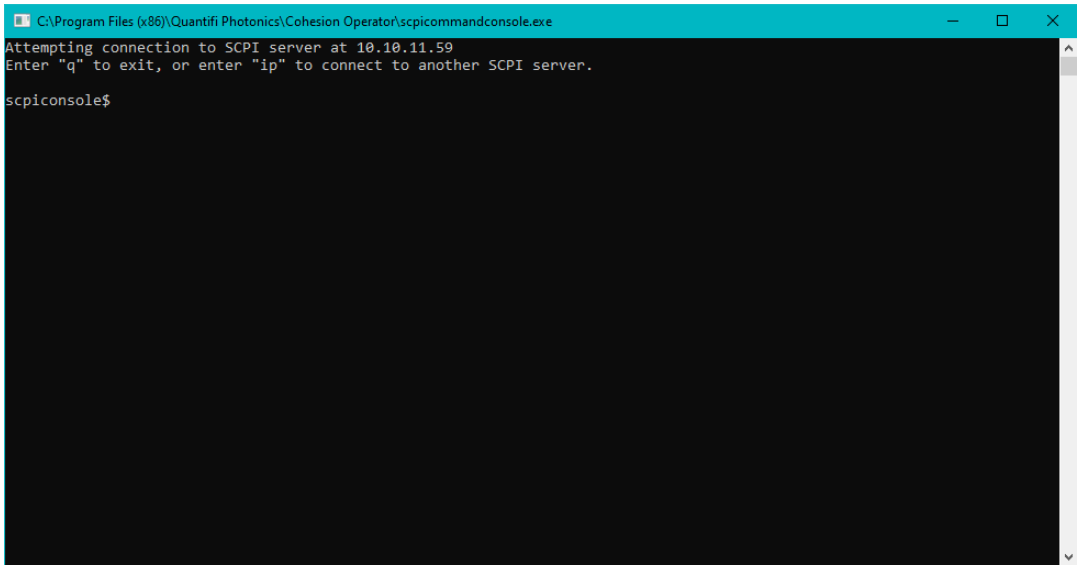
The two most common error codes are:

17: IO write 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**.



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:

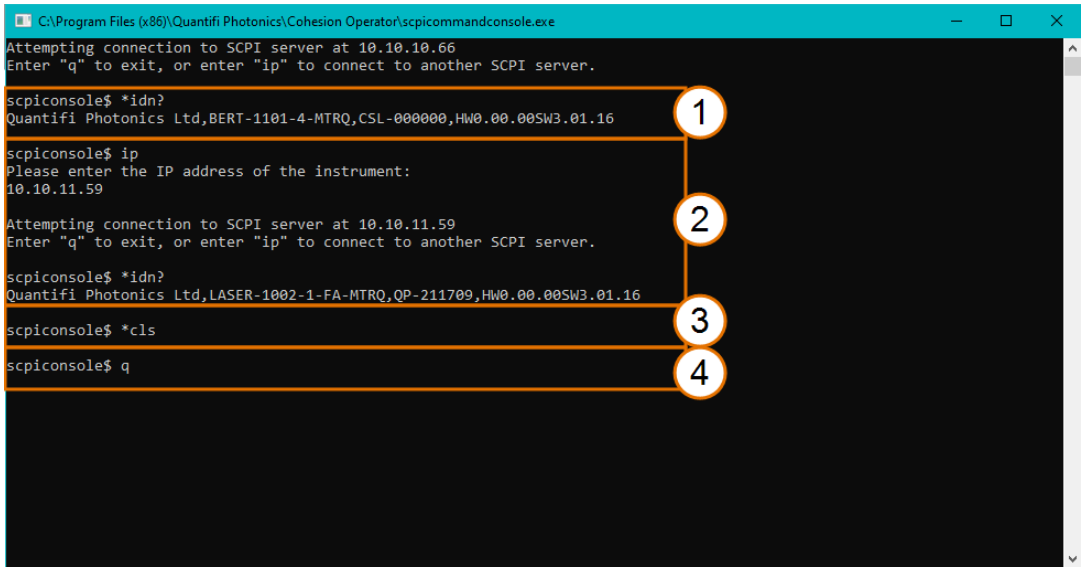
- Enter **`ip`** and press <ENTER>.
- Enter the IP address of the Quantifi Photonics product you would like to switch to and press <ENTER>.
- Confirm you are communicating with the right product: Enter **`*idn?`** and press <ENTER>. The device will return identification details.

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>.

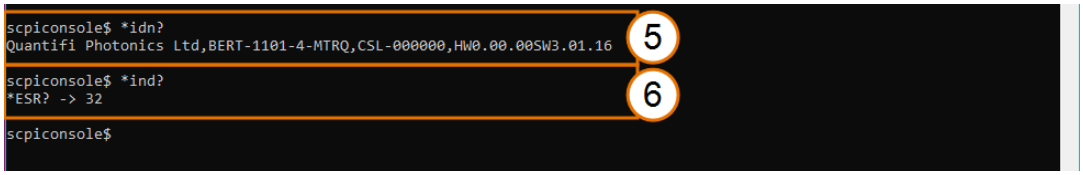


Example: Send instrument identification query **`*idn?`**

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.



Example: Send a WRITE only command

7. Enter a command correctly, for example: **`*cls`**
   The instrument executes the command, there will be no action response.

8. Enter the command incorrectly: **`*csl`**
   The instrument returns **error code 17: IO write error.**

11 Example: Control of the O2E with SCPI

The following is a simple example of how to control the O2E product by using SCPI commands. See the previous section for specific details and extra parameters that the listed commands accept.

After any command, it is recommended to query the `*ESR?` command. This will allow debugging of unreceived or incorrect commands that were sent to the product.

Identifying the O2E product:

1. Query to confirm the correct instrument/PXIe chassis is setup

   ```
   :*IDN?
   ```

2. Query the available instrument module configuration

   ```
   :*OPT?
   ```

3. Query the identification information for a specific slot module

   ```
   :SLOT3:IDN?
   ```

Running a Trace on the O2E product:

1. Set up the Trace parameters

   ```
   :INP3:TRACE:RATE 1000
   :INP3:CHAN1:PDP:AVER 0.02
   :INP3:CHAN2:PDP:AVER 0.02
   :INP3:TRACE:POINTS 1024
   ```

2. Trigger the Trace acquisition

   ```
   :INP3:TRACE:TRIGGER IMMEDIATE
   ```

3. Query the status of the Trace (for completion)

   ```
   :INP3:TRACE:COMPLETE?
   ```

4. Query the Trace data once complete

   ```
   :INP3:TRACE?
   ```

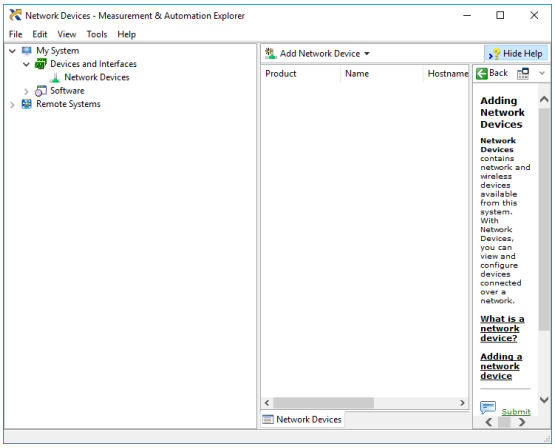
⚠ IMPORTANT

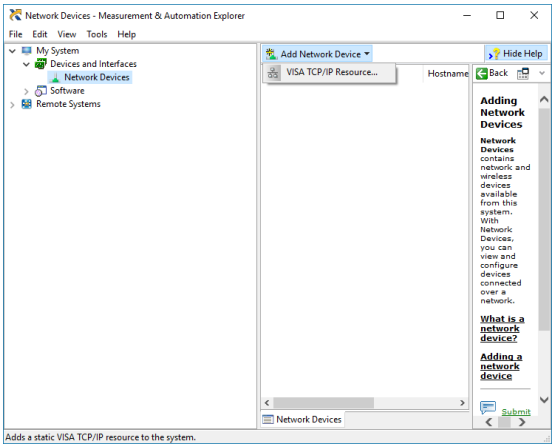
The following section details the various methods that a user may send these commands to a O2E product via **SCPI** commands

11.1 NI-MAX application

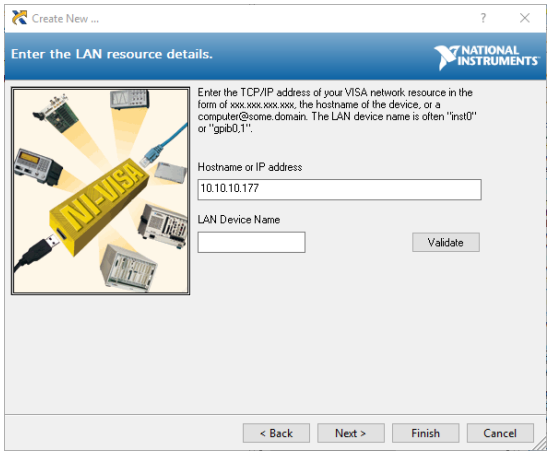
To communicate with any Quantifi Photonics PXIe or MATRIQ product, the chassis / instrument must first be setup as a TCP/IP instrument.

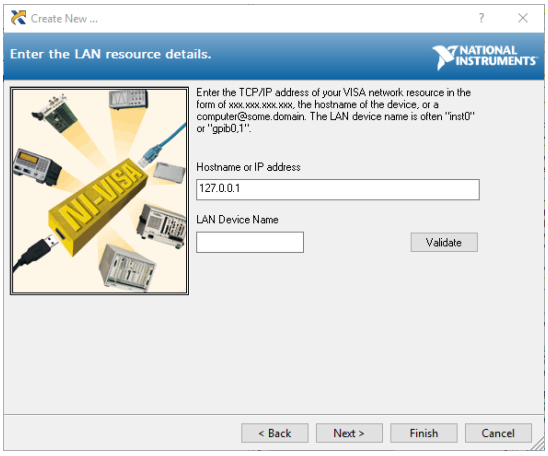
1. After installing NI-MAX, launch the application. In the left side panel of the window, click the **Devices and Interfaces** option. A drop down of available instruments detected will show up.
2. Click on **Network Devices**, then click **Add Network Devices** and select **VISA TCP/IP Resource**.





3. Select **Manual Entry of LAN Instrument**. Enter in the Hostname or IP Address. The top image is an example of operating remotely, the bottom image is an example of operating locally. Note when operating locally, enter in the localhost IP address of **127.0.0.1**. Click **Finish** to end the setup process.

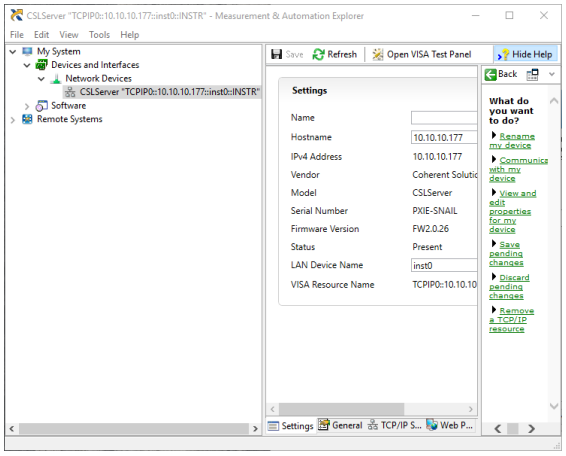




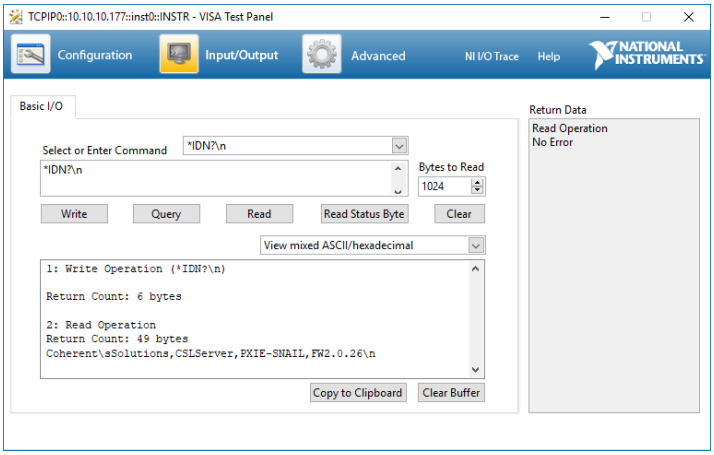
11.2 NI-VISA application

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 righthand 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® 2.7 code example

The following example shows how to communicate with an O2E product using Python code. For a list of supported and valid SCPI commands, refer to the **Programming Guide**.

```
# 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 an O2E 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 O2E 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.

> ⚠ **IMPORTANT**
> 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 an O2E product using MATLAB code. For a list of supported and valid SCPI commands, refer to the **Programming Guide**.

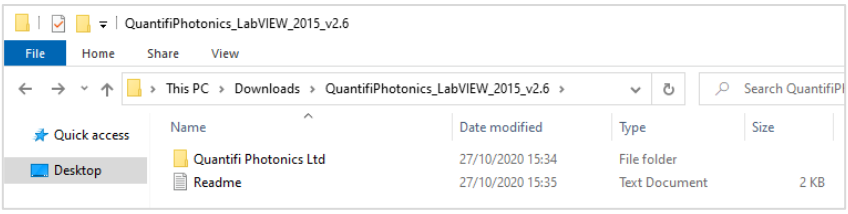
```
% Find a VISA-TCPIP object. This is if the VISA object has already been
% created with tmtool or has been removed from the workspace without
% first being closed (cleanly disconnected).
PXIE_Chassis = instrfind('Type', 'visa-tcpip', ...
       'RsrcName', 'TCPIP0::10.10.10.89::inst0::INSTR', 'Tag', '');
% 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.
fclose(PXIE_Chassis);
% Clean up all objects.
delete(PXIE_Chassis);
```

11.5 LabVIEW™ application

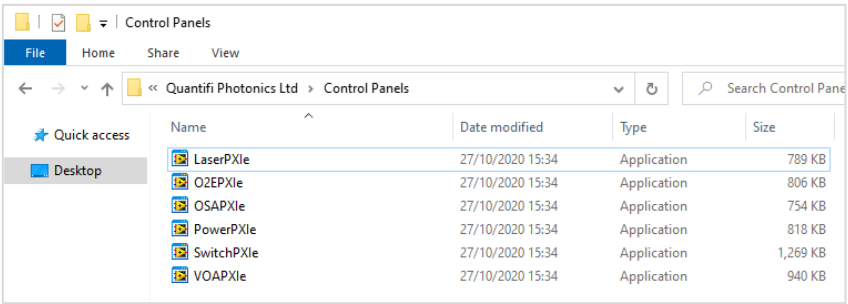
11.5.1 Soft Panels

To control the O2E product with a LabVIEW™ Soft Panel, you will need to have setup the chassis / instrument as a TCP/IP Resource as shown in Section 11.1.

1. Download the LabVIEW zip file from the Quantifi Photonics website. This contains all the Soft Panels and Virtual Instruments (VIs) for Quantifi Photonics PXIe modules.



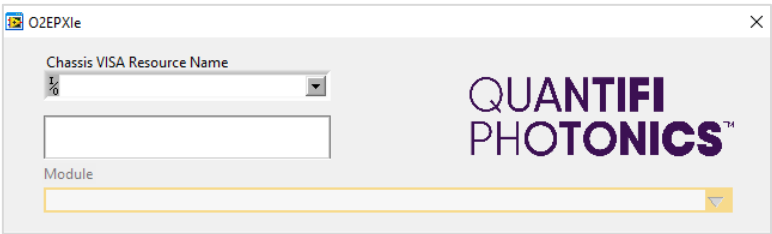
2. Open the Control Panels folder and select the corresponding Soft Panel for the desired PXIe module / MATRIQ instrument. Because these are executables, they will need LabVIEW Runtime Engine 2015 to run.



⚠ IMPORTANT

If LabVIEW Runtime Engine 2015 is not present, a system dialog will pop up. To proceed download the Runtime Engine (more information on LabVIEW website).

3. Once the desired executable has been run, select the VISA Resource corresponding to the intended instrument.



Note this step depends on the setup process shown in Section 11.1. If the instrument has not been setup, then the Soft Panel cannot be used.

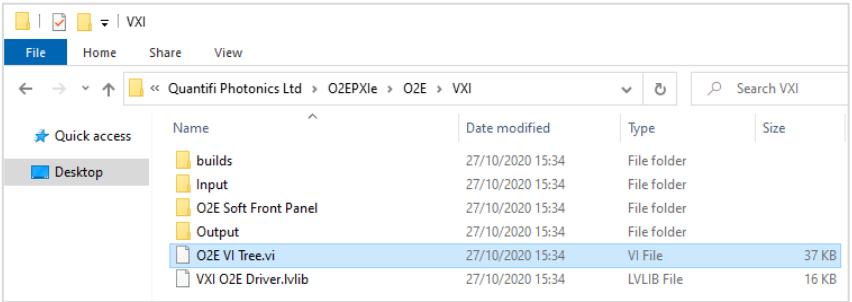
11.5.2 LabVIEW™ Virtual Instruments (VIs)

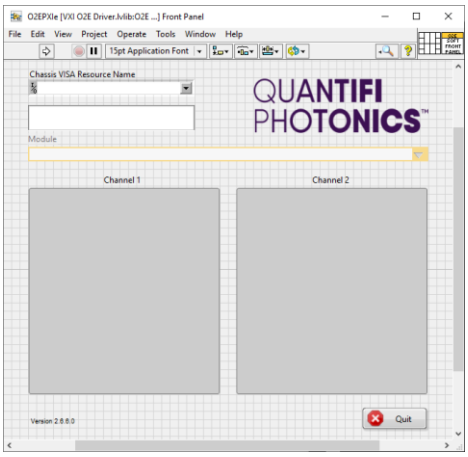
Instead of using the Soft Panels, the Virtual Instruments can also be used to control the O2E product from within LabVIEW. These VIs are provided for customers who want to develop custom applications using the PXIe modules.

1. Copy the QuantifiPhotonics_LabVIEW_2015_v2.6 > **Quantifi Photonics Ltd** folder to the following path:
   C:\Program Files\National Instruments\LabVIEW 20XX\instr.lib\

2. Within the Quantifi Photonics Ltd folder, navigate to the intended module's sub folder.
   e.g. Quantifi Photonics Ltd > O2E > O2E > VXI

This VI Tree can then be added into the desired development project, therefor the Soft Panel can be rebuilt and used by other LabVIEW Runtime Engine.





12 Maintenance

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- Keep the product free of dust.
- Store product 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 product, power off the chassis or the MATRIQ instrument immediately. Remove the product and allow to dry completely.

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.

12.1 Annual calibration schedule

To ensure that the O2E product is performing as expected, it is recommended that the product be sent in for annual re-calibration. As an optical product will naturally degrade over time, it is important to periodically re-test the product, to confirm that it is working as expected.

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.

13 Technical support

13.1 Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact Quantifi Photonics. The Technical Support Group is available to take your calls from Monday to Friday, 9:00 a.m. to 5:00 p.m. (New Zealand Time).

Technical Support Group

Tel.: +64 9 478 4849

support@quantifiphotonics.com

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

13.2 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.
- Avoid high humidity or large temperature fluctuations.
- Keep the product out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

14 Warranty

14.1 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.

⚠ IMPORTANT

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.
- The unit has been used with an external power supply not supplied by Quantifi Photonics with the unit.

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 www.quantifiphotonics.com.

14.2 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.

14.3 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.

14.4 Certification

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

14.5 Service and repairs

To send any equipment for service, repair or calibration please contact the Technical Support Group.

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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