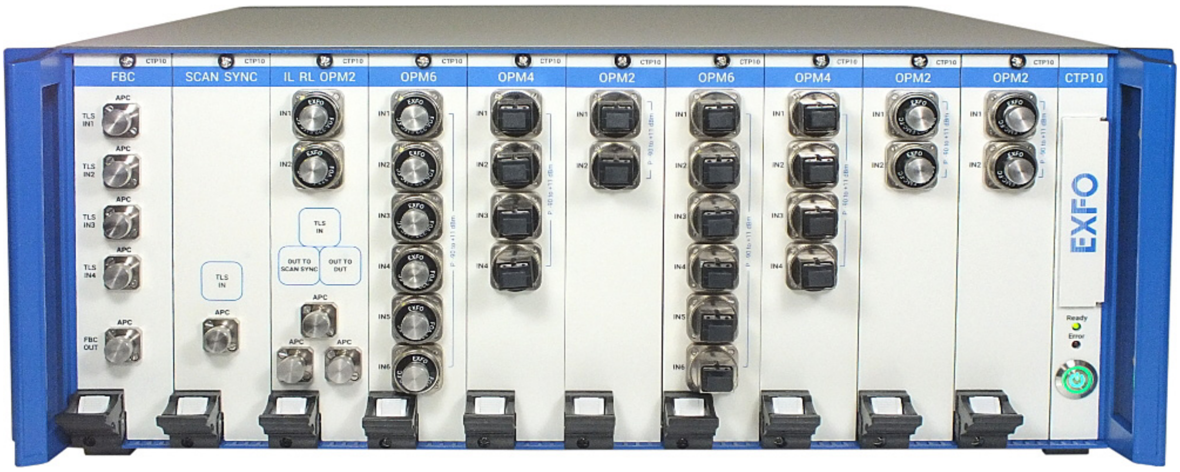
User Guide

CTP10

Component Test Platform



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Units of measurement in this publication conform to SI standards and practices.

Patents

The exhaustive list of patents is available at www.EXFO.com/patent.

Document version number: 11.0.0.2

Information in this document applies to the CTP10 embedded software package version 2.10.x.x.

Contents

Regulatory Information

USA Electromagnetic Interference Regulatory Statement

Electronic test and measurement equipment is exempt from FCC part 15, subpart B compliance in the United States of America. However, EXFO Inc. makes reasonable efforts to ensure compliance to the applicable standards.

The limits set by these standards are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user documentation, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user’s authority to operate the equipment.

Canada Electromagnetic Interference Regulatory Statement

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference.

Cet équipement génère, utilise et peut émettre de l'énergie radio-fréquence et, s'il n'est pas installé et utilisé conformément à la documentation de l'utilisateur, il peut occasionner une interférence néfaste aux communications radio. L'utilisation de cet équipement dans une zone résidentielle est susceptible d'occasionner une interférence néfaste.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Attention: Cet appareil n'est pas destiné à être utilisé dans des environnements résidentiels et peut ne pas assurer la protection adéquate à la réception radioélectrique dans ce type d'environnements.

This is a class A, group 1 product.

- Class A equipment: Equipment that is, by virtue of its characteristics, highly unlikely to be used in a residential environment, including a home business shall be classified as class A and shall comply with the class A limits specified in the applicable ICES standard. Characteristics considered in this assessment include price, marketing and advertising methodology, the degree to which the functional design inhibits applications suitable to residential environments, or any combination of features that would effectively preclude the use of such equipment in a residential environment.

  Classe A: Matériel qui, en raison de ses caractéristiques, ne sera fort probablement pas utilisé dans un milieu domiciliaire ni par des entreprises établies à domicile. Parmi les caractéristiques considérées dans cette évaluation, il y a le prix, les méthodes de commercialisation et de publicité, la mesure dans laquelle les fonctions de l'appareil font qu'il ne se prête pas à des applications convenant au milieu domiciliaire ou toute combinaison de ces caractéristiques qui aurait pour conséquence d'en prévenir effectivement l'utilisation à domicile. Utilisé également pour indiquer les limites d'émission correspondantes qui s'appliquent à un tel matériel.

➤ Group 1 equipment: group 1 contains all equipment which is not classified as group 2 equipment, and includes equipment such as laboratory and scientific equipment, industrial process, measurement and control equipment.

Group 2 equipment: group 2 contains all ISM RF equipment in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used or only used locally, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material for inspection/analysis purposes, or for transfer of electromagnetic energy.

Appareils du groupe 1 : le groupe 1 réunit tous les appareils compris dans le domaine d'application de la présente Norme, qui ne sont pas classés comme étant des appareils du groupe 2. Le groupe 1 inclut les appareils scientifiques et de laboratoire, les processus industriels, appareils de mesure ou de contrôle.

Appareils du groupe 2 : le groupe 2 réunit tous les appareils ISM à fréquences radioélectriques dans lesquels de l'énergie à fréquences radioélectriques dans la plage de fréquences comprises entre 9 kHz et 400 GHz est produite et utilisée volontairement ou uniquement utilisée localement sous forme de rayonnement électromagnétique, de couplage inductif et/ou capacitif, pour le traitement de la matière, à des fins d'examen ou d'analyse ou pour le transfert d'énergie électromagnétique.

Supplier's Declaration of Conformity (SDoC)

The SDoC for your product is as follows:

CAN ICES-001 (A) / NMB-001 (A)

EU and UK Electromagnetic Compatibility Regulatory Statement

Warning: This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures. Your product is suitable for use in industrial electromagnetic environments.

EU and UK Declaration of Conformity

The full text of the declaration of conformity is available at the following Internet address: *www.exfo.com/en/resources/legal-documentation*.

EU Economic Operator

EXFO Solutions SAS
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Saint-Jacques-de-la-Lande,
35091 Rennes Cedex 9
FRANCE

1 Introducing the CTP10

The CTP10 is a modular measurement platform designed for passive component testing. It is composed of the following elements:

- **The CTP10 mainframe**

  The CTP10 mainframe contains 10 module slots that can host up to ten pluggable measurement modules for passive component testing.

  The CTP10 mainframe presentation is available in *CTP10 Mainframe Overview* on page 7.

  The mainframe's CPU embedded software enables you to configure and control all system operations and all plugged modules individually, through the graphical user interface (GUI). You can also control external lasers connected to the mainframe.

  The presentation of the CTP10 GUI is available in *CTP10 Graphical User Interface Overview* on page 21.

- **The CTP10 modules**

  The following modules are available to perform I, IL, RL and PDL measurements:

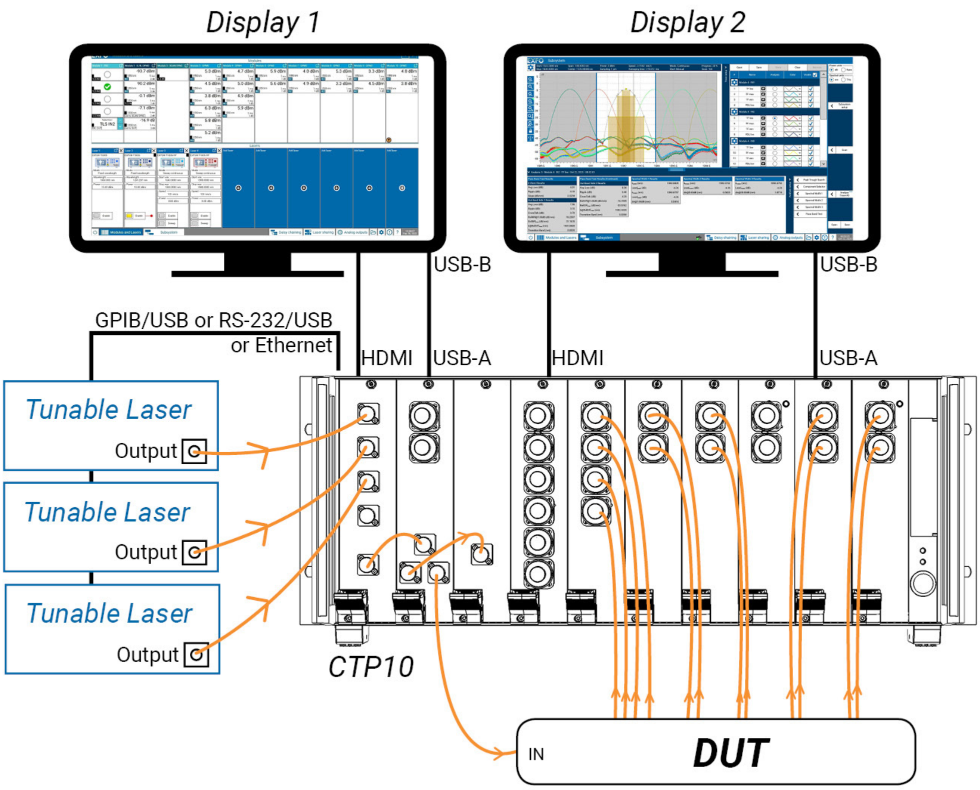
  - IL RL OPM2: insertion loss and return loss measurement system with two optical detectors.
  - IL PDL: insertion loss and polarization dependent loss measurement system over the CL band.
  - IL PDL OPM2: insertion loss and polarization dependent loss measurement system over 1260-1620 nm, with two optical detectors.
  - SCAN SYNC: optical sampling of swept wavelength lasers.
  - OPMx: optical power detectors (x= 2; 4 or 6 detectors per unit).
  - PCMx: photocurrent meters (x= 2 or 6 inputs per unit).
  - FBC: full band combiner, to use up to four sweeping laser sources for full-band DUT characterization.

  The presentation of CTP10 modules is available in *CTP10 Modules Overview* on page 13.

Typical Test Setup

The following figure illustrates a typical IL/RL test setup using the CTP10 platform with three tunable lasers. To operate, the CTP10 requires one IL RL OPM2 module and a SCAN SYNC module. Full band operation is obtained by adding an FBC module.

More examples of typical setups are available in *Installing Your Test Setup* on page 51.



Technical Specifications

This section describes the CTP10 technical specifications and requirements:

➤ *Optical Measurement Specifications* on page 3

➤ *Hardware Specifications* on page 3

➤ *CTP10 Module Compatibilities* on page 4

➤ *TLS Requirements* on page 6

Optical Measurement Specifications

To obtain this product's most recent technical specifications, visit the EXFO Web site at www.exfo.com.

Hardware Specifications

Hardware			
Interfaces for External Devices	HDMI + Displayport (x2)		Screens (2 active at a time) to display the CTP10 GUI. GUI optimized for 1920x1080 (16:9 ratio) screen resolution (recommended resolution)
	USB-A 2.0 (x5)		Devices such as mouse, keyboard, hard disk, GPIB-USB converter...
	USB-A 3.0 (x2)		
	Maximum cable length		3 m (9.8 ft)
Remote Interfaces	Ethernet	RJ45 (x1)	1 Gbit/s (max.) A shielded Ethernet cable is required.
	GPIB (optional)	IEEE 488 (x1)	7.2 Mbit/s (max.)
	USB	USB-B (x1)	300 Mbit/s (max.)
	Maximum cable length (GPIB & USB)		3 m (9.8 ft)
Data Storage	Internal hard drive		HDD, 1.75 TB available
Electrical Interfaces	Maximum cable length		10 m (32.8 ft)
	In (BNC)	Trig in (x8)	5 V TTL (1 MHz max.) ➤ High level: >2 V ➤ Low level: <0.8 V ➤ Input maximum range: 0–5.5 V ➤ Hold function (actual state held when unplugged)
		Sync in (x1)	5 V TTL (10 MHz typ.) (hardware ready, reserved for future use).
		Interlock (x1)	5 V TTL (hardware ready, reserved for future use)

Hardware			
Electrical Interfaces	Out (BNC)	Trig out (x4)	5 V TTL (1 MHz max.) ➤ High level: 4 V typ. on high-impedance load (>10 kΩ) ➤ Low level: 0 to 0.5 V on high-impedance load (>10 kΩ) ➤ Source resistance: 50 Ω
		Sync out (x1)	5 V TTL (10 MHz typ.) (hardware ready, reserved for future use).
		Analog out (x2)	0-5 V Source resistance: 450 Ω
Electrical Specifications	Input power		see *Electrical Safety Information* on page 27.
	Fuses (x2)		T4AH250V
	Maximum power consumption		300 W
Physical Specifications	Dimensions (H x W x D)		178 mm x 482 mm x 435 mm (7 in x 19 in x 17 in) 4U full rack with rackmount fixtures
	Weight	Mainframe	8.5 kg (18.7 lb)
		Module	1 to 2.8 kg (2.2 lb to 6.2 lb)

CTP10 Module Compatibilities

The following table details the CTP10 module compatibilities with CTP10 specific modes:

		IL RL OPM2	IL PDL OPM2	IL PDL
Supported modules	SCAN SYNC (mandatory module)	✓	✓	✓
	FBC	✓	✗	✗
	FBC with M option	✓	✓	✗
	OPMx	✓	✓	✓
	PCMx[a]	✓	✓	✓
Supported CTP10 modes	Standalone	✓	✓	✓
	Daisy Chaining	✗	✓	✓
	Laser Sharing	✓	✗	✓

a. PCM modules are not available in Laser Sharing and Daisy chaining modes, and if multiple lasers are used to perform a scan.

The Laser sharing mode cannot be used in combination with the Daisy chaining mode.
In Laser sharing mode, all CTP10s must be equipped with the same measurement module: IL RL OPM2 module for IL and RL measurements or IL PDL module for IL and PDL measurements.

For more details on Laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.

For more details on Daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.

TLS Requirements

Supported TLS are:

- EXFO T200S
- EXFO T500S
- EXFO T100S-HP
- VIAVI mSWS-A1SLS

Some CTP10 functionalities are not available with all supported lasers. The following table details these laser compatibilities:

		EXFO T200S/T500S	EXFO T100S-HP	VIAVI mSWS-A1SLS[a]
Supported CTP10 modes	Standalone	✓	✓	✓
	Daisy chaining	✓	✓	✓
	Laser sharing	✓	✓	✓
Supported CTP10 functions	Static control: Fixed wavelength	✓	✓	✓
	Static control: Sweep continuous	✗	✓	✓
	Single laser setup	✓	✓	✓
	Multiple laser setup	✓	✓	✓
	High resolution sampling[b]	✓	✓	✗
	Output trigger: Window type[b]	✓	✓	✓
	Output trigger: Pulse type	✓	✓	✗

a. The support of the VIAVI msWS-A1SLS laser in a multiple laser setup is not guaranteed in combination with T200S/T500S lasers.

b. High resolution sampling and Pulse trigger are not available in Laser Sharing and Daisy chaining modes, and if multiple lasers are used to perform a scan.

The CTP10 is expected to work with TLS sweeping sources having the following performances:

- No mode hops during the wavelength scan.

  If a mode hop is detected during the scan, no correction is applied and a warning is issued.

- Speed between 5 nm/s and 1000 nm/s.

  For sweep speed under 5 nm/s, an inaccuracy may appear on the wavelength value in the area of this low speed, so speed below 5 nm/s is not available.

- Multiple lasers: overlap of 5 nm.

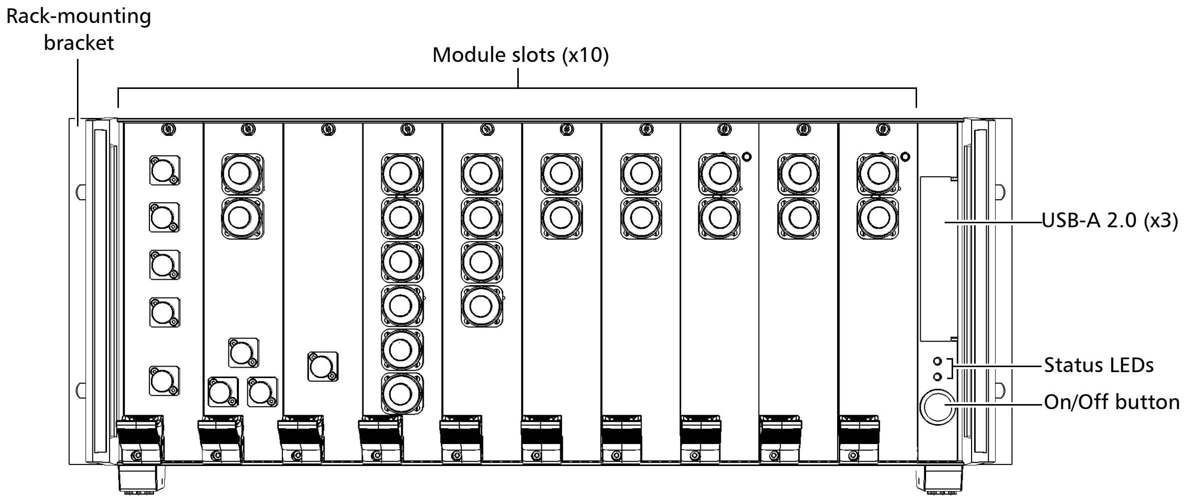
  For continuous traces, specified wavelength limits of multiple TLS (physical characteristics) must overlap by at least 5 nm: the maximum wavelength limit of a laser must overlap by 5 nm the minimum wavelength limit of the next laser.
- TLS with PMF output fiber type for use with the IL PDL and IL PDL OPM2 modules.

CTP10 Mainframe Overview

The CTP10 is delivered with the following accessories:

- 1 power supply cable
- Cover plates for empty module slots
- 1 manual *Getting Started with CTP10*
- 1 USB key containing the system package version installed on the CTP10 and the available drivers, examples (if any), reports and user documentation.

Front panel



On/Off button

The On/Off button enables you to turn on or off the CTP10 (see *Turning on the CTP10 and Accessing the GUI* on page 44 and *Turning off the CTP10* on page 46).

USB ports (protected by a flap)

The  label identifies the three USB 2.0 type-A ports located on the front panel; they are protected by a flap.

These ports enable you to:

- Connect USB devices such as:
  - A keyboard and mouse if needed
  - A USB key or hard disk to export your measurement results
  - An external multi-touch screen

- Control a laser through an adapter (GPIB, RS232).
  The CTP10 is compatible with National Instrument USB-GPIB adapters.

Status LEDs

- The green **Ready** LED indicates the startup status of the CTP10:
  - Slow flashing: the GUI software is initializing
  - Fixed: the GUI software is ready to be used
- The **Error** LED lights red for 1 minute if an error or warning occurs:
  - Flashing: a warning occurred.
  - Fixed: an error occurred.

  The GUI displays the corresponding message. You can display the last error and warning messages as explained in *Displaying the List of Errors and Warnings* on page 239.

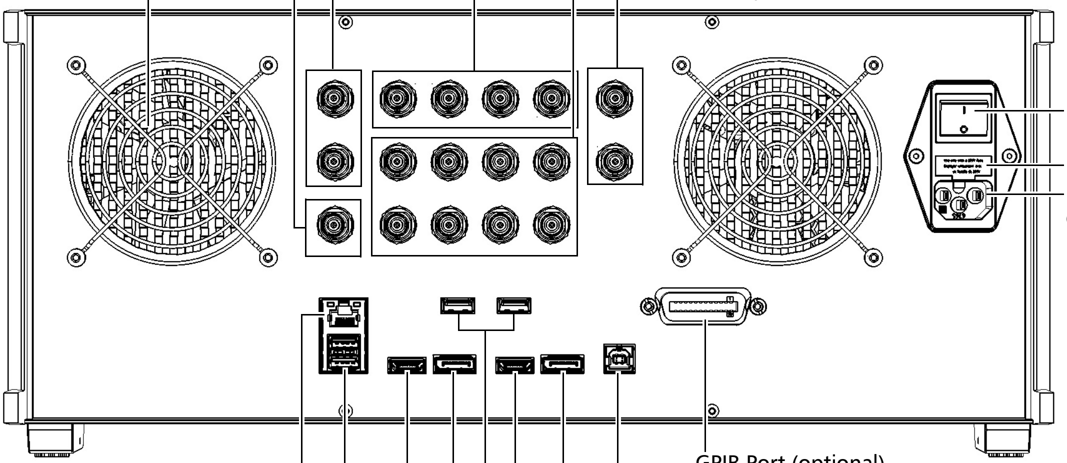
Module slots

Any CTP10 module can be placed in any of the ten slots (for more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33).

Rear panel

The rear panel of the CTP10 contains:

- A complete set of communication ports and interfaces for remote control and export of data. All ports and interfaces are SELV classified (except for the power connector) and must only be connected to interfaces of the same type.
- Two fans for air output.



External Screen Connectors

The label identifies the ports to connect external screens. You can connect two external screens to the following ports:

- **DisplayPort** port (x2)
- **HDMI** port (x2)

For more details on how to configure the external screen settings, see *Connecting and Configuring External Screens to the CTP10* on page 39.

BNC Connectors

The BNC connectors enable you to synchronize scans or measurements (see *Hardware Specifications* on page 3 for more details on signal levels).

- **TRIG IN** (x8): input BNC connector for starting scan in synchronization with an external trigger input signal, event, sampling strobe or modulation input.

  The TRIG IN connectors of the CTP10 can handle the following modes of TTL trigger signals:

  - **Sampling trigger**:

    In Daisy chaining mode, the signal coming out of the Primary CTP10 (through its TRIG OUT port) enables data sampling on the Secondary CTP10 through its TRIG IN port. For more details, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.

  - **Event trigger**:

    The external signal triggers an event such as the scan start (see *Triggering the Acquisition* on page 138) or data acquisition (see *Performing Power Level Data Acquisition* on page 80).

  - **Window trigger**:

    To output Pulse triggers during the acquisition, the CTP10 needs the electrical trigger from the laser (for more details, see *Generating Pulse Trigger Signals* on page 142).

  When unplugged, the trigger holds the actual state of the connector.

- **SYNC IN/OUT**: reserved for future use.

- **ANLG OUT** (x2): BNC analog output connector to send an internal measurement as an analog signal to be displayed on an external analog instrument. For more details, see *Generating Output Analog Signals* on page 144.

- **TRIG OUT** (x4): BNC connector for outputting a trigger signal during scan. For more details, see *Generating Output Trigger Signals* on page 140.
  In Daisy chaining mode, the signal coming out of the Primary CTP10 through its TRIG OUT port enables data sampling on the Secondary CTP10 (through its TRIG IN port). For more details, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.

- **INTERLOCK**: reserved for future use.

USB-A Ports

The label identifies the USB-A 3.0 ports, the identifies the USB-A 2.0 ports.

These ports enable you to:

- Connect USB devices such as:

  - A keyboard and mouse if needed
  - A USB key or hard disk to export your measurement results
  - An external multi-touch screen

- Control a laser through an adapter (GPIB, RS232).
  The CTP10 is compatible with National Instrument USB-GPIB adapters.

  For more details, see *Adding and Connecting the Laser(s)* on page 88.

For more details on USB connections, see *Connecting a Mouse and Keyboard to the CTP10* on page 43 and *Connecting/Disconnecting USB Storage Devices* on page 199.

Ethernet Port

The label identifies the Ethernet port, which enables you to:

- Connect the CTP10 to your network. For more details, see *Connecting the CTP10 to your Company Network* on page 49.
- Control a laser from the CTP10. For more details, see *Adding and Connecting the Laser(s)* on page 88.
- Perform remote control operations on the CTP10. For more details, see *Remotely Controlling the CTP10* on page 205.

GPIB Port (optional)

This port enables you to perform IEEE 488 remote control operations on the CTP10 (slave mode only). For more details, see *Remotely Controlling the CTP10* on page 205.

USB-B 2.0

This port enables you to perform remote control operations on the CTP10. For more details, see *Remotely Controlling the CTP10* on page 205.

Cooling Fans

The two cooling fans extract warm air from inside (air enters under the CTP10). A cover grid protects the fans.

Power Input

The power input part includes the following elements:

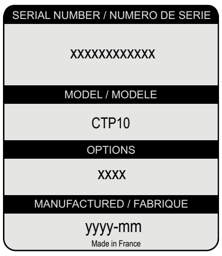
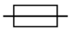
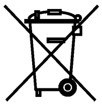
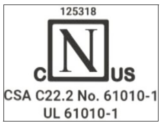
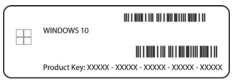
- **Power Switch**
- **Power Cable Connector**

  The CTP10 is equipped with a self-regulating power supply.
- **Fuse Drawer**

  The fuse drawer contains two fuses to protect the CTP10 from overcurrent (for fuse type, see *Technical Specifications* on page 3).

  For details on how to replace the fuses, see *Replacing Fuses* on page 230.

Labels and Markings

Label	Description
	Identification of the product Indicates serial number, model, options (if any), hardware version (if any) and date of manufacture.
	Manufacturer identification Contact information of the manufacturer.
	Fuse type (x2): see *Hardware Specifications* on page 3.
	Indicates an injury hazard. It appears on a location that requires special instructions for proper use: see *Electrical Safety Information* on page 27.
	WEEE symbol for recycling. See *Recycling and Disposal* on page 232.
	Safety certification label.
CAN ICES-001 (A) / NMB-001 (A)	Canadian certification. See *Regulatory Information* on page vi.
	UK conformity assessment. See *Regulatory Information* on page vi.
	CE marking. See *Regulatory Information* on page vi.
	EFUP label (RoHS China) See *Chinese Regulation on Restriction of Hazardous Substances (RoHS)* on page 565.
	Windows license label The CTP10 embeds Windows 10.
	Warranty seal The CTP10 cover must not be open, otherwise the warranty is not valid anymore.

CTP10 Modules Overview

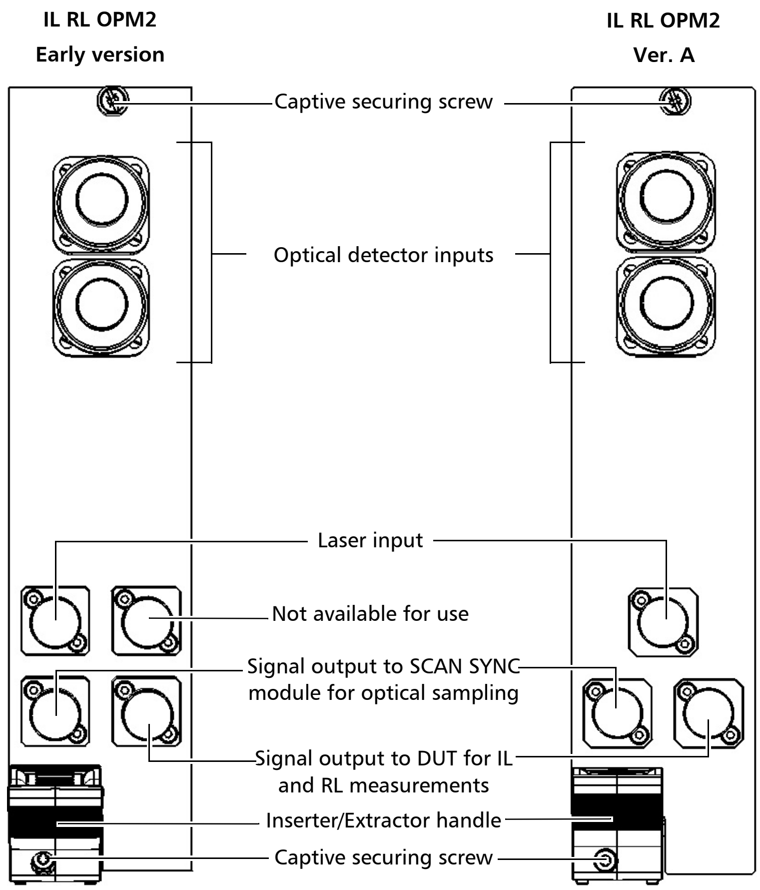
The CTP10 available modules are:

- *IL RL OPM2 Module* on page 13
- *IL PDL Module* on page 15
- *IL PDL OPM2 Module* on page 16
- *SCAN SYNC Module* on page 17
- *OPMx Modules* on page 18
- *PCMx Modules* on page 19
- *FBC Module* on page 20

IL RL OPM2 Module

The IL RL OPM2 module is an insertion loss and return loss measurement system with one laser input linked to two outputs and two optical detectors.

You cannot use the IL RL OPM2 module in combination with an IL PDL or IL PDL OPM2 module in a single mainframe. To perform proper measurements with the IL RL OPM2 module, do not insert an IL PDL or IL PDL OPM2 module in the same mainframe.



Optical Connectors

➤ **Detectors**

The **IN1** and **IN2** connectors are optical detector inputs to connect the devices under test (DUT) for power measurement.

➤ **Laser input**

The **TLS IN** is a laser input port to connect the tunable laser source that you want the CTP10 to control, or the FBC OUT port of the FBC module if you want to use several laser sources.

Early versions of the IL RL OPM2 module had two laser inputs (**TLS IN1** and **TLS IN2**). Only the **TLS IN1** input is available for use.

➤ **Output ports**

The **OUT TO SCAN SYNC** (**OUT1** on earlier version) and **OUT TO DUT** (**OUT2** on earlier version) are signal outputs to connect a DUT and the SCAN SYNC module (for more details, see *Installing Your Test Setup* on page 51).

- ➤ **OUT TO SCAN SYNC** (**OUT1** on earlier version): APC connector (PC connector on earlier version) that enables optical sampling by being connected to the SCAN SYNC module.
- ➤ **OUT TO DUT** (**OUT2** on earlier version): APC connector that enables transfer function (TF) and back reflection (BR) measurement by being connected to a DUT.

Inserter/Extractor handle

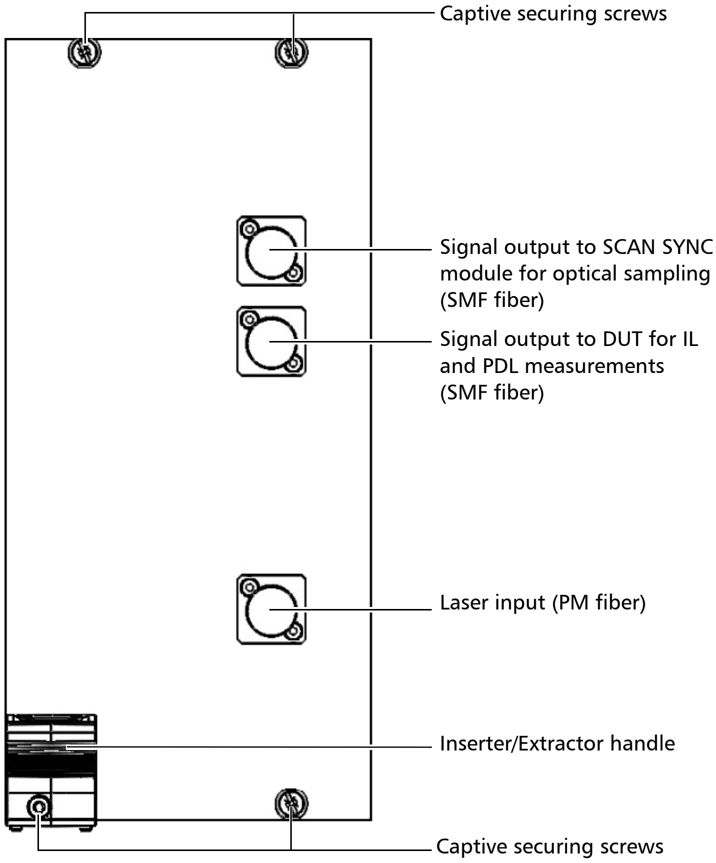
The module handle enables you to lock or unlock the module into the mainframe slot.

For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

IL PDL Module

The IL PDL module is a double-slot module for insertion loss and polarization dependent loss measurements, with one laser input linked to two outputs.

You cannot use the IL PDL module in combination with an IL RL OPM2 or IL PDL OPM2 module in a single mainframe. To perform proper measurements with the IL PDL module, do not insert an IL RL OPM2 or IL PDL OPM2 module in the same mainframe.



Optical Connectors

➤ **Output ports**

The **OUT TO SCAN SYNC** and **OUT TO DUT** are signal outputs to connect a SCAN SYNC and a DUT (for more details, see *Installing Your Test Setup* on page 51).

➤ **OUT TO SCAN SYNC**: APC connector that enables optical sampling by being connected to the SCAN SYNC module.

➤ **OUT TO DUT**: APC connector that enables transfer function (TF) and polarization dependent loss (PDL) measurements over the CL band by being connected to a DUT.

➤ **Laser input**

The **TLS IN** (PM) is a laser input port to connect the tunable laser source that you want the CTP10 to control.

Inserter/Extractor handle

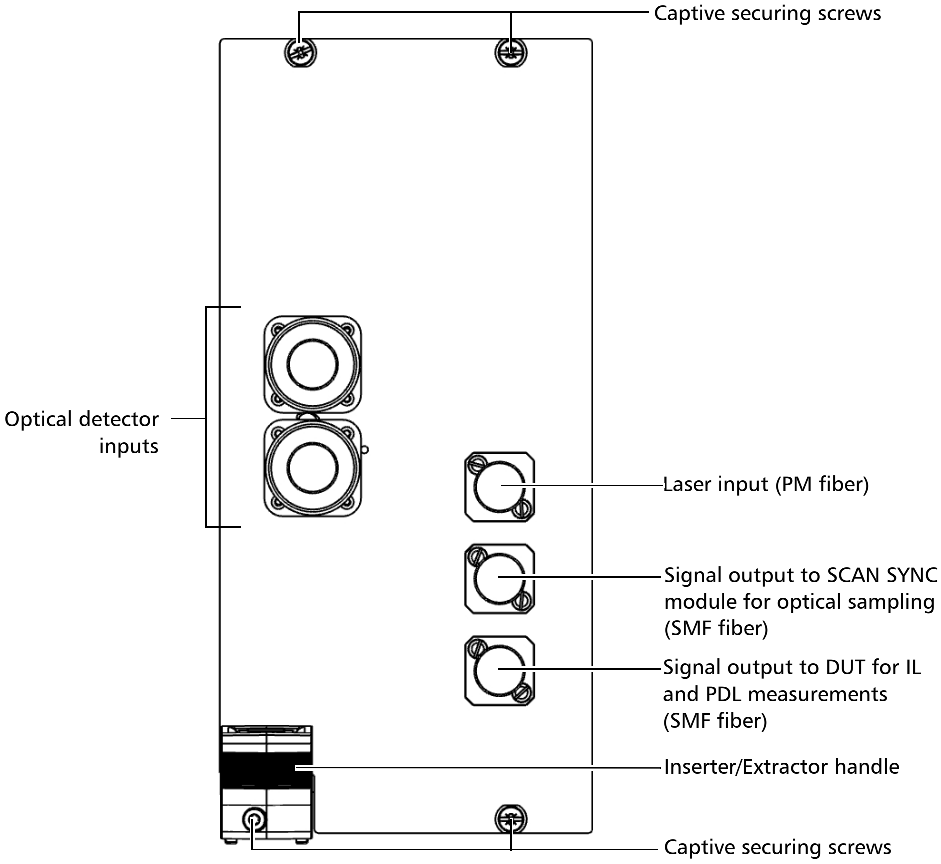
The module handle enables you to lock or unlock the module into the mainframe slot.

For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

IL PDL OPM2 Module

The IL PDL OPM2 module is a double-slot module for insertion loss and polarization dependent loss measurements, with one laser input linked to two outputs and two optical detectors.

You cannot use the IL PDL OPM2 module in combination with an IL RL OPM2 or IL PDL module in a single mainframe. To perform proper measurements with the IL PDL OPM2 module, do not insert an IL RL OPM2 or IL PDL module in the same mainframe.



Optical Connectors

➤ **Laser input**

The **TLS IN** (PM) is a laser input port to connect the tunable laser source that you want the CTP10 to control, or the FBC OUT port of the FBC module (with M option) if you want to use several laser sources.

➤ **Output ports**

The **OUT TO SCAN SYNC** and **OUT TO DUT** are signal outputs to connect a SCAN SYNC and a DUT (for more details, see *Installing Your Test Setup* on page 51).

- ➤ **OUT TO SCAN SYNC**: APC connector that enables optical sampling by being connected to the SCAN SYNC module.
- ➤ **OUT TO DUT**: APC connector that enables transfer function (TF) and polarization dependent loss (PDL) measurements over the entire band by being connected to a DUT.

Inserter/Extractor handle

The module handle enables you to lock or unlock the module into the mainframe slot.

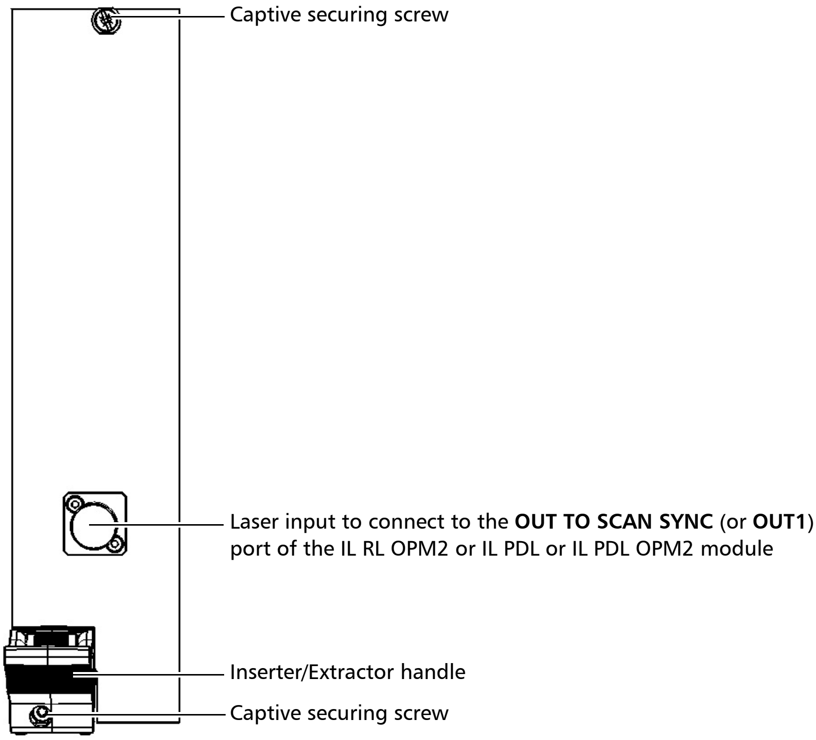
For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

SCAN SYNC Module

The SCAN SYNC module is a wavelength scan synchronization module, to use in combination with the IL RL OPM2, IL PDL or IL PDL OPM2 module. It enables you to perform optical sampling of a swept wavelength laser.

It provides high wavelength accuracy and removes the need of electrical triggering of the instrument.

It triggers data acquisition at the frequency given in *Technical Specifications* on page 3.



Optical Connectors

The **TLS IN** is a laser input port to connect the **OUT TO SCAN SYNC (**or **OUT1**) output port of the IL RL OPM2, IL PDL or IL PDL OPM2 module for optical sampling. For more details, see *Installing Your Test Setup* on page 51.

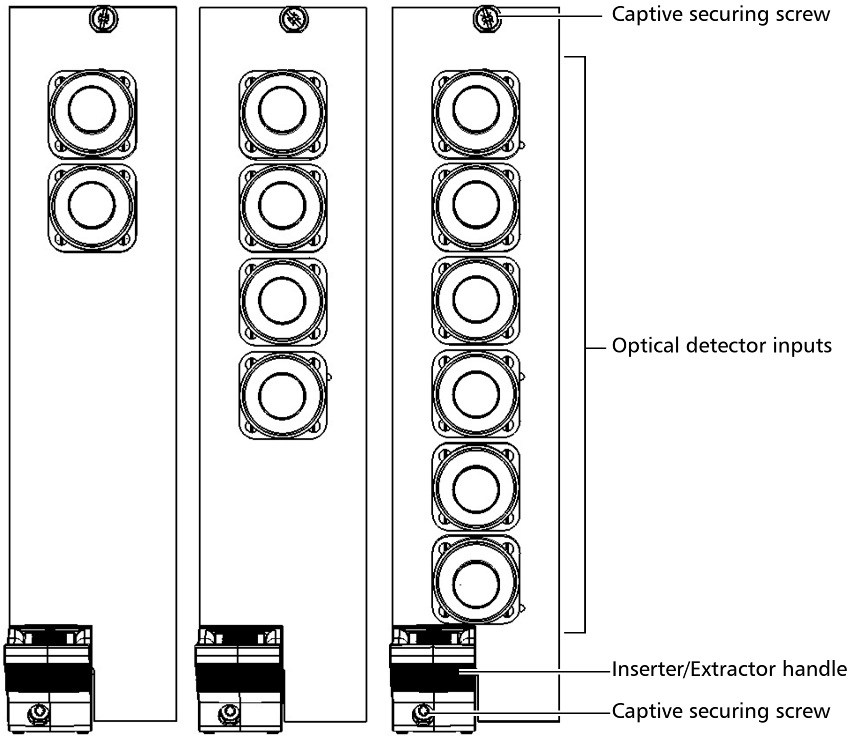
Inserter/Extractor handle

The module handle enables you to lock or unlock the module into the mainframe slot.

For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

OPMx Modules

The OPM module is a detection module for power measurement with two, four or six photo-detectors.



Detector inputs

On all models of OPM, the IN connectors are optical detector inputs to connect the devices under test (DUT) for power measurement.

For more details, see *Installing Your Test Setup* on page 51.

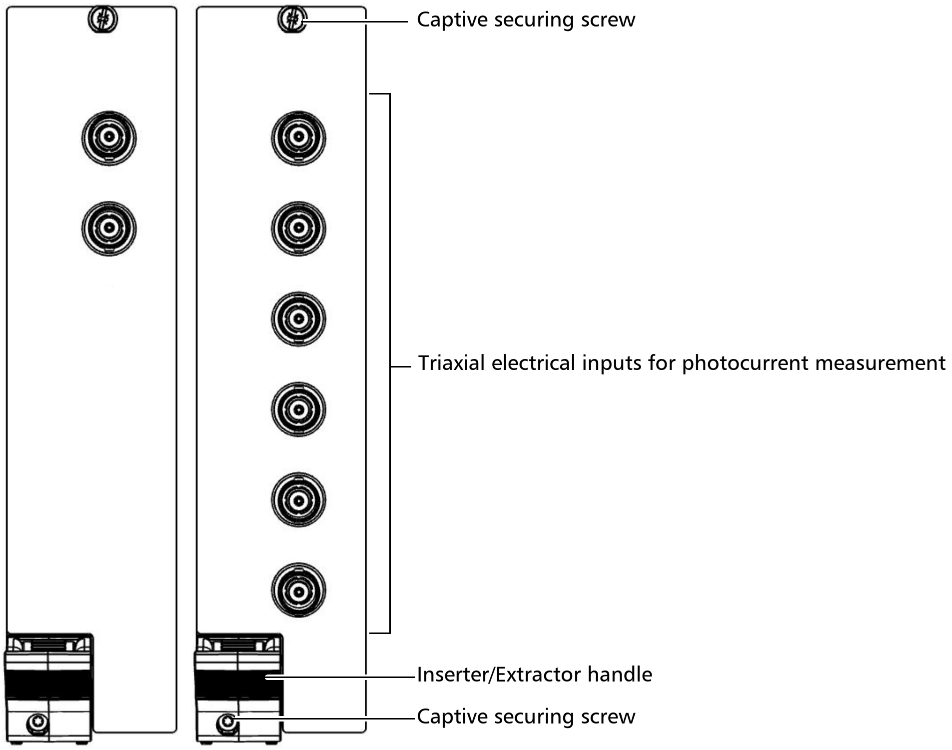
Inserter/Extractor handle

The module handle enables you to lock or unlock the module into the mainframe slot.

For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

PCMx Modules

The PCM module is a photocurrent meter with two or six triaxial electrical inputs.



Triaxial electrical detectors

On all models of PCM, the IN connectors are triaxial inputs to connect an external detector or a remote optical head with a triaxial cable for photocurrent measurements.

For more details on how to connect a photodiode, see *Connecting an External Photodiode to the PCM Module* on page 32.

Inserter/Extractor handle

The module handle enables you to lock or unlock the module into the mainframe slot.

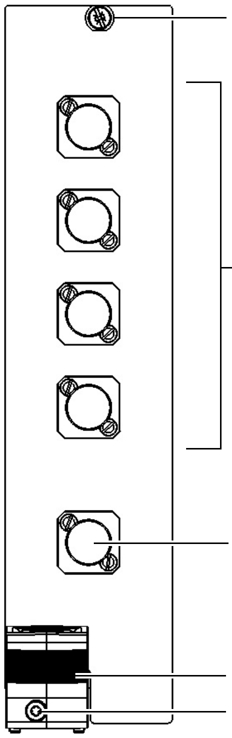
For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

FBC Module

The FBC module enables you to connect up to four tunable lasers to the CTP10. It switches between the available laser sources from one port to the next to direct the signal through a common output port so that multiple TLS can be used as a unique full band source.

You cannot use the FBC module with an IL PDL module. The FBC module (any option) is compatible with the IL RL OPM2 module and the FBC with M option is compatible with the IL PDL OPM2 module: see *CTP10 Module Compatibilities* on page 4.

The FBC with M option must be used with PM lasers and connected with PM fibers.



Optical Connectors

➤ **Laser inputs**

The **TLS IN1**, **TLS IN2**, **TLS IN3**, and **TLS IN4** are laser input ports to connect the tunable laser sources that you want the CTP10 to control.

If you use an FBC with M option, the lasers must be PM and connected to the module with PM fibers.

➤ **Output port**

FBC OUT is the signal output port to connect to the **TLS IN** port of the IL RL OPM2 or IL PDL OPM2 module for measurements (for more details, see *Installing Your Test Setup* on page 51). The FBC module is not compatible with the IL PDL module.

If you use an FBC with M option in combination with an IL PDL OPM2, the FBC to the **TLS IN** port of the IL PDL OPM2 module with a PM fiber.

Inserter/Extractor handle

The module handle enables you to lock or unlock the module into the mainframe slot.

For more details, see *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33.

CTP10 Graphical User Interface Overview

The CTP10 GUI has two main windows:

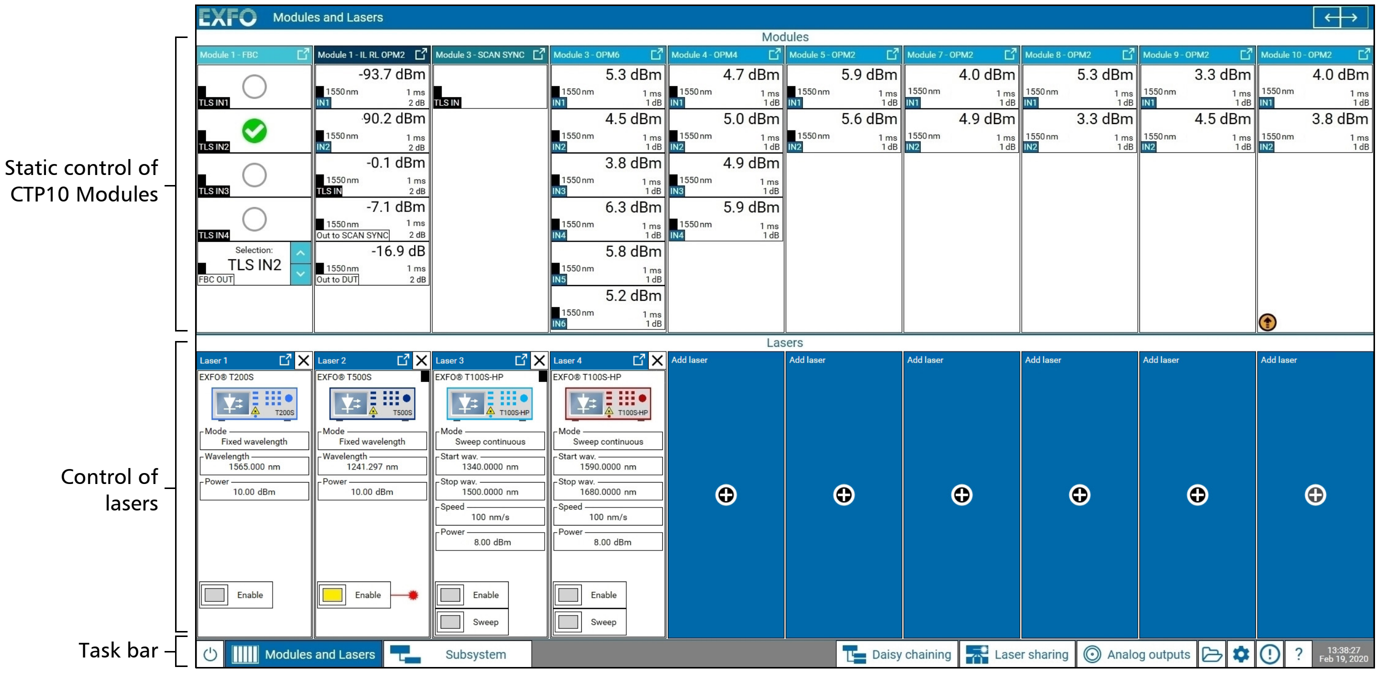
➤ The **Modules and Lasers** window for static measurement and control of the CTP10 modules and connected lasers: see *Modules and Lasers Window* on page 21.

➤ The **Subsystem** window for dynamic measurement: scanning of transfer function (TF) and back reflection (BR): see *Subsystem Window* on page 22.

Modules and Lasers Window

The upper part of the **Modules and Lasers** window displays all the modules plugged into the CTP10, with their related information and measured values. From this window, you can control and monitor the modules individually: for more details, see *Operating CTP10 Modules* on page 61.

The lower part of the **Modules and Lasers** window enables you to add, configure and control the lasers connected to the CTP10: for more details, see *Defining and Controlling Your Laser(s)* on page 87.



Subsystem Window

The **Subsystem** window enables you to perform dynamic TF, BR or PDL measurements using modules and instruments connected to the CTP10.

This window enables you to:

➤ Configure your test setup by graphically connecting all instruments: for more details, see *Defining Your Subsystem* on page 101.

➤ Define and start scanning operation: for more details, see *Performing Measurement Scans* on page 117.

➤ Display and handle the scan traces: for more details, see *Displaying and Handling Traces* on page 147.

➤ Analyze measurement traces: for more details, see *Analyzing Traces* on page 159.

Conventions

Before using the product described in this guide, you should understand the following conventions:

WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in *death or serious injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in *minor or moderate injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in *component damage*. Do not proceed unless you understand and meet the required conditions.

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

Abbreviations Used

Abbreviation	Meaning
AC	alternating current
APC	angled physical contact
BR	back reflection
CPU	central processing unit
CTP	component test platform
CW	continuous wave
DP	DisplayPort
DUT	device under test
FOA	fiber optic adapter
GPIB	general purpose interface bus
GUI	graphical user interface
I	photocurrent intensity
IL	insertion loss
LAN	local area network
PC	physical contact
PCM	photocurrent meter
PDL	polarization dependent loss
PM	polarization maintaining
PSG	polarization state generator
RL	return loss
RMS	root mean square
SCPI	standard commands for programmable instruments
SELV	safety extra-low voltage
SOP	state of polarization
TF	transfer function
WEEE	waste electrical and electronic equipment

2 Safety Information

WARNING

Do not install or terminate fibers while a light source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times.

WARNING

The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING

Use only accessories designed for your unit and approved by EXFO. For a complete list of accessories available for your unit, refer to its technical specifications or contact EXFO.

IMPORTANT

Refer to the documentation provided by the manufacturers of any accessories used with your EXFO product. It may contain environmental and/or operating conditions limiting their use.

IMPORTANT

When you see the following symbol on your unit , make sure that you refer to the instructions provided in your user documentation. Ensure that you understand and meet the required conditions before using your product.

IMPORTANT

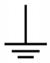
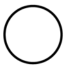
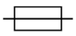
When you see the following symbol on your unit , it indicates that the unit is equipped with a laser source, or that it can be used with instruments equipped with a laser source. These instruments include, but are not limited to, modules and external optical units.

IMPORTANT

Other safety instructions relevant for your product are located throughout this documentation, depending on the action to perform. Make sure to read them carefully when they apply to your situation.

Other Safety Symbols on Your Unit

One or more of the following symbols may also appear on your unit.

Symbol	Meaning
	Direct current
	Alternating current
	The unit is equipped with an earth (ground) terminal.
	The unit is equipped with a protective conductor terminal.
	The unit is equipped with a frame or chassis terminal.
	On (Power)
	Off (Power)
 OR 	On/off (Power)
	Fuse

Optical Safety Information

WARNING

- **The modules and instruments that you use with your unit may have different laser classes. Refer to their user documentation for exact information.**
- **Do not install or terminate fibers while a light source is active.**
- **Never look directly into a live fiber and ensure that your eyes are protected at all times.**
- **Laser radiation may be encountered at the optical output port.**

Electrical Safety Information

This unit uses an international safety standard three-wire power cable. This cable serves as a ground when connected to an appropriate AC power outlet.

WARNING

- **If you need to ensure that the unit is completely turned off, disconnect the power cable.**
- **Use only the certified power cord that is suitably rated for the country where the unit is used.**
- **Replacing detachable MAINS supply cords by inadequately RATED cords may result in overheating of the cord and create a risk of fire.**

The color coding used in the electric cable depends on the cable. New plugs should meet the local safety requirements and include:

- adequate load-carrying capacity
- ground connection
- cable clamp

WARNING

- **Use this unit indoors only.**
- **Do not remove unit covers during operation.**
- **Operation of any electrical instrument around flammable gases or fumes constitutes a major safety hazard.**
- **To avoid electrical shock, do not operate the unit if any part of the outer surface (covers, panels, etc.) is damaged.**
- **Only authorized personnel should carry out adjustments, maintenance or repair of opened units under voltage. A person qualified in first aid must also be present. Do not replace any components while the power cable is connected.**
- **Your unit is equipped with an internal replaceable clock battery to keep time and date accurate. Only authorized personnel can replace this battery. Attempting to replace it yourself could seriously compromise your safety.**
- **Use only fuses with the required rated current and specified type . Do not use repaired fuses or short-circuited fuse holders. For more information, see the section about replacing the fuses in this user documentation.**
- **Unless otherwise specified, all interfaces are intended for connection to Safety Extra Low Voltage (SELV) circuits only.**
- **Capacitors inside the unit may be charged even if the unit has been disconnected from its electrical supply.**

CAUTION

Position the unit so that the air can circulate freely around it.

Equipment Ratings		
Temperature	Operation	+5 °C to +40 °C (+41 °F to +104 °F)
	Storage	-20 °C to +65 °C (-4 °F to +149 °F)
Relative humidity[a]		80 % for temperatures up to 31°C decreasing linearly to 50 % relative humidity at 40°C
Maximum operation altitude		< 2000 m (6562 ft)
Pollution degree		2
Overvoltage category		II
Measurement category		Not rated for measurement categories II, III, or IV
Input power[b]		100–240 V ～; 50/60 Hz; 3–1.3 A

a. Measured in 0 °C to 31 °C (32 °F to 87.8 °F) range, decreasing linearly to 50 % at 40 °C (104 °F).
b. Not exceeding ± 10 % of the nominal voltage.

CAUTION

- **The use of voltages higher than those indicated on the label affixed to your unit may damage the unit.**
- **The operation and storage temperatures, as well as the altitude and relative humidity values of some modules may differ from those specified for your unit. In this case, always ensure that you comply with the most restrictive conditions (either module or unit).**

3 Getting Started with Your CTP10

This section explains how to properly install and connect your CTP10 to build a test set-up:

- Unpack and install the CTP10:
  - *Unpacking and Installing the CTP10* on page 29.
  - *Connecting the CTP10 to a Power Source* on page 38.
- Install the CTP10 modules:
  - *Installing FOA on Detectors* on page 31.
  - *Connecting an External Photodiode to the PCM Module* on page 32.
  - *Handling CTP10 Modules Into the CTP10 Mainframe* on page 33
- Connect the CTP10 to external instruments:
  - *Connecting and Configuring External Screens to the CTP10* on page 39.
  - *Connecting a Mouse and Keyboard to the CTP10* on page 43.
- Start/stop the CTP10:
  - *Turning on the CTP10 and Accessing the GUI* on page 44.
  - *Turning off the CTP10* on page 46.

Unpacking and Installing the CTP10

The CTP10 is designed for indoor use only, and is not dedicated to wet locations. It must be operated under proper environment conditions, as explained in the following procedure.

You can use the CTP10 as a bench-top instrument or you can install it in a 19" rack.

CAUTION

- **Make sure the location where the CTP10 will be installed meets the environmental characteristics listed in *Electrical Safety Information* on page 27.**
- **Do not install the CTP10 near any source of heat or cold.**
- **To ensure proper ventilation and cooling, make sure there is sufficient clearance below and at the rear of the CTP10 in the place where it will be installed.**

To unpack and install the CTP10:

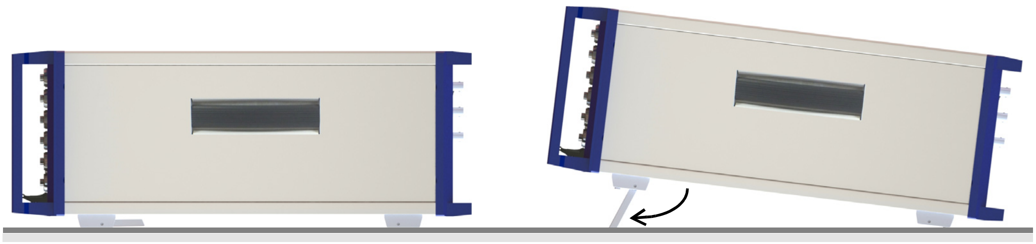
1. Open the package with care and remove the protective foam.

IMPORTANT

When unpacking, handle the device with care and do not damage the original shipping container in case the CTP10 needs to be returned to EXFO.

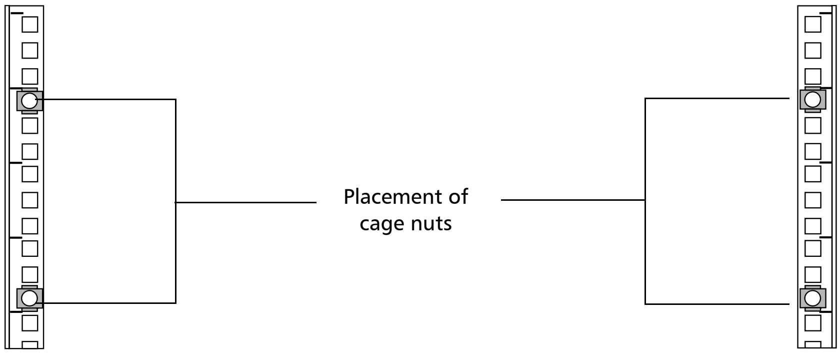
2. Pull out the CTP10 vertically from its packaging: hold it by its two retractable handles located on the side panels and keep it horizontal.
3. Do one of the following:
   - To use the CTP10 as a bench-top instrument, set it on a flat stable surface free of excessive vibration.
   - To install the CTP10 in a 19-inch rack, follow the instruction detailed in on page 30.

4. Allow the flow of air to circulate freely under and at the rear of the CTP10 and remove any equipment or paper that could block the air flow. Ventilation holes are located on the bottom and rear sides of the CTP10.
5. On the rear panel (see *Rear panel* on page 9), make sure the power switch is set to **O**.
6. To tilt the CTP10 upward (bench-top use only), deploy the two retractable legs located below it, as illustrated in the following figure.



To Install the CTP10 in a 19-inch rack:

1. Make sure that:
   - You have a 4U space in your rack
   - You have four rack mounting screws and cage nuts (no rack fastening kit is provided).
   - There is enough empty space underneath the space reserved for the CTP10, to be able to hold it from below.
2. Install 4 cage nuts at the desired height on the rack, as illustrated below:



3. With assistance, lift the CTP10 to its position in the rack by holding it from below.
4. Use the rack mounting screws to attach the CTP10 rack mounting brackets to the front of the rack.

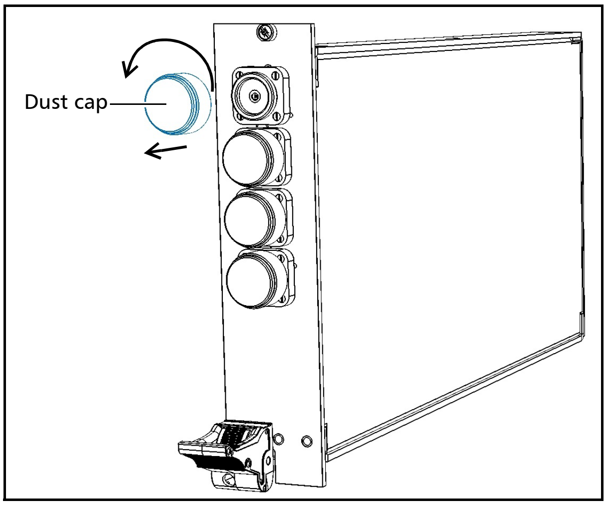
Installing FOA on Detectors

The fiber optic adapters (FOA) are delivered with your CTP10 modules; you must install them on the detector connectors to be able to use them.

Only use CTP10-specific fiber optic adapters.

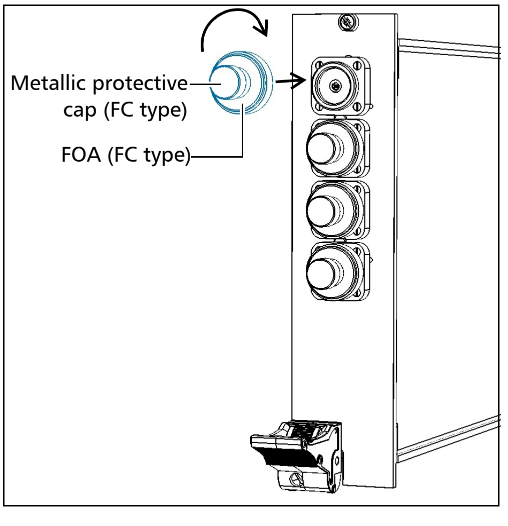
To install an FOA on a detector:

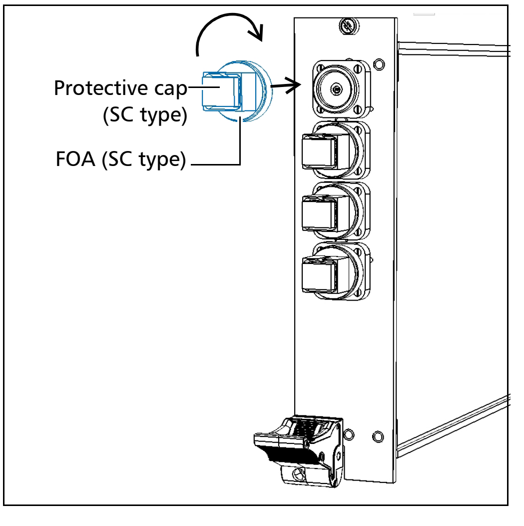
1. On the module front panel, use your fingers to unscrew the dust cap from the connector. Keep the dust cap in safe place in case you need to use it to ship the module.



2. Take the FOA (and its protective cap) out of its packaging; do not remove the protective cap from the FOA.

3. Use your fingers to screw the fiber optic adapter (FOA) with its protective cap on the connector.

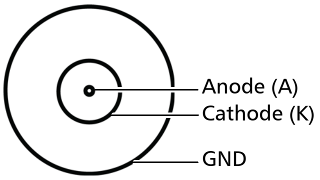




Connecting an External Photodiode to the PCM Module

To connect an external photodiode to the PCM module, you must use a triaxial cable with the following connections:

- Center contact: photodiode anode (A). Never connect any voltage source to this contact point, only connect a photodiode anode pin.
- Outer contact: photodiode cathode (K)
- Shield: GND



To connect the PCM module to the remote photodiode:

CAUTION

To avoid damaging the PCM module:

- **Make sure to strictly follow ESD protection instructions when the cable is connected only at one side: do not touch the accessible center and outer contacts of the cable, it may cause permanent damage to the connected device on the other side (module or photodiode in the remote optical head).**
- **Never apply voltage on the module.**

1. Connect the triaxial cable to the photodetector head.
2. Connect the other side of the cable to the PCM module.

Handling CTP10 Modules Into the CTP10 Mainframe

You can install the CTP10 modules in the CTP10 mainframe in any of the available 10 slots and in any combination alongside other types of modules supported by the CTP10.

CTP10 modules are hot-swappable: you do not need to turn off the unit before inserting or removing a module.

➤ To install/remove a cover plate, see *Removing/Installing a Cover Plate* on page 33

➤ To install a module, see *Installing a Module Into the CTP10 Mainframe* on page 35

➤ To remove a module, see *Removing a Module From the CTP10 Mainframe* on page 37

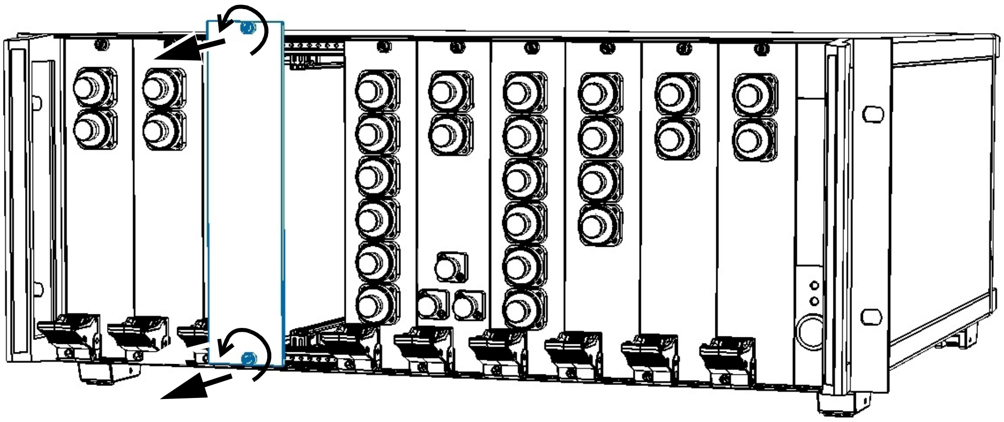
Removing/Installing a Cover Plate

CAUTION

Do not operate the CTP10 mainframe if a slot is left open. Always put back the protection cover plate on an empty slot. Failure to reinstall protective covers over empty slots will result in ventilation problems.

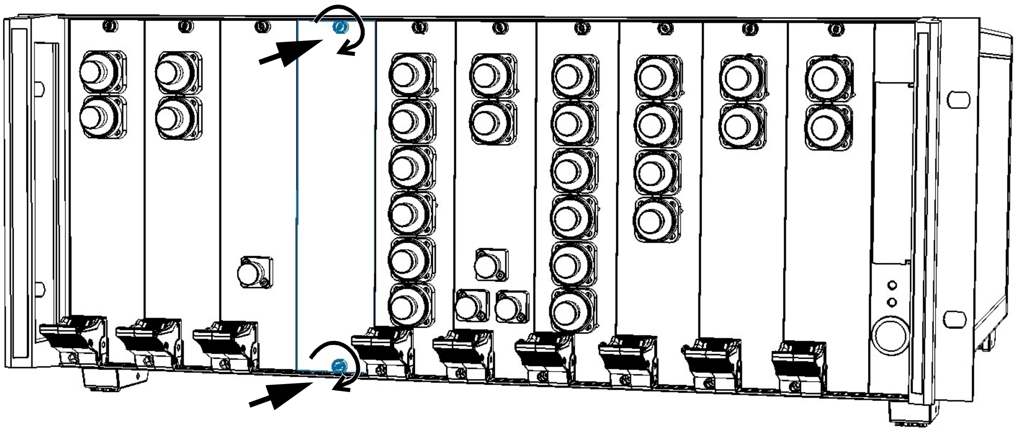
To remove a cover plate from an empty slot:

1. Loosen the bottom and top captive screws using a slot head or Phillips head (recommended) screwdriver (size #1).
2. Remove the plate.



To install a cover plate on an empty slot:

Place the cover plate on the empty slot and tighten the top and bottom captive screws of the module using the slot head or Phillips head (recommended) screwdriver (size #1).



Installing a Module Into the CTP10 Mainframe

This section explains how to install a CTP10 module into an empty slot of the CTP10 mainframe. You cannot connect an other module type in the CTP10 mainframe. All CTP10 modules can be installed in any of the available 10 slots of the CTP10 mainframe and in any combination alongside other types of CTP10 modules.

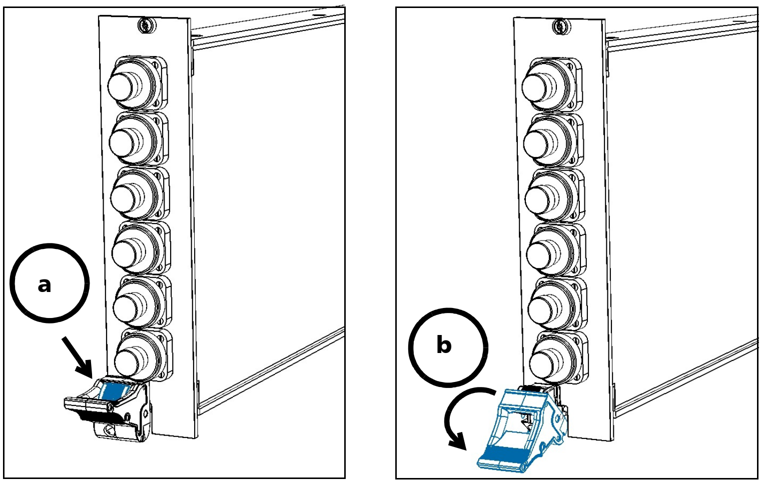
To insert a module into the CTP10 mainframe:

1. Make sure you have a slot head or Phillips head (recommended) screwdriver (size #1).
2. Unpack the CTP10 module by opening the package with care and remove the CTP10 module from its packaging.

IMPORTANT

When unpacking, handle the device with care and do not damage the original shipping container in case the module needs to be returned to EXFO.

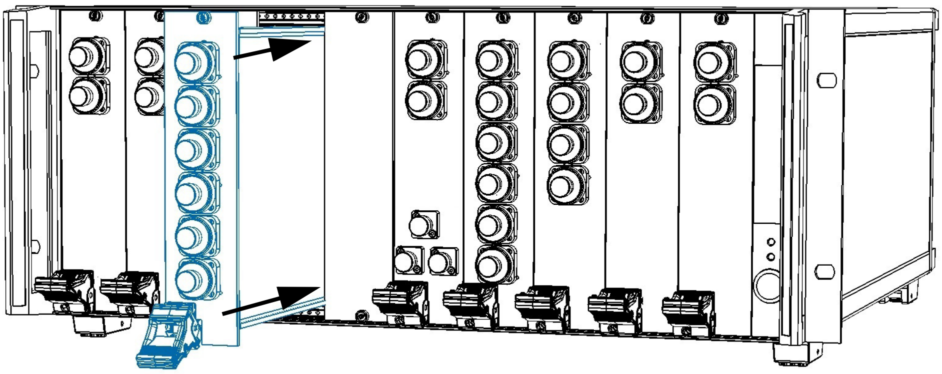
3. If a cover plate or a module is installed on the slot where you want to install the module, remove it as explained in *Removing/Installing a Cover Plate* on page 33 or *Removing a Module From the CTP10 Mainframe* on page 37.
4. Lower the module inserter/extractor handle as follows: use your thumb to press the grey button and hold the button pressed while you lower the black handle.



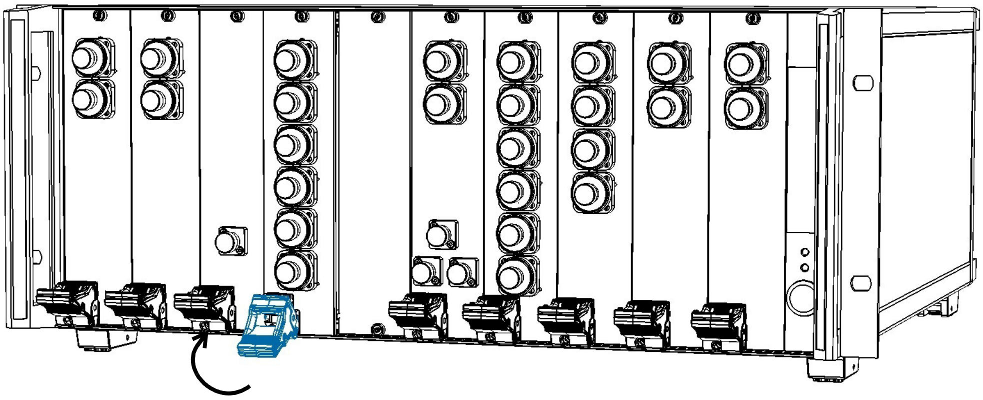
5. Hold the module with both hands by its top and bottom edges in front of the open slot to align the top and bottom edges of the module with the slot grooves on the CTP10 chassis, and insert the module into the open slot.

CAUTION

To avoid damaging the internal optical components, do not squeeze the module sideplates.



6. Push the module into the slot until the black handle touches the mainframe.
7. Lift the handle up until the grey button clicks into position.



The module is correctly inserted when its front panel is flush with the front panel of the unit. If the module is not properly locked into position, it will not be displayed on the GUI.

8. To secure the module in place, tighten the two captive screws of the module using the appropriate screwdriver.

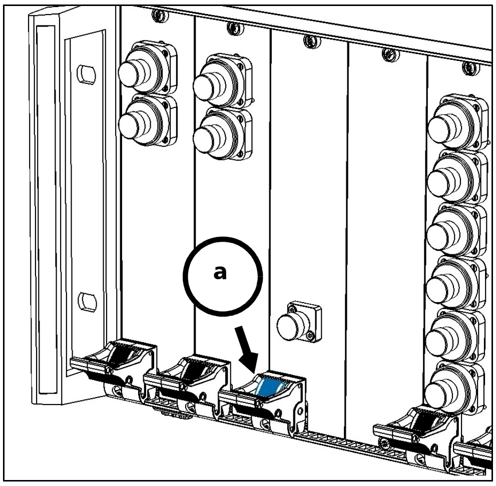
Removing a Module From the CTP10 Mainframe

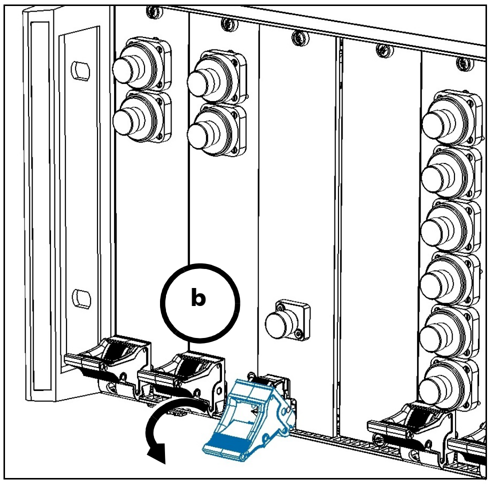
This section explains how to remove a module from the CTP10 mainframe.

Removing a module from the CTP10 mainframe definitely removes it from the subsystem in which it is used. All measurements using the module are immediately stopped.

To remove a module from the CTP10 mainframe:

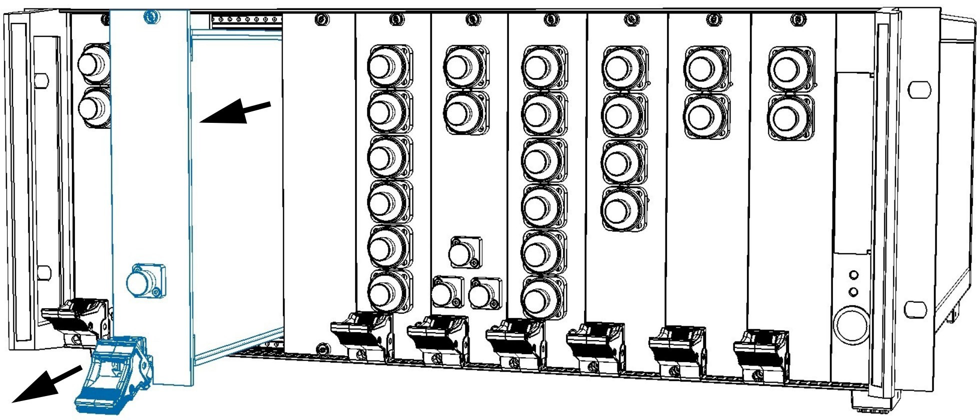
1. Make sure you have a slot head or Phillips head (recommended) screwdriver (size #1).
2. On the CTP10 mainframe front panel, loosen the captive screws of the module using the appropriate screwdriver.
3. Put your thumb on the grey button and press it while you lower the black handle.





The module is released from the mainframe slot.

4. Pull the module out by sliding it out from the slot.



CAUTION

Pulling out a module by its connectors could seriously damage both the module and connectors. Always pull out a module by its casing.

5. Hold the module with both hands by its top and bottom edges and put it in its original container.
6. Cover the empty slots with the supplied cover plates as explained in *Removing/Installing a Cover Plate* on page 33.

CAUTION

Do not operate the CTP10 mainframe if a slot is left open. Always put back the protection cover plate on an empty slot. Failure to reinstall protective covers over empty slots will result in ventilation problems.

Connecting the CTP10 to a Power Source

The CTP10 has a chassis connected to ground via the power supply cable. A protective ground connection by way of the grounding conductor in the power cable is essential for safe operation.

WARNING

- ➤ **Make sure the wall socket on which the CTP10 will be plugged is protected by a 16 A max circuit breaker.**
- ➤ **Make sure the CTP10 power source does not apply more than 265 Volts RMS between the supply conductors and the ground.**
- ➤ **To avoid the possibility of injury, make sure the socket outlet in which the power supply cable will be plugged is equipped with a protective ground contact, and that the electrical installation fulfills the local safety requirements.**

To connect the CTP10 to a wall socket:

1. Make sure the power switch is set to **O**.
2. On the rear panel, connect the power supply cable provided with the instrument to the mains socket located on the rear panel of the CTP10.
3. Plug the other end of the power supply cable to the proper voltage wall socket outlet (to know the voltage requirement, see *Technical Specifications* on page 3).
4. On the rear panel, set the power switch to **I**.

Connecting and Configuring External Screens to the CTP10

You must connect at least one external screen to the CTP10 to display the CTP10 GUI and control the instrument (two screens at most).

External screen connectors are all located on the rear panel of the CTP10. For more details, see *Rear panel* on page 9.

Before starting:

➤ Make sure the screens you want to connect to the CTP10 meet the requirements detailed in **Interfaces for External Devices on page 3**.

➤ Make sure the screen you want to connect to the CTP10 can connect to an HDMI port or a DisplayPort directly or through an adapter.

➤ Make sure you have the appropriate connection cable(s) to connect your external screen.

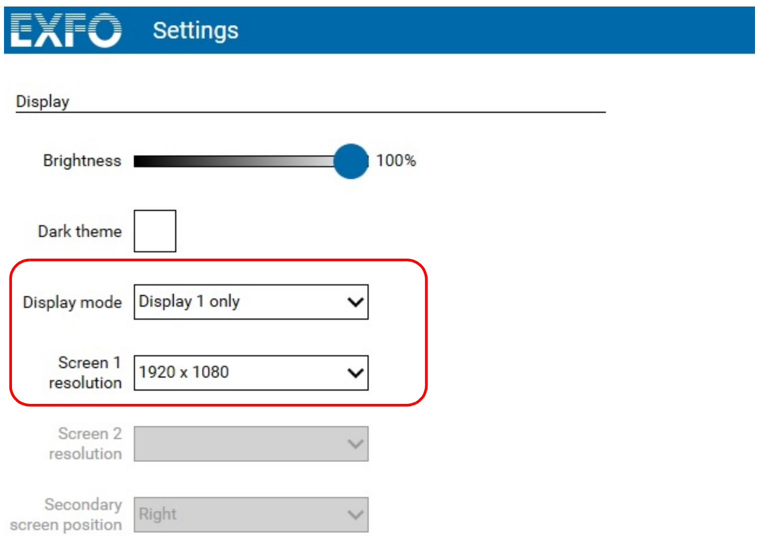
Connecting an External Screen to the CTP10

You must connect at least one external screen to the CTP10 to display the CTP10 GUI that enables you to operate the instrument.

To connect an external screen to the CTP10:

1. Connect the screen to one of the two available display connectors of the **Display 1** group of connectors located on the rear panel of the CTP10 (see *Rear panel* on page 9) with the appropriate cable.
2. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
3. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Display** area enables you to set the screen resolution.



4. In the **Screen 1 resolution** list, set your screen resolution. The recommended value is the screen native resolution.

Connecting a Secondary Screen to the CTP10

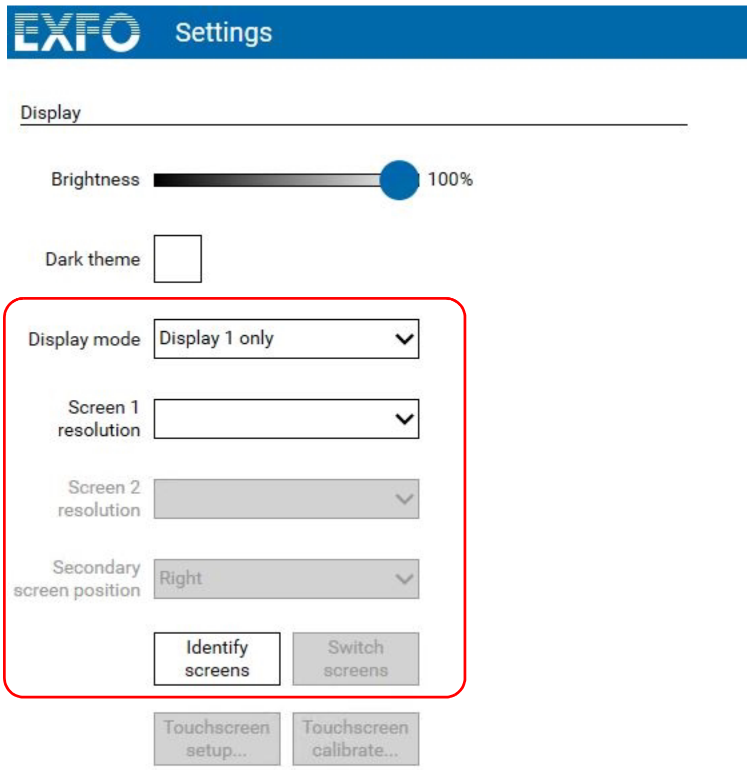
IMPORTANT

If you want to connect two screens to the CTP10, you must connect one screen to one of the connectors marked as "Display 1" and the other screen to one of the connectors marked as "Display 2". You cannot connect the two screens to the same group of connectors.

To connect a second screen to the CTP10

1. Connect the second screen to one of the two available display connectors of the **Display 2** group of connectors (on the rear panel) with the appropriate cable.
2. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
3. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Display** area enables you to set the screen, resolution and position parameters.



4. Click the **Identify screens** button to clearly identify Screen 1 and Screen 2, with their corresponding set resolution.
5. In the **Screen 2 resolution** list, set your second screen resolution. The recommended value is the screen native resolution.

6. In the **Display mode** list, select the wanted mode for your screen(s):
   - **Display 1 only**: all windows of the CTP10 GUI are displayed on the same display 1.
   - **Display 2 only**: all windows of the CTP10 GUI are displayed on the same display 2.
   - **Duplicate**: displays the same window on the two different connected screens.
   - **Extend** (default): displays a different window on each connected screen simultaneously. Recommended setting to fully use the two screens simultaneously.

     In this case, you can set Screen 1 to Screen 2 and the Screen 2 to Screen 1 by clicking the **Switch screens** button.
7. In the **Secondary screen position** list, select the physical position of your second screen relative to the Screen 1. This enable you to intuitively move the mouse from one screen to another.

To change screen:

- To send the window displayed on Screen 1 to Screen 2 (only applies if **Display mode** is set to **Extend** in the **Settings** window):

  On the top right of the open window, click the  button.

  The window appears on Screen 2, which enables you to open a new window on Screen 1.
- To open a window directly on Screen 2 (if available):

  In the task bar, right-click the corresponding window button.

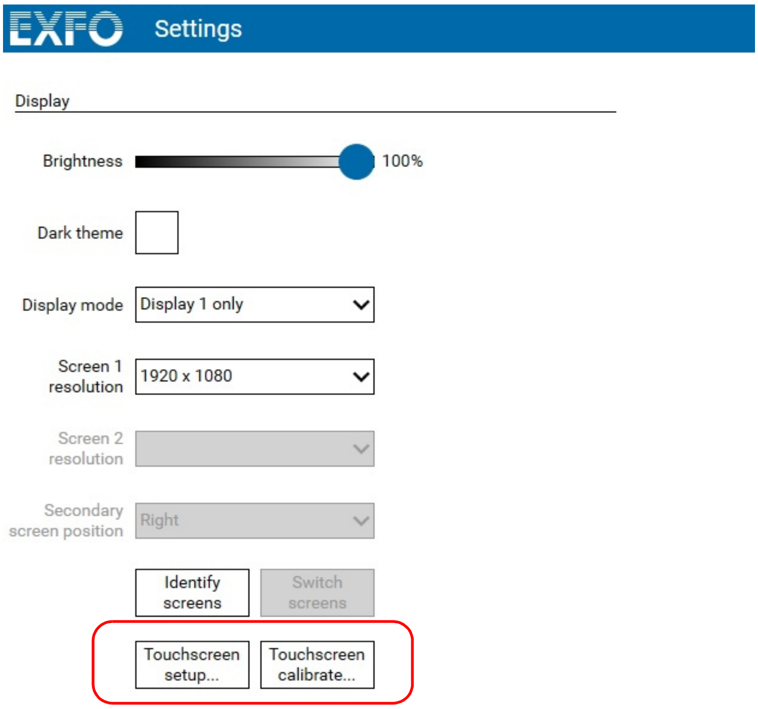
Configuring a Touchscreen

If your external screen is a touchscreen, you can operate the CTP10 from the connected screen with multi-touch gestures.

To connect and configure a touchscreen:

1. Connect the USB-B port of your touchscreen to one of the USB-A ports of the CTP10.
2. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
3. In the CTP10 task bar, click the button.

   In the **Settings** window, two buttons in the **Display** area enable you to set the touchscreen parameters.



4. Click the **Touchscreen setup...** button and follow the instructions displayed on screen to clearly identify the touchscreen display.
5. If you detect a problem in the touchscreen accuracy, click the **Touchscreen calibrate...** button to calibrate the touchscreen display.

IMPORTANT

Before calibrating a touchscreen, make sure to set the screen to its highest resolution to be able to calibrate it properly.

Connecting a Mouse and Keyboard to the CTP10

To operate the CTP10 GUI, you can connect a USB mouse and keyboard to the USB-A 2.0 and USB-A 3.0 ports located on the front and rear panels of the CTP10 (see *CTP10 Mainframe Overview* on page 7).

To connect a mouse and keyboard:

Do one of the following:

- Connect the USB mouse and keyboard to one of the available USB-A ports of the CTP10 mainframe (you do not need to restart the CTP10).
- Connect one of the screens to the USB-A port of the CTP10 and directly connect the USB mouse and keyboard to the USB-A ports of the screen.

All operations available using the multi-touch screen are also accessible using the mouse and keyboard.

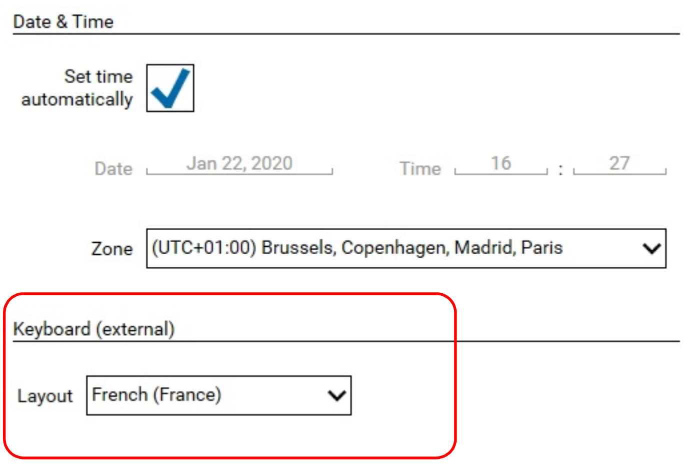
If a keyboard is connected, the Windows keyboard shortcuts Ctrl + C, Ctrl + X and Ctrl + V are only available in text entry areas.

To configure your keyboard using the GUI:

If you connect an external keyboard to the CTP10, you can set the language layout corresponding to the external keyboard you have connected.

1. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
2. In the CTP10 task bar, click the  button to display the **Settings** window.

   The **Keyboard** area enables you to switch between QWERTY and AZERTY keyboard.



3. Select the appropriate keyboard in the **Layout** list:
   - French (France): AZERTY keyboard
   - English (United States): QWERTY keyboard

To rapidly switch the keyboard from one language to the other:

On your keyboard, press Alt + Shift.

Turning on the CTP10 and Accessing the GUI

At startup, the CTP10 GUI appears on the connected screens. The task bar enables you to access all the CTP10 functions.

To access the CTP10 graphical user interface:

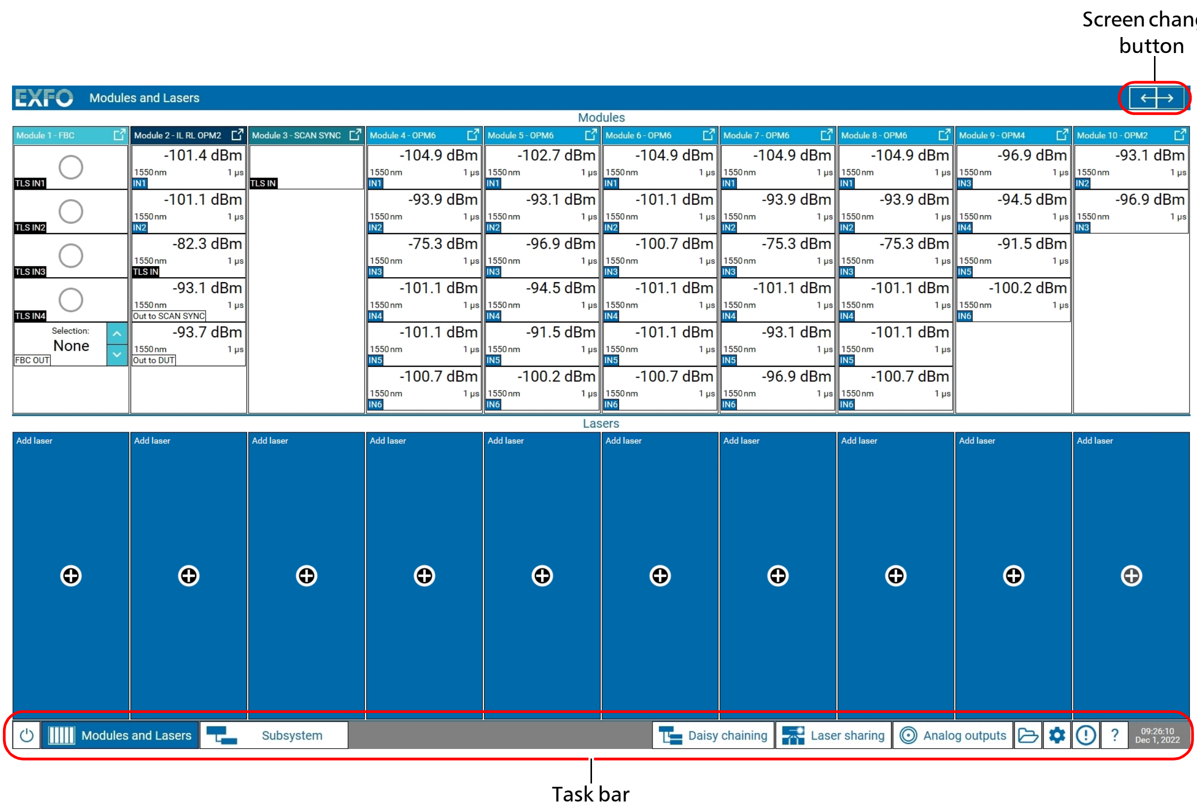
1. Make sure the CTP10 is properly installed: see *Unpacking and Installing the CTP10* on page 29.
2. On the CTP10 front panel, press the on/off button (see *Front panel* on page 7).

   After a few seconds, the button lights up.

   The startup procedure takes approximately 90 s; the startup time depends on the number of modules to load.
3. If you start the CTP10 for the first time, accept the license agreement.

   Once started, the **Modules and Lasers** window appears on screen and the last user configuration is loaded.

   Access the wanted CTP10 function by using the task bar:



Task Bar Button	Description
	Turns off the CTP10. For more details, see *Turning off the CTP10* on page 46.
Modules and Lasers	Displays the **Modules and Lasers** window, to perform static measurement and control the CTP10 modules and connected lasers. For more details, see *Operating CTP10 Modules* on page 61 and *Defining and Controlling Your Laser(s)* on page 87.
Subsystem	Displays the **Subsystem** window, which enables you to perform dynamic measurement: transfer function (TF), polarization dependent loss (PDL) and back reflection (BR) scanning and analysis. For more details, see *Defining Your Subsystem* on page 101.
Daisy chaining	Displays the **Daisy chaining** menu, which enables you to connect the current CTP10 to another, in order to increase the number of optical detectors on your setup by using those of the other CTP10 for measurements. For more details, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Laser sharing	Displays the **Laser sharing** menu, which enables you to connect the current CTP10 to seven CTP10s so that they can benefit from the tunable lasers connected to the current CTP10 for their acquisition. For more details, see *Sharing the Lasers with Several CTP10s* on page 95.
Analog outputs	Enables you to output internal measurements as analog signals. For more details, see *Generating Output Analog Signals* on page 144.
	Displays the **File Explorer** window, to access the drives available from the CTP10 and handle corresponding files. For more details, see *Handling Files and User Data* on page 199.
	Displays the **Settings** window, to define the CTP10 general parameters, connect the CTP10 or manage CTP10 data.
	Displays the last 100 main errors and/or warnings that occurred on the CTP10. For more details, see *Displaying the List of Errors and Warnings* on page 239.
?	➤ The **Help** command displays the *CTP10 User Guide*. ➤ The **About** command displays information about the CTP10, the license agreement and a customer support contact list.

Turning off the CTP10

If you turn off the CTP10, the last user configuration is kept in memory to be loaded at next startup.

CAUTION

Never turn the CTP10 off by directly setting the power switch to O.

To turn the CTP10 off:

1. Make sure that no scan or analyze is in progress. You cannot shut down the system if a subsystem is busy.
2. Do one of the following:
   - In the CTP10 GUI task bar, click the button.

     A confirmation message appears: click **Yes**.
   - On the CTP10 front panel, shortly press the on/off button.

   The CTP10 stops.
3. On the rear panel, set the power switch to **O**.

4 Setting Up Your CTP10

This section explains how to set general parameters and install your test setup:

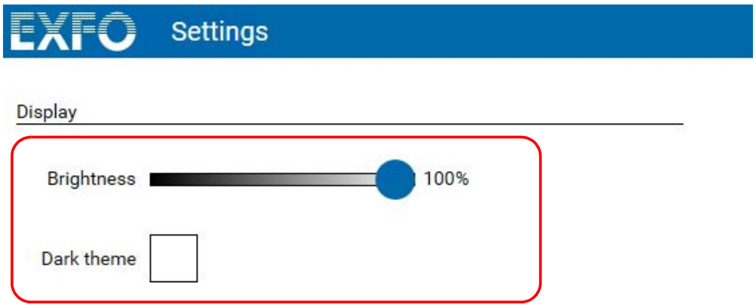
Defining the GUI Colors

You can change the theme of the GUI and modify its brightness as explained in the following procedures.

To modify the GUI brightness and theme:

1. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Display** area enables you to define the colors of the CTP10 GUI.



2. To increase or decrease the brightness of the CTP10 GUI, slide the **Brightness** cursor or use the following keyboard shortcuts: Ctrl + ← and Ctrl + →
3. To shift the light colors on screen to darker colors, select the **Dark theme** check box or use the following keyboard shortcut: Ctrl + D.
   This operation takes approximately 10 seconds.

Setting the Date and Time

The date and time set here will be used for all measurements of the subsystem: the date and time of trace scans are saved with the traces and the date and time of trace analysis are saved with the analysis results.

If the CTP10 is connected to a network, it can automatically set the date and time depending on your time zone. You can also choose to manually set the date and time.

To set the date and time:

1. In the CTP10 task bar, click the button to display the **Settings** window.

The **Date & Time** area enables you to set the date and time of the CTP10.

2. To manually set the date and time:

2a. Clear the **Set time automatically** check box.

2b. Click the **Date** and **Time** fields to enter the date and time of your location.

2c. In the **Zone** list, select the time zone of your location.

3. If your CTP10 is connected to a network and you want the date and time to be automatically set by the CTP10:

3a. Select the **Set time automatically** check box.

3b. In the **Zone** list, select the time zone of your location.

The date and time is automatically set.

Connecting the CTP10 to your Company Network

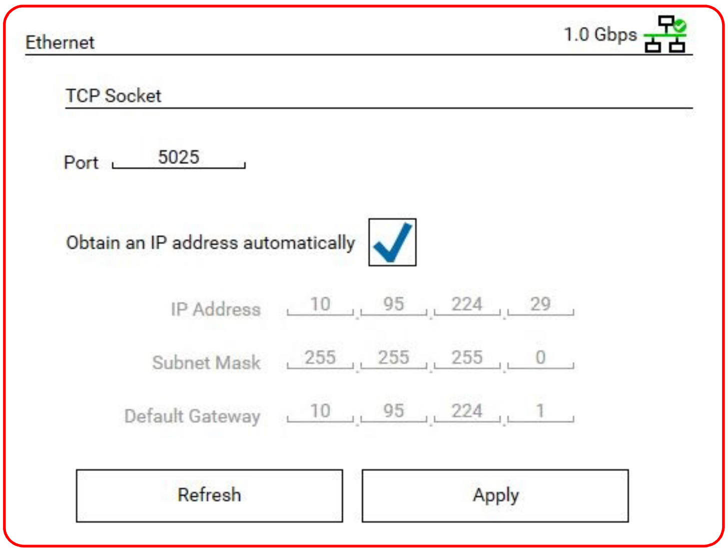
The Ethernet port enables you to connect your CTP10 to your company network.

It also allows you to perform remote control operations on the CTP10. For more details, see *Remotely Controlling the CTP10* on page 205.

To connect the CTP10 to your company network:

1. In the CTP10 task bar, click the button to display the **Settings** window.

The **Ethernet** area enables you to configure the Ethernet connection of the CTP10.



- ➤ : indicates that the connection is established and displays the connection speed.
- ➤ : indicates that the connection to the network is not established, or that the CTP10 is directly connected to a computer (see *Setting the CTP10 Ethernet Port* on page 205).
- ➤ : indicates that the port is not connected to any external device.

2. In the **Port** field, set the TCP destination port of the CTP10, to allow data transmission between the CTP10 and an external computer for remote control.
Default value: 5025 (SCPI-RAW)
The value is automatically taken into account.

IMPORTANT

- ➤ **Make sure that the firewall of your computer allows communication on this port.**
- ➤ **Do not use this port to connect CTP10s for laser sharing purposes (for more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95).**

3. To manually set the connection parameters:

3a. Clear the **Obtain an IP address automatically** check box.

3b. Set the IP address, subnet mask and gateway to identify your CTP10.

4. To automatically retrieve the connection parameters (IP address, subnet mask and default gateway) from the connected network (DHCP), select the **Obtain an IP address automatically** check box.

The connection is automatically established. You cannot modify the connection values.

5. Click **Apply** to validate the set connection parameters.

6. If you want to retrieve the previously applied connection parameters, click the **Refresh** button.

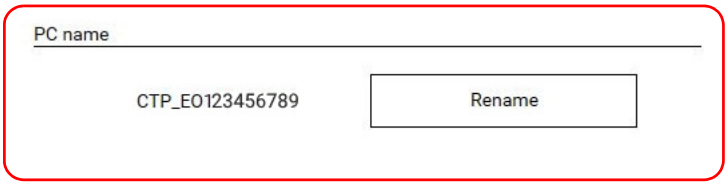
Renaming the Instrument

The default instrument name is "CTP10<serial number>". The following procedure explains how to change the instrument name.

To change the instrument name:

1. In the CTP10 task bar, click the  button to display the **Settings** window.

The **PC name** area enables you to rename the CTP10.



2. Click the **Rename** button.

3. Modify the instrument name and click **Rename**.

The instrument name will be modified at next startup.

Installing Your Test Setup

This section gives an overview of the DUT characterization steps using the CTP10 and gives examples of typical subsystem setups:

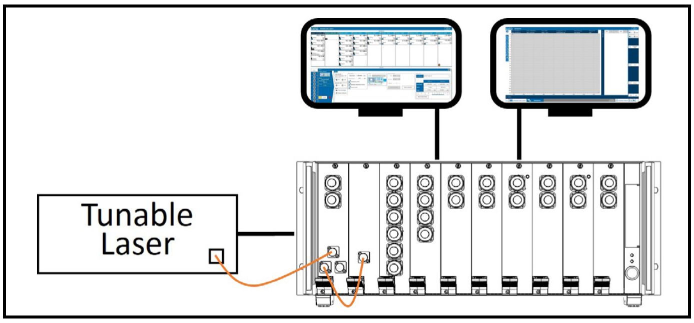
➤ *Overview Diagram* on page 51

➤ *Typical Test Setups* on page 53

Overview Diagram

The following diagram gives an overview of the DUT characterization procedure using the CTP10.

Connect and configure your laser(s) to the CTP10



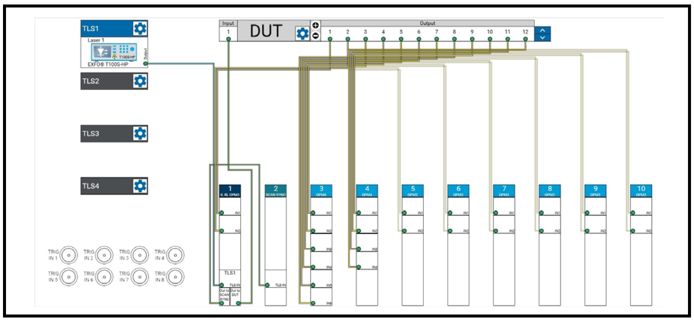
1. Physically connect the laser(s) to your CTP10.

2. Configure the laser connection from the GUI.

Related section:

Defining and Controlling Your Laser(s) on page 87.

Configure your test setup



Configure your test setup from the subsystem setup menu.

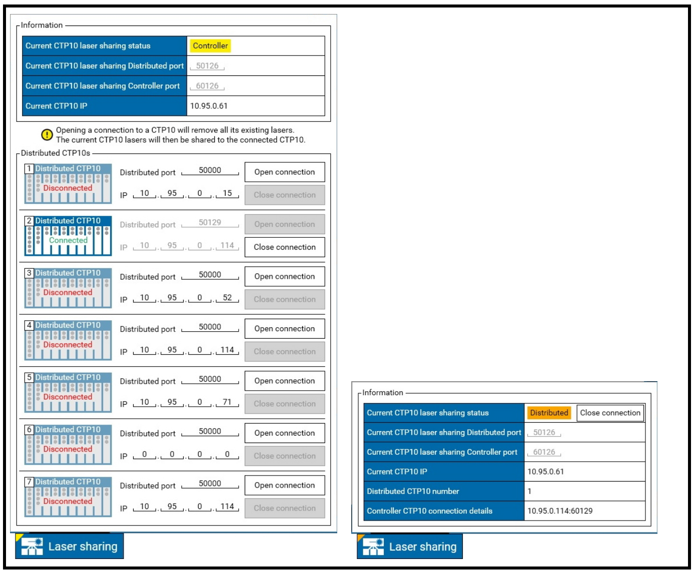
If you need more detectors, you can use the Daisy chaining function (not available with the IL RL OPM2 module).

Related section:

Setting up Your Subsystem on page 103

Using Additional OPMs (Daisy Chaining mode) on page 109

Share the lasers with other CTP10s if needed (not compatible with Daisy chaining)

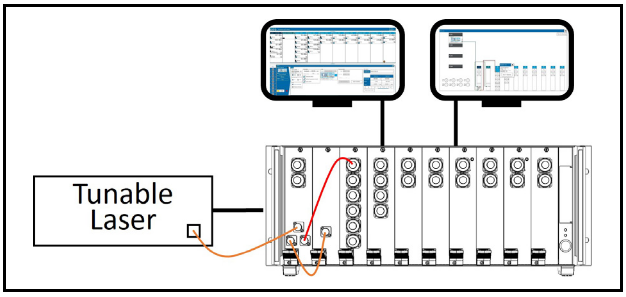


If needed, enter the laser sharing mode by connecting the Controller CTP10 to Distributed CTP10s.

Related section:

Sharing the Lasers with Several CTP10s on page 95.

Configure the scan parameters and reference the subsystem

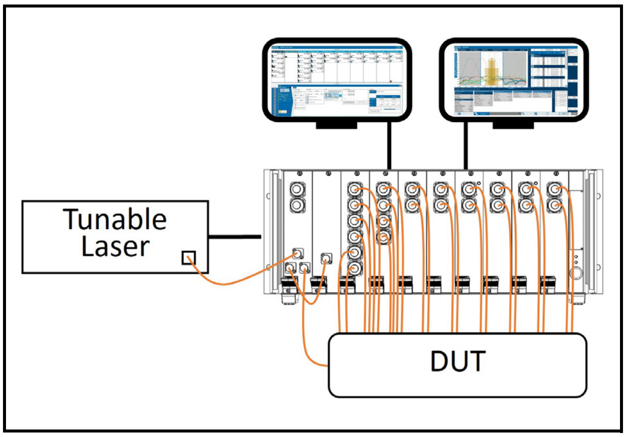


- TF and BR referencing on OPM detectors (with the IL RL OPM2 module).
- TF and PDL referencing on OPM detectors (with the IL PDL or IL PDL OPM2 module).
- Wavelength referencing.
- Dark current referencing.

Related sections:

- *Defining the Scan Parameters* on page 117.
- *Referencing the Subsystem* on page 130.

Test your DUT



- Scan.
- Trace display.
- Analysis.
- Data management.

Related sections:

- *Performing Acquisition Scans* on page 136.
- *Displaying and Handling Traces* on page 147.
- *Analyzing Traces* on page 159.
- *Handling Subsystem Data* on page 114.

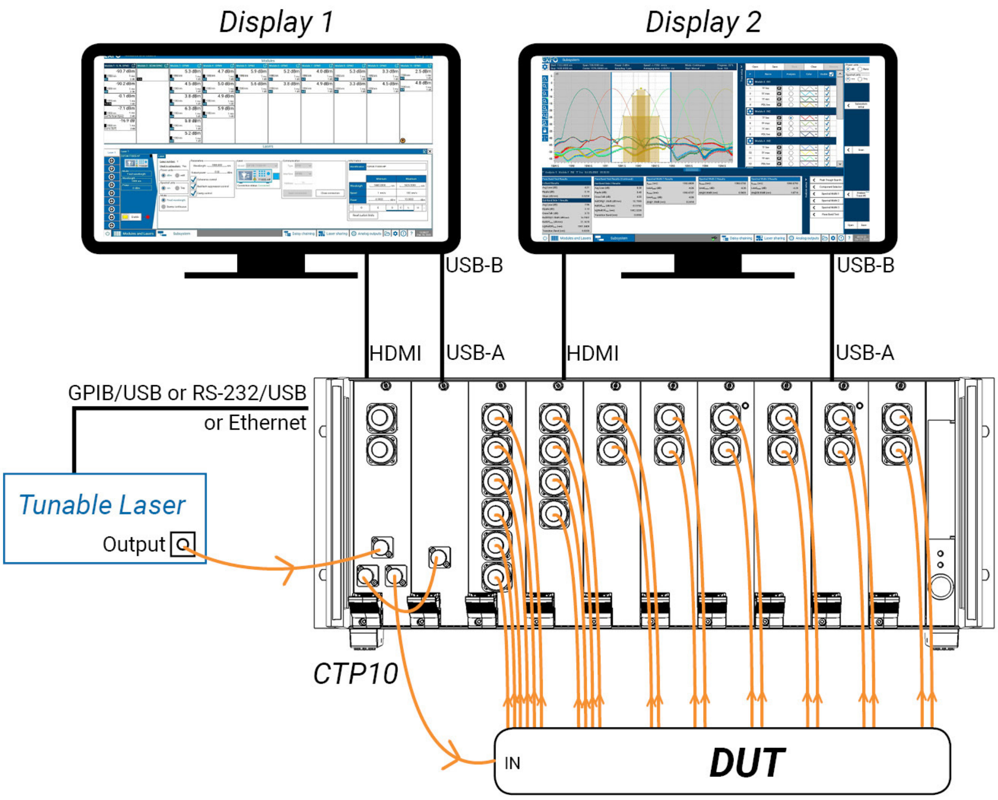
Typical Test Setups

Typical IL/RL test setup with one laser

The following figure illustrates an example of test setup with one tunable laser.

The CTP10 controls the laser via Ethernet or via an adapter (USB-RS232 or USB-GPIB) depending on the laser used. The laser output is directly connected to the TLS IN input connector of the IL RL OPM2 module.
The IL RL OPM2 module is connected to the SCAN SYNC module for optical sampling and to the DUT for TF/BR measurements.

The CTP10 uses the laser optical trigger for data acquisition with the help of the SCAN SYNC module, which performs optical sampling.

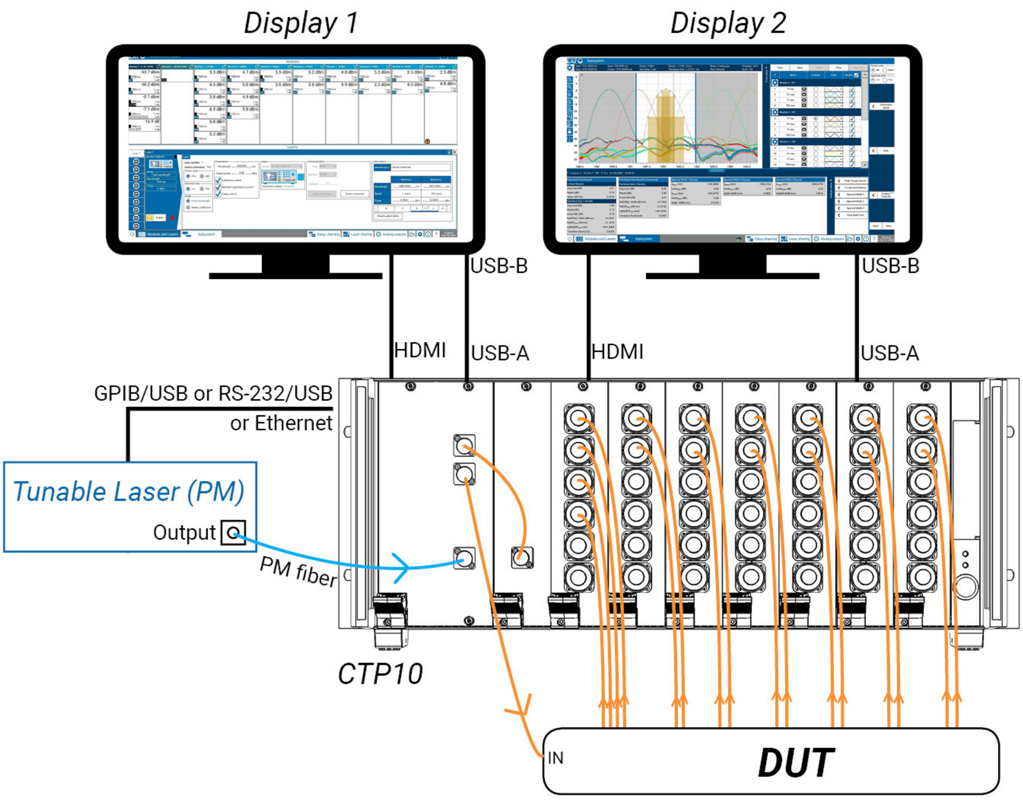


Typical IL/PDL test setup

The following figure illustrates the typical test setup with an IL PDL module.

The CTP10 controls the tunable laser via Ethernet or via an adapter (USB-RS232 or USB-GPIB), depending on the laser used.
The laser used must be a PM tunable laser. The laser output is directly connected to the TLS IN input connector of the IL PDL module with a PM patchcord.

The IL PDL module is connected to the SCAN SYNC module for optical sampling and to the DUT for TF and PDL measurements.

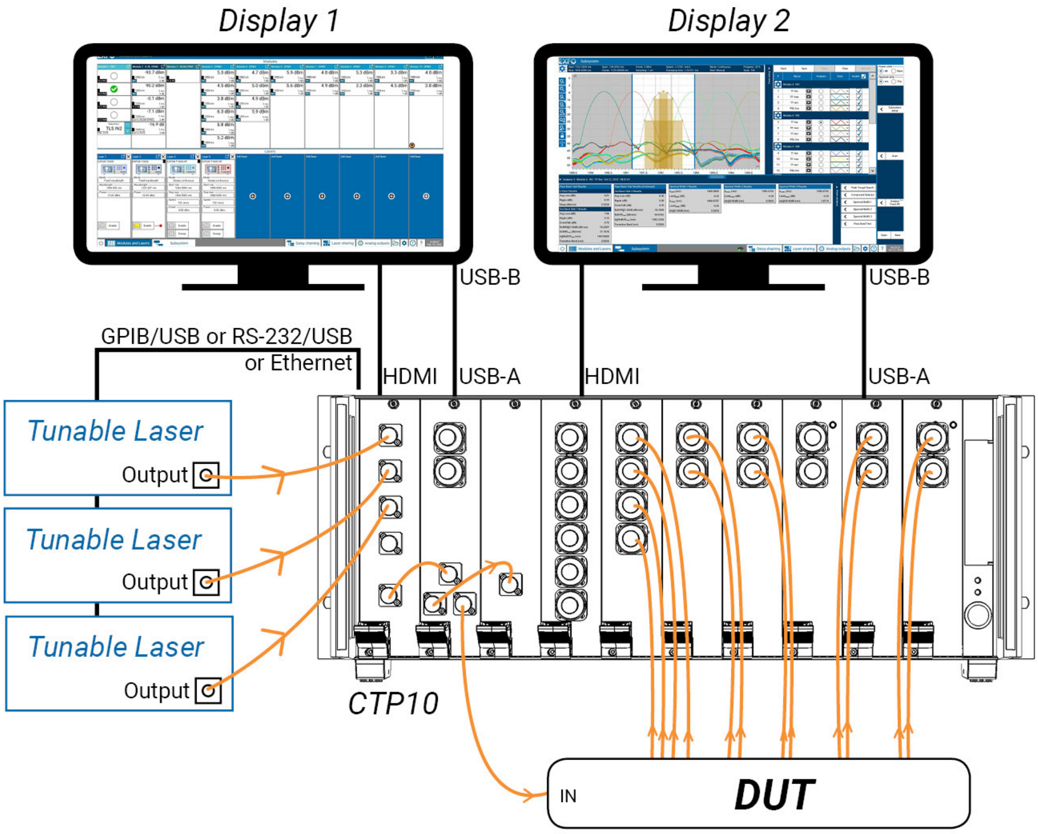


Typical IL/RL test setup with multiple lasers (full-band characterization)

The following figure illustrates a test setup with three tunable lasers.

The CTP10 controls the lasers via Ethernet, or via GPIB with a USB-GPIB adapter, or via RS-232 with USB-RS232 adapters (one per laser). The three laser outputs are connected to the FBC module input connectors. The signal coming from the FBC output connector is connected to the IL RL OPM2 module for measurements.
The IL RL OPM2 module is connected to the SCAN SYNC module for optical sampling and to the DUT for TF/BR measurements.

The CTP10 uses the laser optical trigger for data acquisition with the help of the SCAN SYNC module, which performs optical sampling.

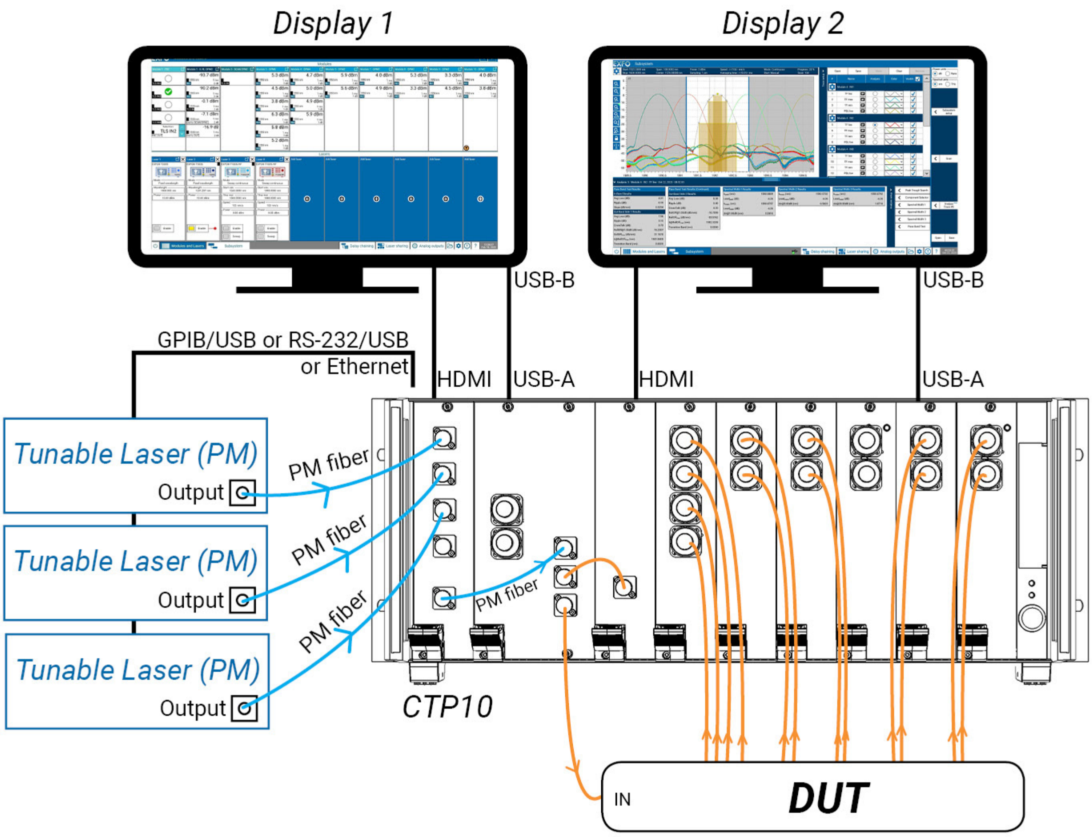


Typical IL/PDL test setup with multiple lasers (full-band characterization)

The following figure illustrates a test setup with three tunable lasers.

The CTP10 controls the lasers via Ethernet, or via GPIB with a USB-GPIB adapter, or via RS-232 with USB-RS232 adapters (one per laser). The three laser outputs are connected to the FBC module input connectors. The signal coming from the FBC output connector is connected to the IL PDL OPM2 module for measurements.
The IL PDL OPM2 module is connected to the SCAN SYNC module for optical sampling and to the DUT for TF/PDL measurements.

The CTP10 uses the laser optical trigger for data acquisition with the help of the SCAN SYNC module, which performs optical sampling.



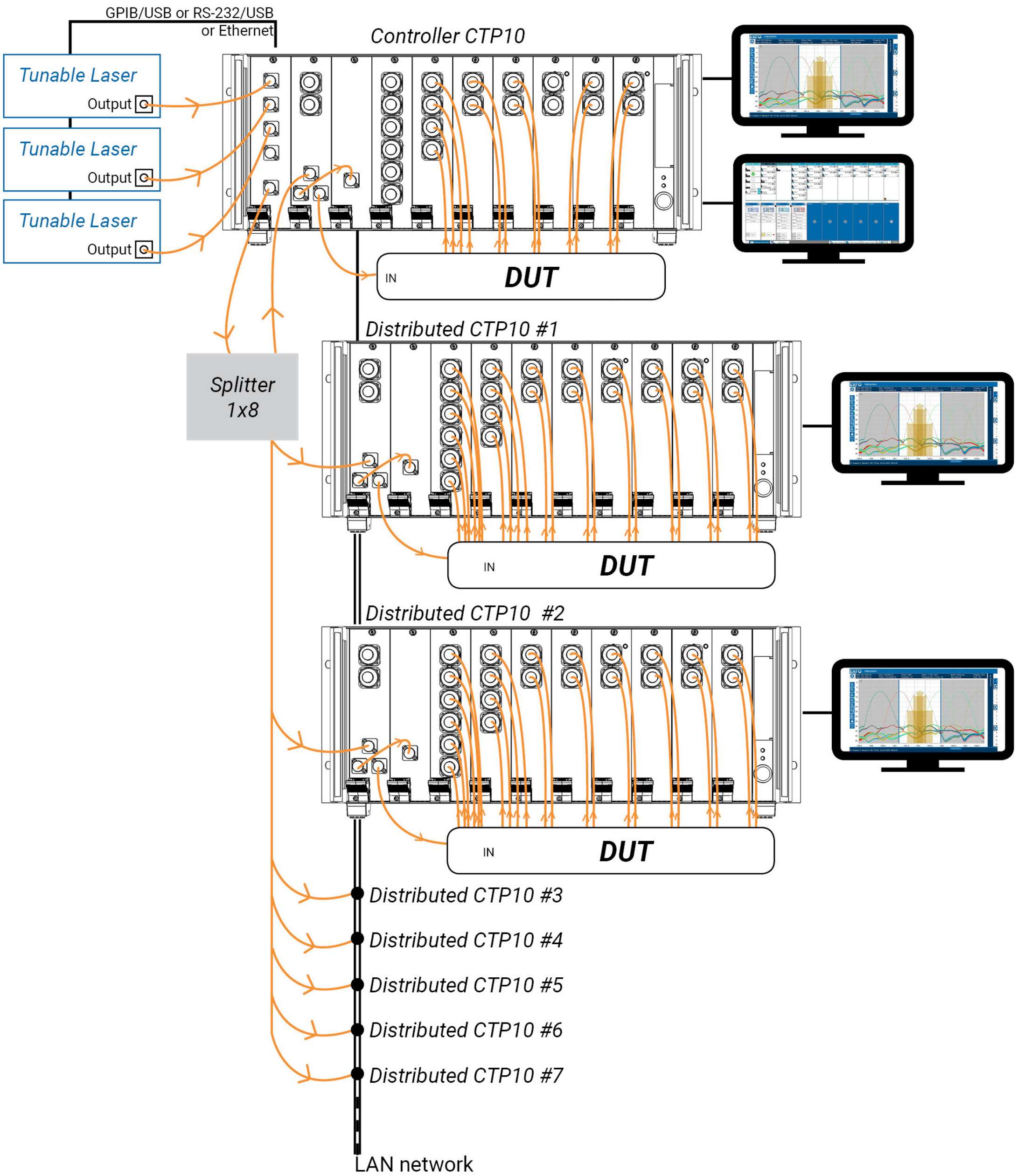
Typical IL/RL test setup with multiple lasers shared between several CTP10

The **Laser Sharing** function enables you to perform simultaneous measurement scans on eight CTP10s using the tunable lasers connected to a single CTP10.

The Controller CTP10 controls the lasers via Ethernet, or via GPIB with a USB-GPIB adapter, or via RS-232 with USB-RS232 adapters (one per laser). The three laser outputs are connected to the FBC module input connectors.
The signal coming from the FBC output connector is directed to a 1x8 splitter to share the laser signal with seven other CTP10s (called Distributed CTP10s).

On each CTP10, the IL RL OPM2 module receives the signal and is connected to the SCAN SYNC module for optical sampling and to the DUT for TF/BR measurements.

For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.



Typical IL/PDL test setup with 2 CTP10s connected in a daisy chain

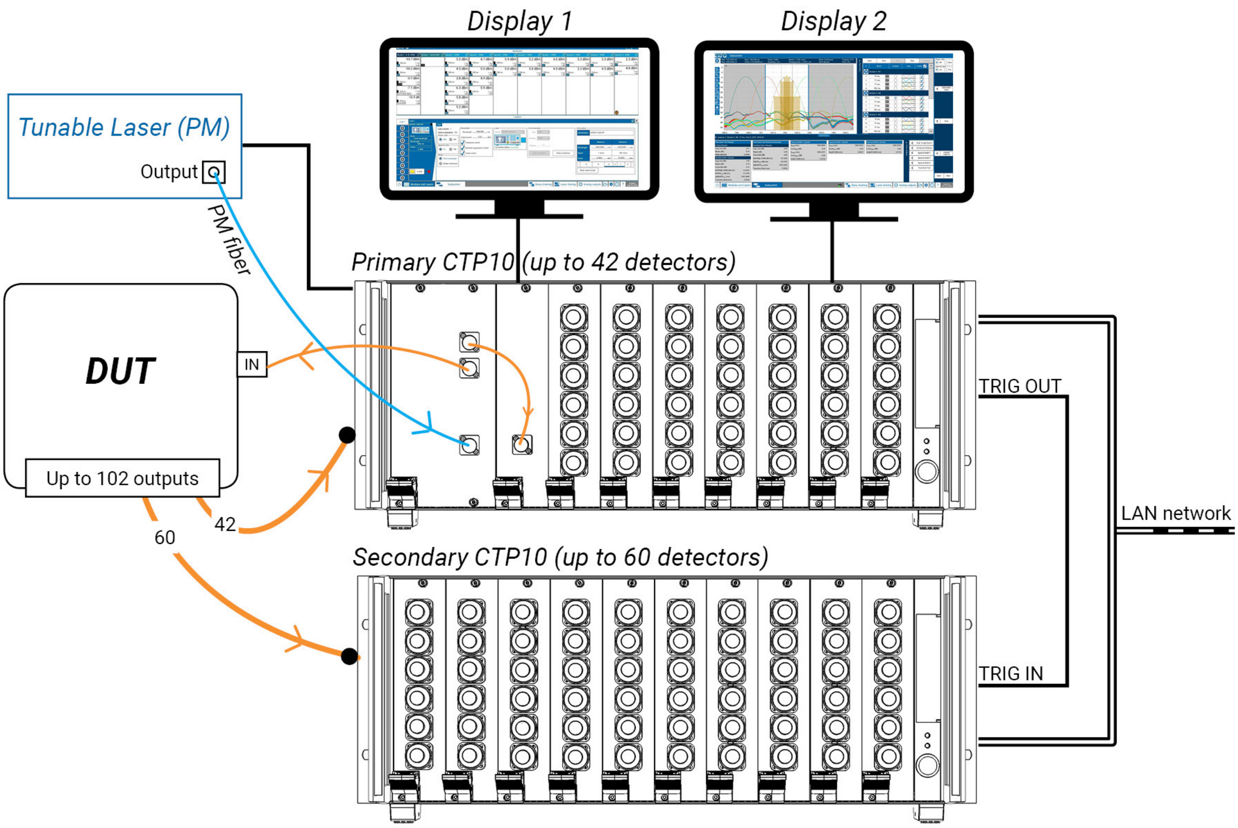
The **Daisy chaining** function enables you to perform IL/PDL measurements on DUT of more than 42 ports (44 with an IL PDL OPM2 module), by using the detectors of another CTP10.

On the Primary CTP10, the IL PDL or IL PDL OPM2 module receives the laser signal. It is connected to the SCAN SYNC module for optical sampling and to the DUT for TF/PDL measurements.
The Primary CTP10 is connected to the Secondary CTP10 with a BNC cable, which enables data sampling of all external detectors located on the Secondary CTP10.

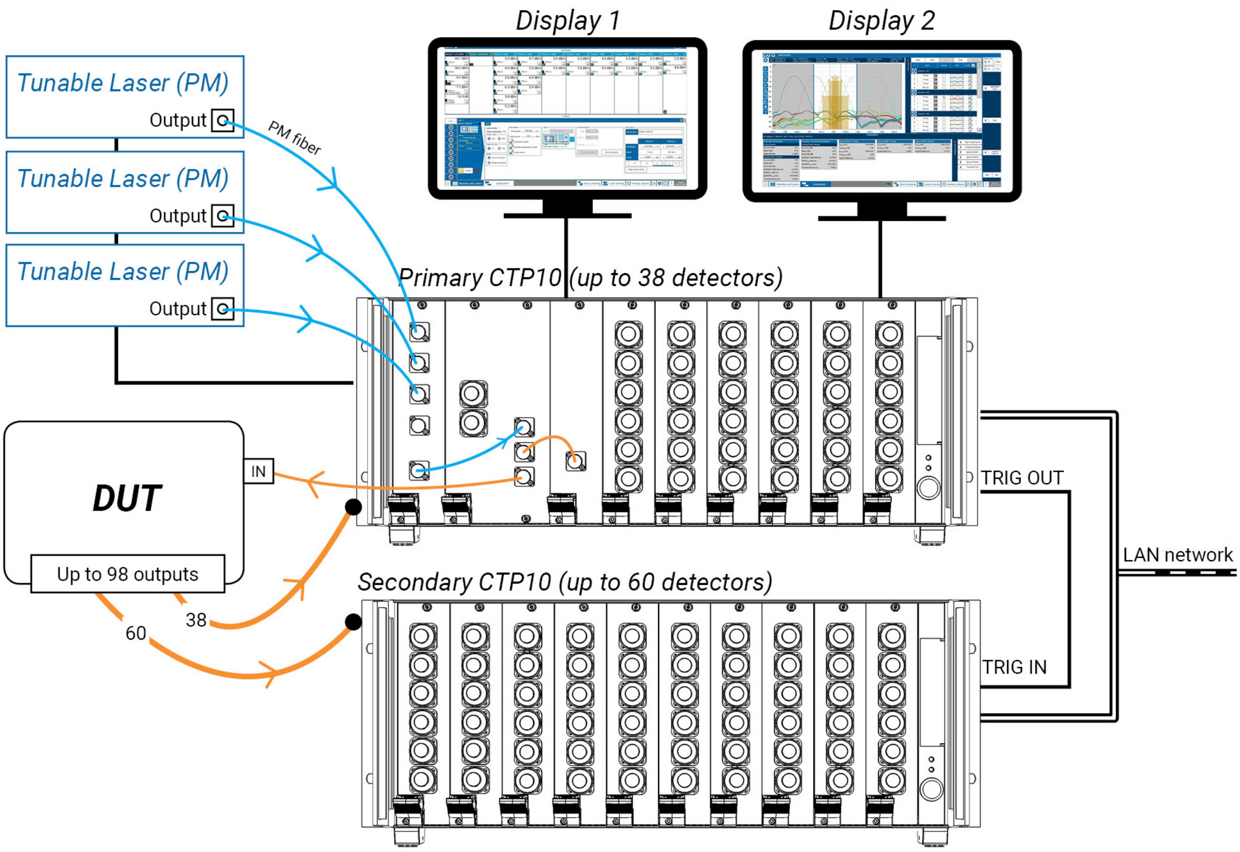
The Primary CTP10 displays the results of all measurements performed on the connected Secondary CTP10.

For more details on Daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.

➤ Example of setup with an IL PDL module and one laser:



➤ Example of setup with an IL PDL OPM2 module and three lasers:



5 Operating CTP10 Modules

The CTP10 mainframe hosts up to 10 modules that you can control individually from the CTP10 user interface or use in a subsystem to perform TF/BR or TF/PDL and/or I measurements.

The modules plugged into the CTP10 are all displayed on the upper part of the **Modules and Lasers** window, with their related information and measured values.

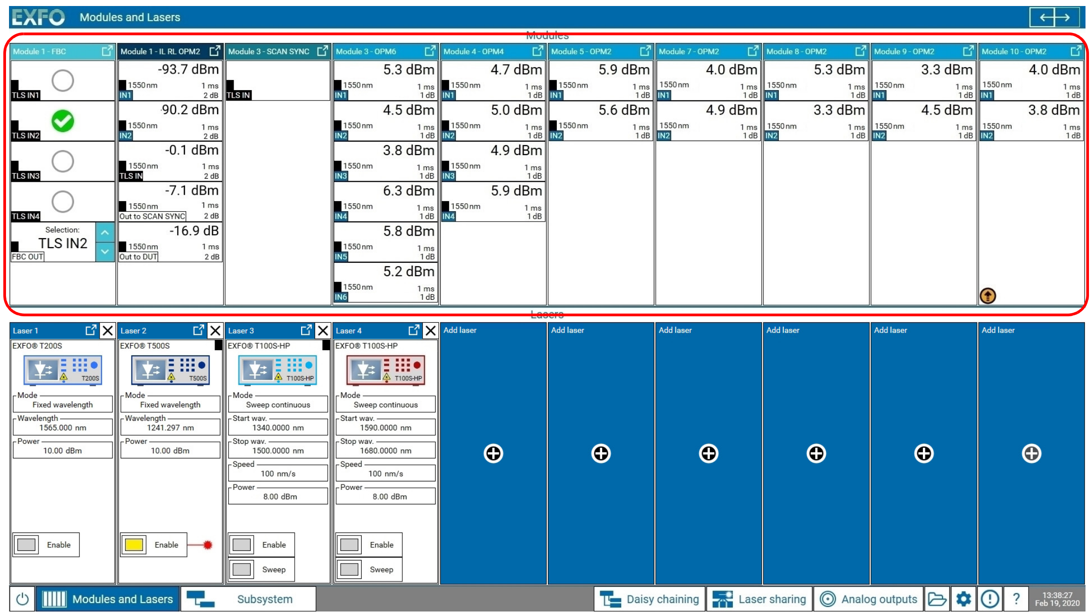
This window enables you to statically control the available modules, without the use of a subsystem (for more details on subsystems, see *Defining Your Subsystem* on page 101).

> **IMPORTANT**
>
> ➤ **The displayed measurement values are only valid on continuous wave signals. If your signal is pulsed or modulated, the displayed values cannot be considered as reliable.**
>
> ➤ **The parameters defined individually for the modules in this window are not taken into account in subsystem measurements.**

To access the module control window:

1. In the task bar, click the **Modules and Lasers** button.

All modules plugged into the CTP10 mainframe are represented in the top part of the window and display the defined module parameters and measured values for each connector.



2. Operate the wanted modules from this window, as explained in the following sections:

➤ *Displaying Information on Modules* on page 62

➤ *Controlling the IL RL OPM2 Module* on page 63

➤ *Controlling the IL PDL or IL PDL OPM2 Module* on page 68

➤ *Controlling the SCAN SYNC Module* on page 74

- *Controlling OPMx Modules* on page 75
- *Controlling PCMx Modules* on page 77
- *Controlling the FBC Module* on page 79
- *Zeroing the Dark Current on Detectors* on page 83
- *Restoring the Factory Settings of a Module* on page 84
- *Updating a Module System Version* on page 85

Displaying Information on Modules

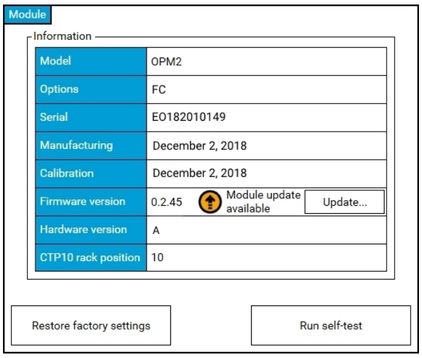
For each module, the **Information** area displays information on the module version. It also enables you to update the module version, reset the module settings and run a self-test.

To ensure compatibility between the module and the CTP10 mainframe, please make sure that the latest system version is installed on the mainframe: see *Updating the CTP10 System Version* on page 219.

To display general information on a module:

1. In the **Modules and Lasers** window, click a module.

The module details appear at the right of the window.



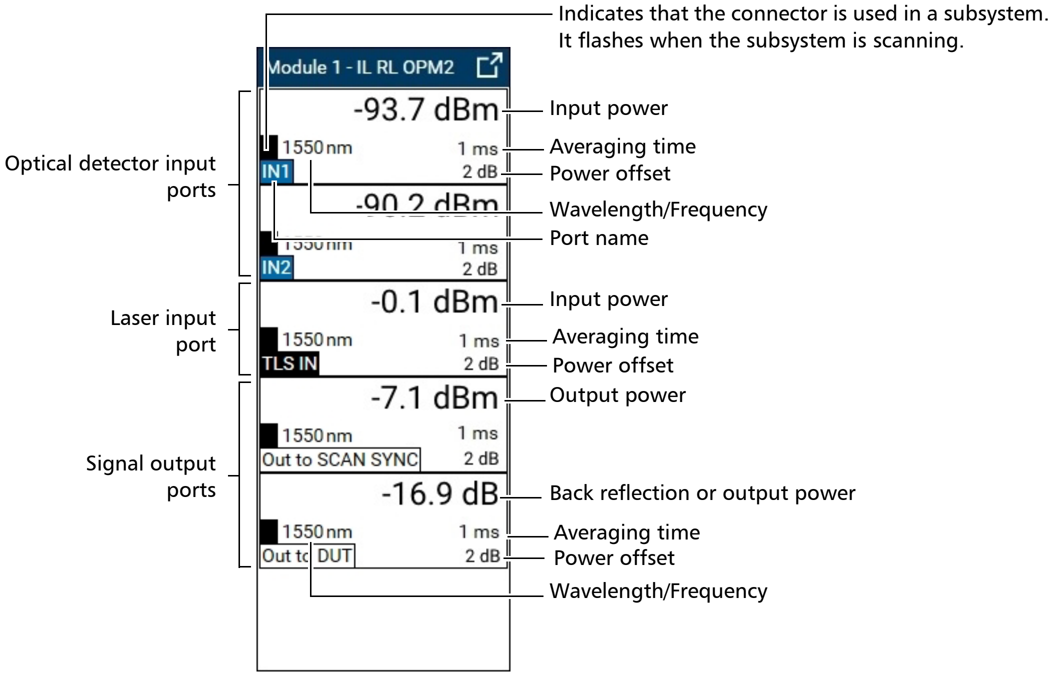
2. The module **Information** area enables you to control the module version and general parameters, as explained in the following table:

Button	Description
Update...	If an update is available for the module, this button enables you to install the updated version. For more details on the update procedure, see *Updating a Module System Version* on page 85.
Restore factory settings	Deletes all the user customized settings on the module (units, parameters, dark current zeroing). For more details on the restore procedure, see *Restoring the Factory Settings of a Module* on page 84.
Run self-test	Enables you to detect possible errors on the module (for remote assistance). If an error occurs, the module becomes unavailable. For more details, see *Performing a Self-test* on page 238.

Controlling the IL RL OPM2 Module

The IL RL OPM2 module plugged into the CTP10 mainframe is represented in the top part of the **Modules and Lasers** window.

The IL RL OPM2 module panel displays all the module connectors with the corresponding measured values (expressed at their nearest round number) and defined parameters.



You can display and update the module version (see *Displaying Information on Modules* on page 62) and modify the parameters of each module connector individually, as explained in the following procedures.

IMPORTANT

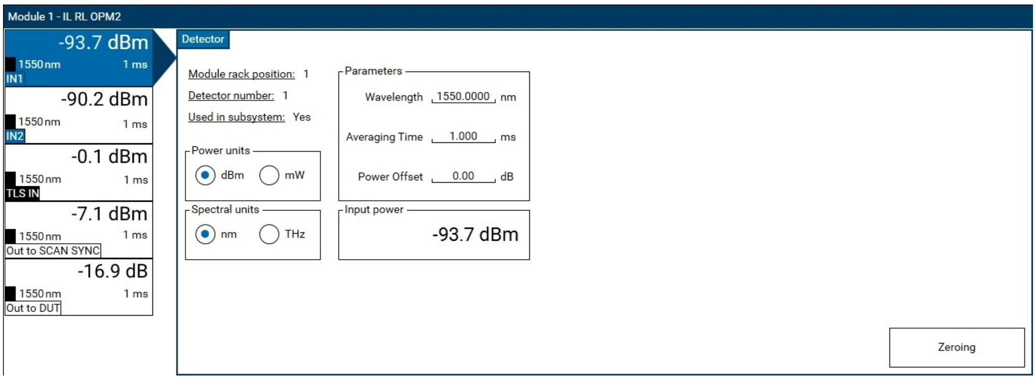
- **The displayed measurement values are only valid on continuous wave signals. If your signal is pulsed or modulated, the displayed values cannot be considered as reliable.**
- **The parameters defined individually for the modules in this window are not taken into account in subsystem measurements.**

Controlling the Detector Ports

The detector inputs of the IL RL OPM2 module enable you to measure the optical power of connected devices.

To define the detector (IN1/IN2) port parameters:

1. In the **Modules and Lasers** window, click the IL RL OPM2 module.
2. Click the detector connector you want to modify.



3. Click the parameter value you want to modify as explained in the following table.

Settings		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the defined wavelength/frequency.
Parameters	**Wavelength /Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
Input power		Instant input power measured on the port, according to the parameters set in the **Parameters** area.
Zeroing button		Performs dark current zeroing on the connector: see *Zeroing the Dark Current on Detectors* on page 83.

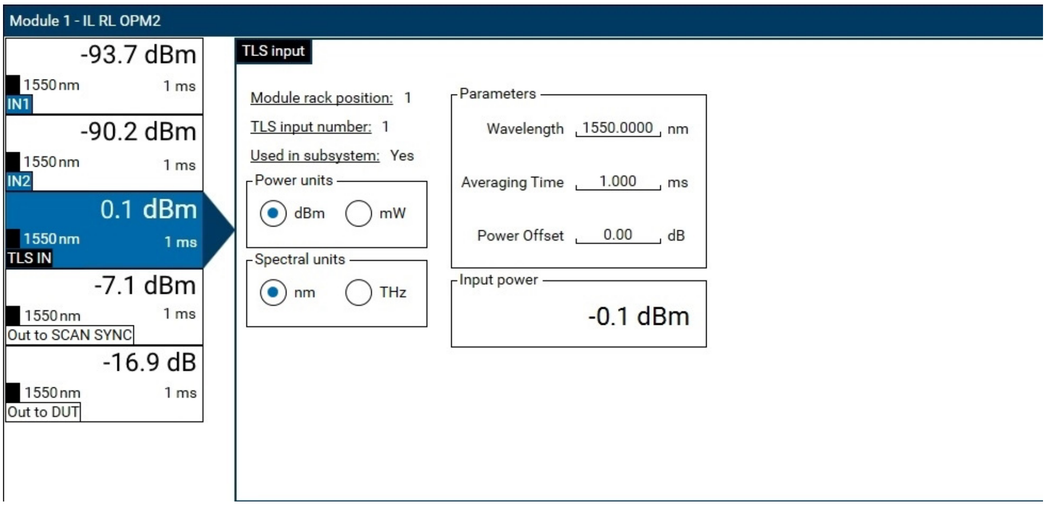
Controlling the TLS Input Port

The laser input port of the IL RL OPM2 module enables you to measure the optical input power of connected devices.

To define the TLS input (TLS IN) parameters:

1. In the **Modules and Lasers** window, click the IL RL OPM2 module.

2. Click the TLS input connector.



3. Click the parameter value you want to modify as explained in the following table.

Settings		Description
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the defined wavelength/frequency.
Input Power		Instant input power measured on the port, according to the parameters set in the **Parameters** area.

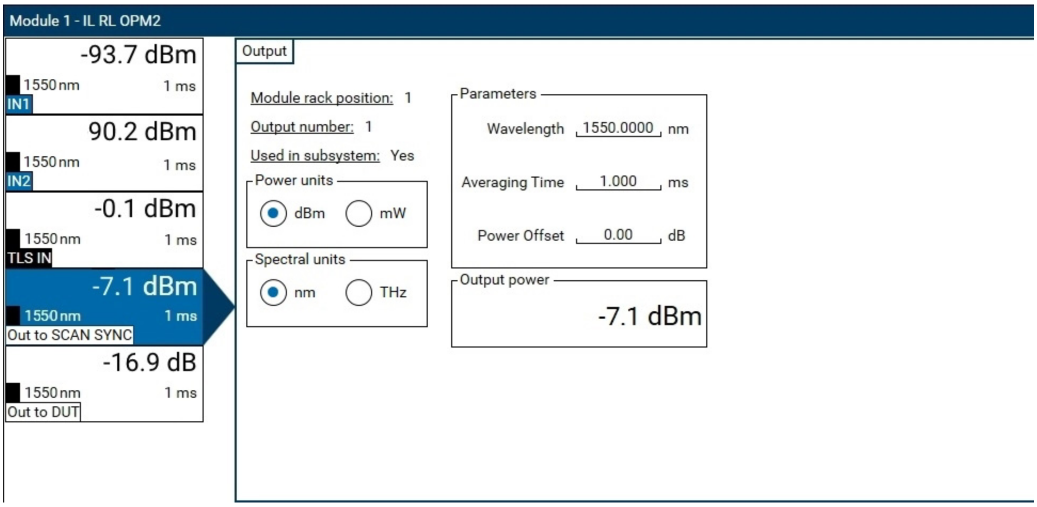
Controlling the Output Ports

The output ports of the IL RL OPM2 module enable you to perform output power and back reflection measurements.

To define the Out to SCAN SYNC output parameters:

1. In the **Modules and Lasers** window, click the IL RL OPM2 module.

2. Click the Out to SCAN SYNC connector.



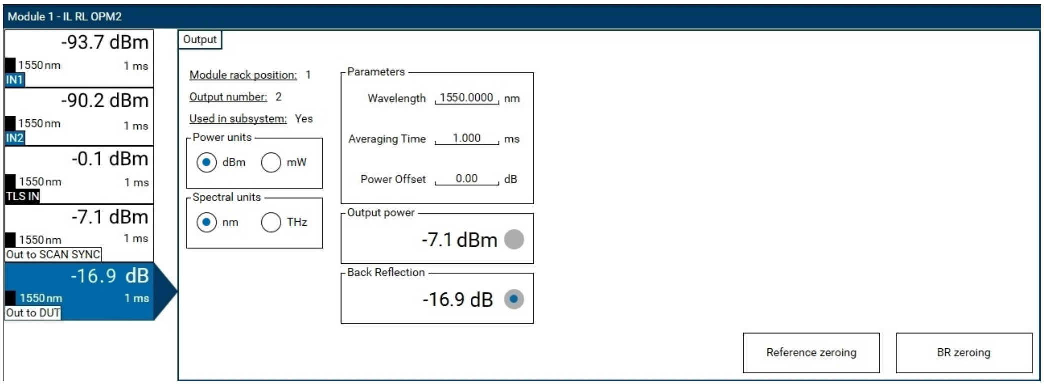
3. Click the parameter value you want to modify as explained in the following table.

Settings		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the measured input signal.
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
Output power		Output optical power measured on the port.

To define the Out to DUT output parameters:

1. In the **Modules and Lasers** window, click the IL RL OPM2 module.

2. Click the Out to DUT connector.



3. Click the parameter value you want to modify as explained in the following table.

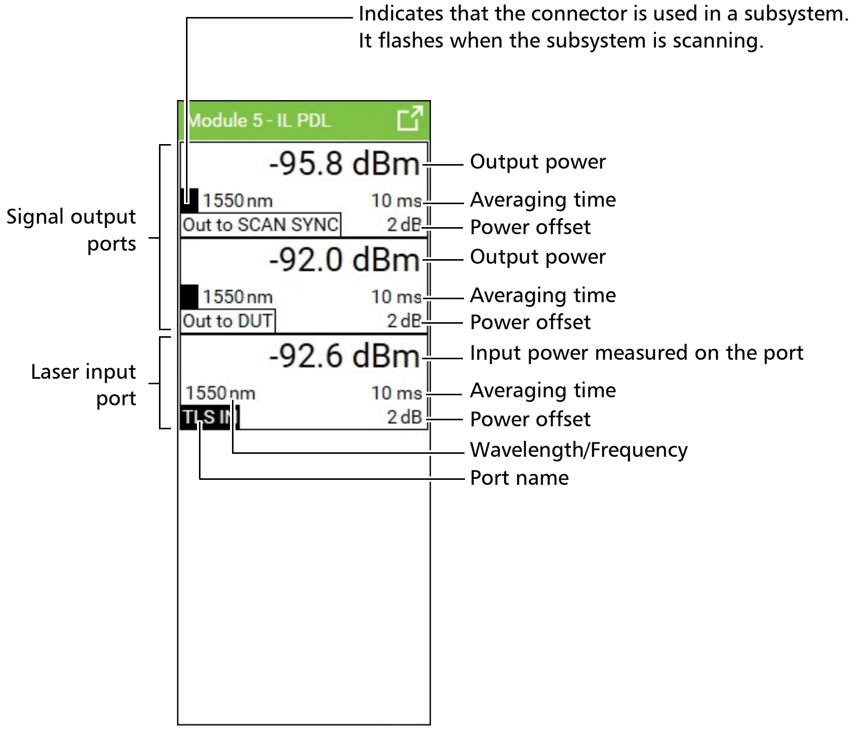
Parameter		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the measured input signal.
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
Output power		Output optical power measured on the port. Select the value if you want it to be displayed in the overall view of modules, in the **Modules and Lasers** window.
Back Reflection		Back reflection value measured on the port. Select the value if you want it to be displayed in the overall view of modules, in the **Modules and Lasers** window. If no power is detected on the TLS input port(s), no value is displayed.
Reference zeroing button		Performs dark current zeroing of the monitoring detector used for TF and BR measurements: see *Zeroing the Dark Current on Detectors* on page 83.
BR zeroing button		Performs dark current zeroing on the connector for BR measurements: see *Zeroing the Dark Current on Detectors* on page 83.

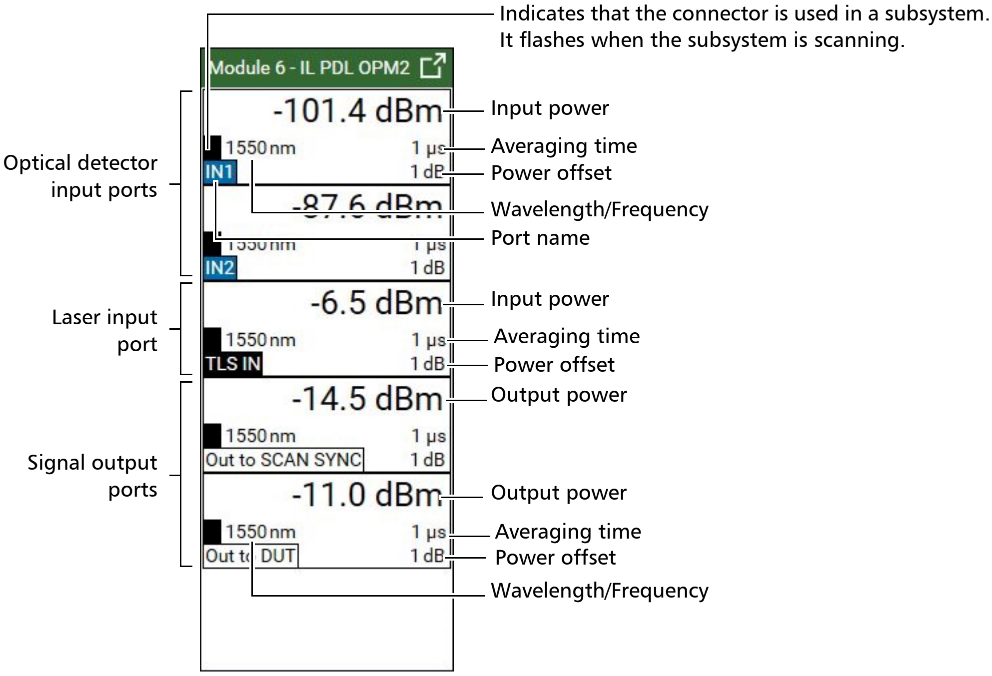
Controlling the IL PDL or IL PDL OPM2 Module

The IL PDL or IL PDL OPM2 module plugged into the CTP10 mainframe is represented in the top part of the **Modules and Lasers** window.

The IL PDL and IL PDL OPM2 modules are double-slot modules, which are displayed as single-slot modules in the upper part of the **Modules and Lasers** window.

The IL PDL or IL PDL OPM2 module panel displays the module connectors with the corresponding measured values (expressed at their nearest round number) and defined parameters.





You can display and update the module version (see *Displaying Information on Modules* on page 62) and modify the parameters of each module connector individually, as explained in the following procedures.

IMPORTANT

➤ **The displayed measurement values are only valid on continuous wave signals. If your signal is pulsed or modulated, the displayed values cannot be considered as reliable.**

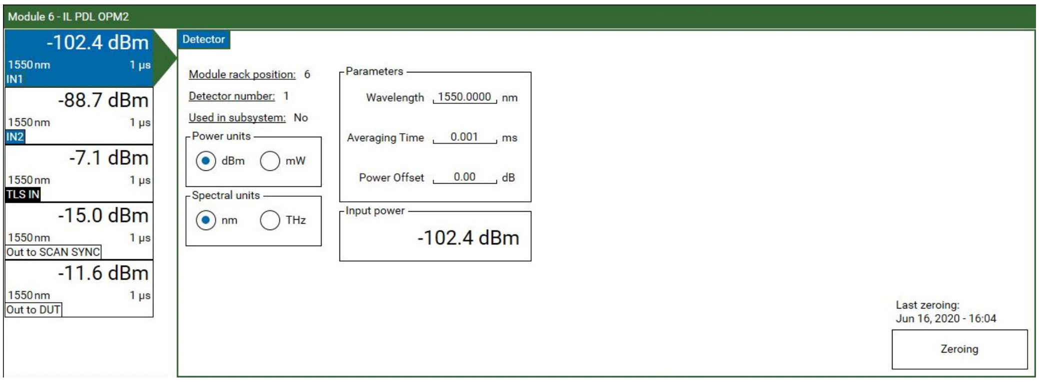
➤ **The parameters defined individually for the modules in this window are not taken into account in subsystem measurements.**

Controlling the Detector Ports (IL PDL OPM2 module only)

The detector inputs of the IL PDL OPM2 module enable you to measure the optical power of connected devices.

To define the detector (IN1/IN2) port parameters:

1. In the **Modules and Lasers** window, click the IL PDL OPM2 module.
2. Click the detector connector you want to modify.



3. Click the parameter value you want to modify as explained in the following table.

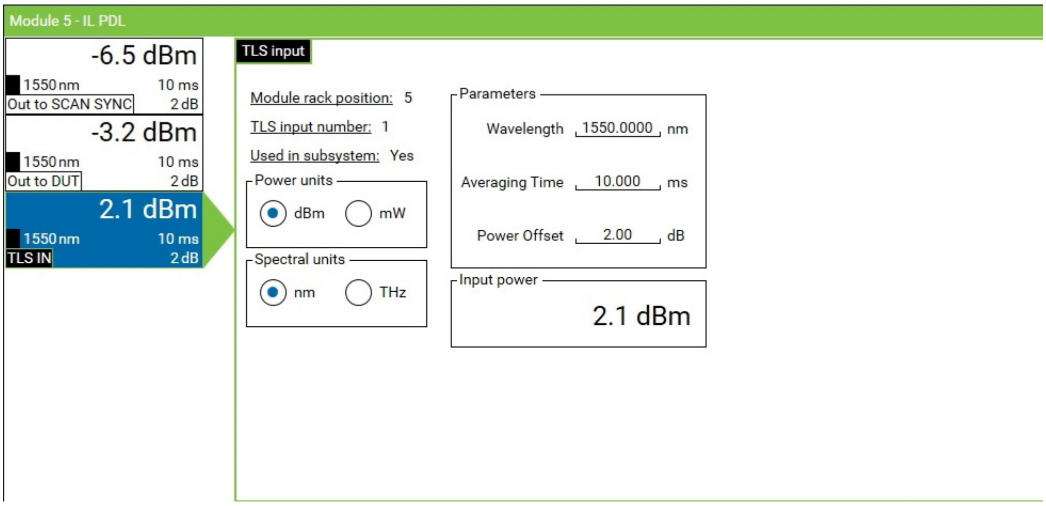
Settings		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the defined wavelength/frequency.
Parameters	**Wavelength /Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
Input power		Instant input power measured on the port, according to the parameters set in the **Parameters** area.
Zeroing button		Performs dark current zeroing on the connector: see *Zeroing the Dark Current on Detectors* on page 83.

Controlling the TLS Input Port

The laser input port of the IL PDL or IL PDL OPM2 module enables you to measure the optical input power of connected devices.

To define the TLS input (TLS IN) parameters:

1. In the **Modules and Lasers** window, click the IL PDL or IL PDL OPM2 module.
2. Click the TLS input connector.



3. Click the parameter value you want to modify as explained in the following table.

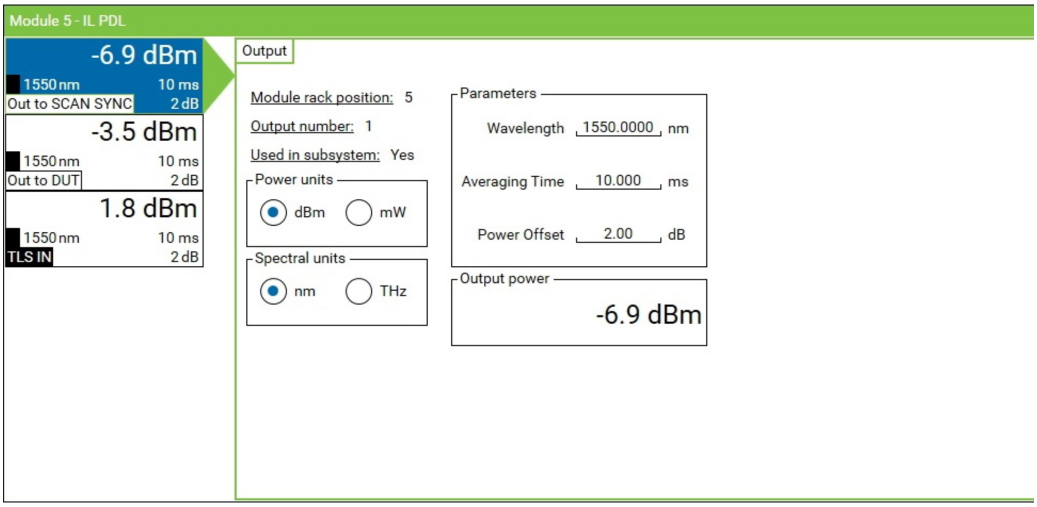
Settings		Description
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the module "Out to SCAN SYNC" and "Out to DUT" connectors, and to all detectors used in the subsystem.
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the defined wavelength/frequency.
Input Power		Instant input power measured on the port, according to the parameters set in the **Parameters** area.

Controlling the Output Ports

The output ports of the IL PDL or IL PDL OPM2 module enable you to perform output power measurements.

To define the Out to SCAN SYNC output parameters:

1. In the **Modules and Lasers** window, click the IL PDL or IL PDL OPM2 module.
2. Click the Out to SCAN SYNC connector.

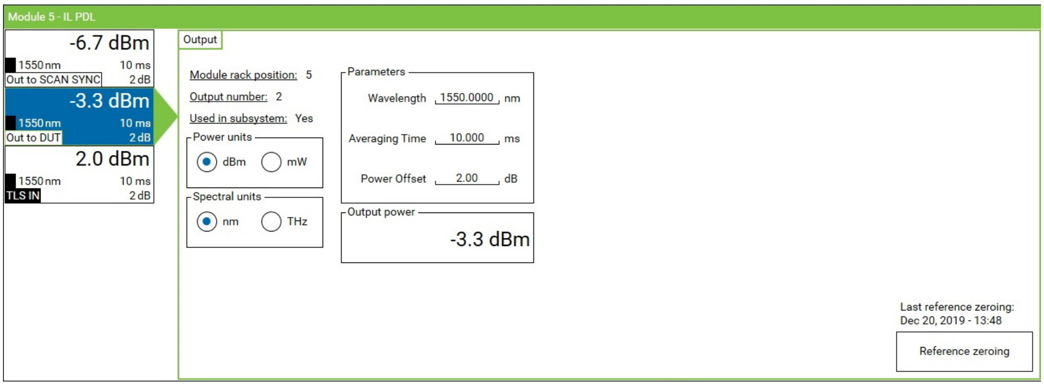


3. Click the parameter value you want to modify as explained in the following table.

Settings		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the measured input signal.
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the module "TLS IN" and "Out to DUT" connectors, and to all detectors used in the subsystem.
Output power		Output optical power measured on the port.

To define the Out to DUT output parameters:

1. In the **Modules and Lasers** window, click the IL PDL or IL PDL OPM2 module.
2. Click the Out to DUT connector.



3. Click the parameter value you want to modify as explained in the following table.

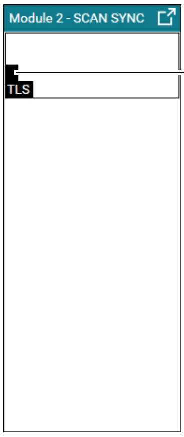
Parameter		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the measured input signal.
Parameters	**Wavelength/ Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
	Power Offset	Compensation value you want to apply to the detected signal. The value set also applies to the TLS input and Out to SCAN SYNC connectors.
Output power		Output optical power measured on the port. Select the value if you want it to be displayed in the overall view of modules, in the **Modules and Lasers** window.
Reference zeroing button		Performs dark current zeroing of the monitoring detector used for TF and PDL measurements: see *Zeroing the Dark Current on Detectors* on page 83.

Controlling the SCAN SYNC Module

The SCAN SYNC module plugged into the CTP10 mainframe is represented in the top part of the **Modules and Lasers** window.

The SCAN SYNC module perform optical sampling of swept wavelength lasers. No measurement is displayed in the **Modules and Lasers** window.

You can display and update the module version (see *Displaying Information on Modules* on page 62), restore factory settings or run a self test as explained in *Restoring the Factory Settings of a Module* on page 84 and *Performing a Self-test* on page 238.



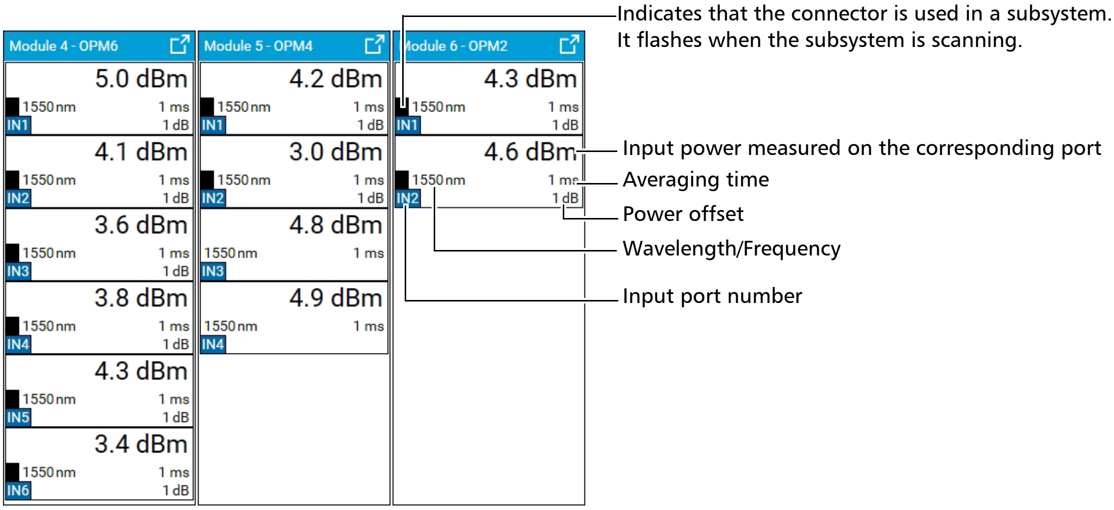
Indicates that the connector is used in a subsystem.
It flashes when the subsystem is scanning.

Controlling OPMx Modules

In the **Modules and Lasers** window, OPM modules enable you to measure the optical power of connected devices. The OPM modules plugged into the CTP10 mainframe are represented in the top part of the **Modules and Lasers** window.

All values are displayed as their nearest round number.

Each OPM module panel displays all the module connectors with the corresponding measured values and defined parameters.



You can display and update the module version (see *Displaying Information on Modules* on page 62) and modify the parameters of each module connector individually, as explained in the following procedure.

IMPORTANT

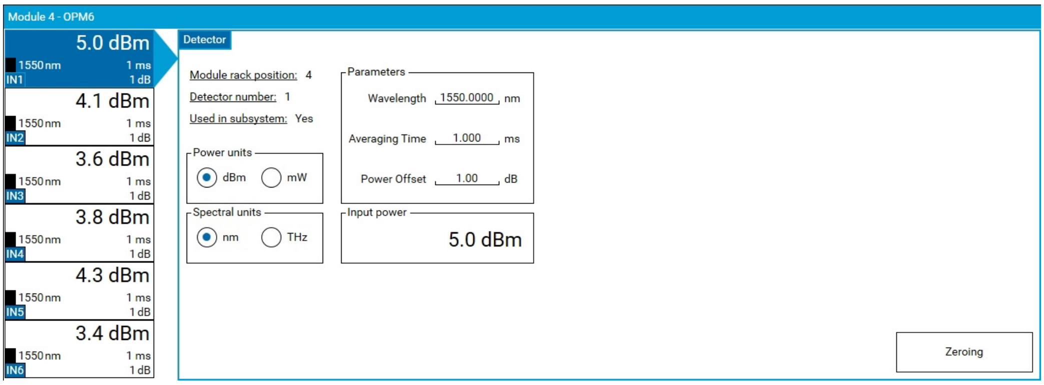
- **The displayed measurement values are only valid on continuous wave signals. If your signal is pulsed or modulated, the displayed values cannot be considered as reliable.**
- **The parameters defined individually for the modules in this window are not taken into account in subsystem measurements.**

To define the detector port parameters:

1. In the **Modules and Lasers** window, click the module you want to modify.

2. Click the detector port you want to modify.

3. Click the parameter value you want to modify as explained below.



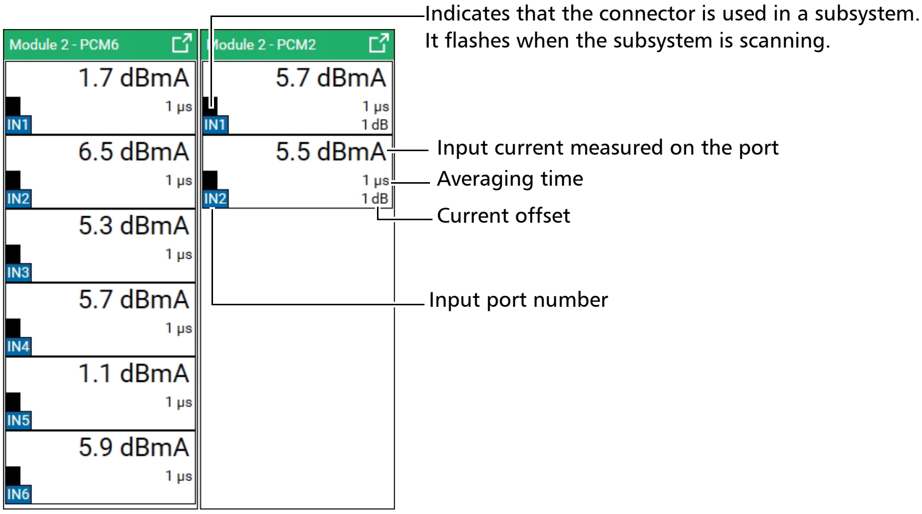
Settings		Description
Power units		Select the unit to use for the measured input signal.
Spectral units		Select the unit to use for the defined wavelength/frequency.
Parameters	**Wavelength /Frequency**	Enter the wavelength/frequency value of the signal received by the module input connector. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Averaging Time	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Power Offset	Compensation value you want to apply to the detected signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
Input power		Instant input power measured on the port, according to the parameters set in the **Parameters** area.
Zeroing button		Performs dark current zeroing on the connector: see *Zeroing the Dark Current on Detectors* on page 83.

Controlling PCMx Modules

In the **Modules and Lasers** window, PCM modules enable you to measure the photocurrent of connected devices. The PCM modules plugged into the CTP10 mainframe are represented in the top part of the **Modules and Lasers** window.

All values are displayed as their nearest round number.

Each PCM module panel displays all the module connectors with the corresponding measured values and defined parameters.



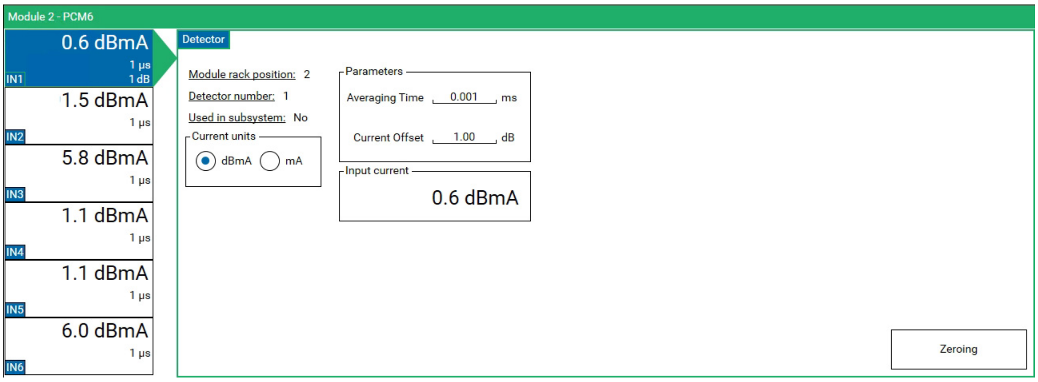
You can display and update the module version (see *Displaying Information on Modules* on page 62) and modify the parameters of each module connector individually, as explained in the following procedure.

IMPORTANT

- **The displayed measurement values are only valid on continuous wave signals. If your signal is pulsed or modulated, the displayed values cannot be considered as reliable.**
- **The parameters defined individually for the modules in this window are not taken into account in subsystem measurements.**

To define the input port parameters:

1. In the **Modules and Lasers** window, click the module you want to modify.
2. Click the port you want to modify.
3. Click the parameter value you want to modify as explained below.

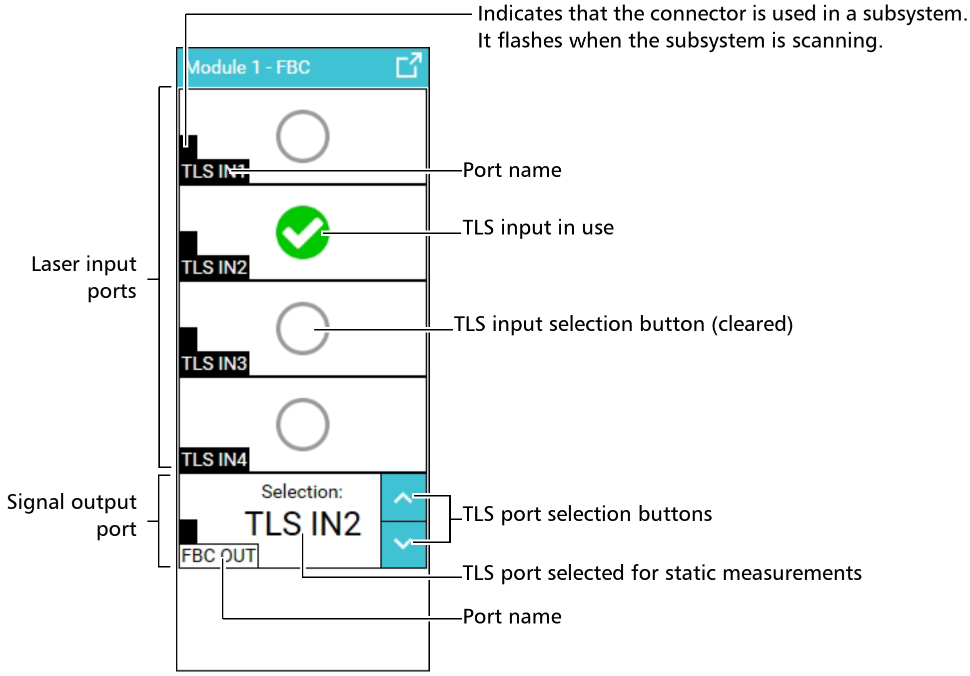


Settings		Description
Current units		Select the unit to use for the measured input signal.
Parameters	**Averaging Time**	Period of time during which you want the signal to be averaged; increasing the averaging time reduces noise level on the measured signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
	Current Offset	Compensation value you want to apply to the detected signal. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.
Input current		Instant input photocurrent measured on the port, according to the parameters set in the **Parameters** area.
Zeroing button		Performs dark current zeroing on the connector: see *Zeroing the Dark Current on Detectors* on page 83.

Controlling the FBC Module

The FBC module enables you to combine up to four tunable laser sources.

In the **Modules and Lasers** window, you can select the TLS to use for static measurements.

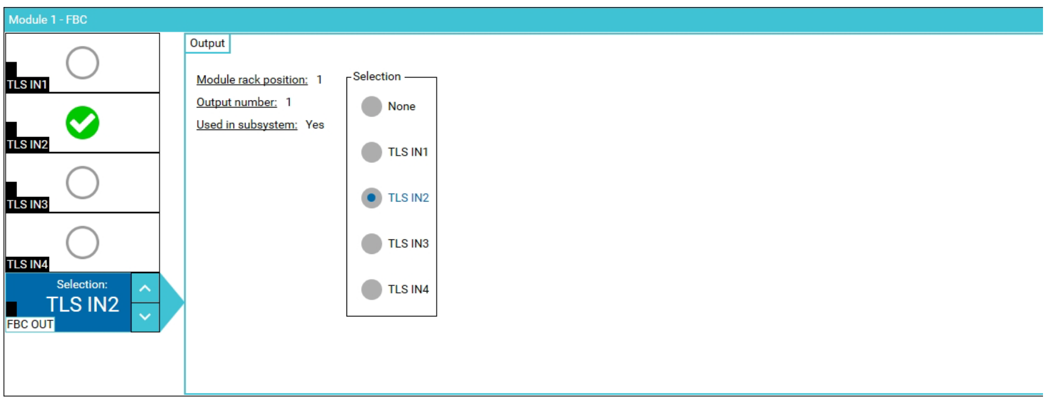


To select the laser input:

From the **Modules and Lasers** window, do one of the following:

- On the wanted TLS IN port, click the TLS input selection button.
- On the **FBC OUT** port, use the up and down arrow buttons to selected the wanted TLS input port.
- Click the **FBC OUT** port and in the **Selection** area, click the laser input you want to activate.

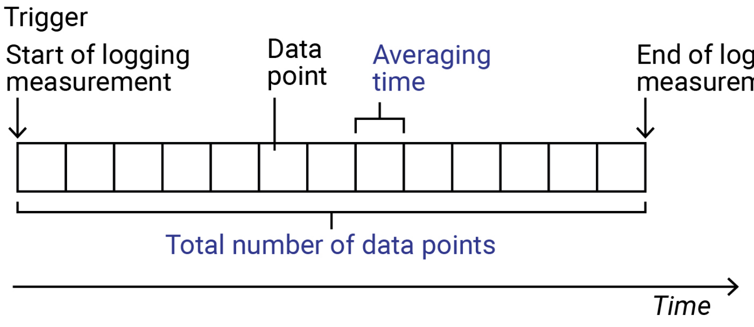
  The  icon appears on the selected port, to indicate that it is selected for static measurements and the selected port name is displayed on the **FBC OUT** port.



Performing Power Level Data Acquisition

The **logging**, **pulse logging** and **stability** functions enable you to acquire a definite number of power level samples from the wanted OPM or PCM detector ports, upon receipt of an electrical or software trigger. These functions are available by using a set of remote commands.

➤ The **logging** function enables you to continuously acquire a defined number of data points (for a given wavelength), according to a specified averaging time for each measurement.

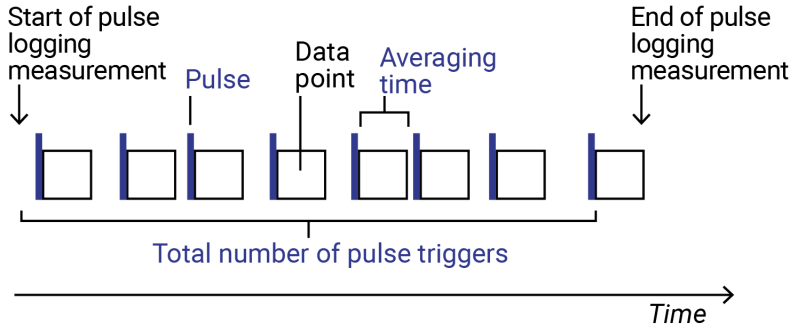


This function can be triggered by an external trigger generator or by command.

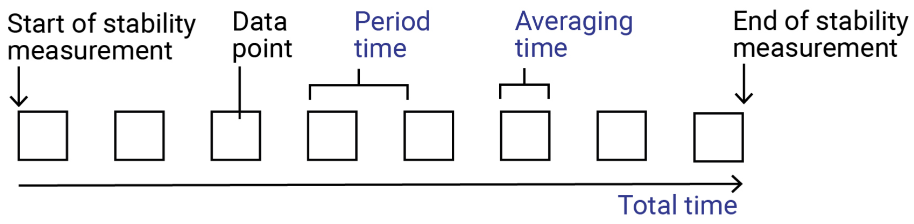
If an external trigger is selected, the function is armed by command and the acquisition starts when the voltage level at the TRIG IN port is "high".

➤ The **pulse logging** function enables you to acquire data points corresponding to a defined number of pulse triggers (for a given wavelength), according to a specified averaging time for each measurement.

This function can only be triggered by command.



- The **stability** function enables you to acquire data points (for a given wavelength) during a defined period of time with a specified dwell time between measurements, and according to a specified averaging time for each measurement. It is specifically adapted to long measurements.
  This function can only be triggered by command.



In Daisy chaining mode, these functions are only available on detector ports located on the Primary CTP10.

The following procedure explains how to use the available commands to activate and execute the logging or stability functions.

To execute the logging or stability measurement function:

1. Make sure that:

- The module(s) on which you want to activate the logging, pulse logging or stability function is updated to the last system version (see *Updating a Module System Version* on page 85).
- The CTP10 is in idle state.

2. Select the detector(s) on which you want to activate the logging, pulse logging or stability function by using the command *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate* on page 441.

3. If you want to use the logging function, select the data acquisition trigger for the module by using the command *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer* on page 444.
This command does not apply to the pulse logging or stability function, which can only be triggered by command (see *CTP:FUNCtion:STATe* on page 418).

You can select one trigger by module used for the logging function. The detectors of a module cannot have different triggers.

4. If you want to use a physical trigger (to start the logging function or to use the pulse logging function), connect the external trigger generator to the wanted **TRIG IN** BNC connector of the CTP10 rear panel.

5. Configure the function you want to use (logging or pulse logging or stability):

- To configure the logging function, use the command *CTP:FUNCtion:PARameter:LOGGing* on page 412.
- To configure the stability function, use the command *CTP:FUNCtion:PARameter:STABility* on page 416.
- To configure the pulse logging function, use the command *CTP:FUNCtion:PARameter:PLOGging* on page 414.

6. Start the data acquisition by using the command *CTP:FUNCtion:STATe* on page 418.

   ➤ If you have selected an external trigger (logging function only, with *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer* on page 444), the function waits for the trigger to start the acquisition.

   ➤ If you have selected a software trigger or no trigger (pulse logging or stability function), the acquisition starts immediately.

   During acquisition, the GUI is not available. The function stops automatically when the acquisition is completed.

7. Display the status of the data acquisition function on a detector by using the query *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:STATe?* on page 443.

8. Once the data acquisition is completed, return the data acquisition results by using the query *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:RESult?* on page 442.

9. Deactivate the function on the detector by using the command *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate* on page 441.

Zeroing the Dark Current on Detectors

Temperature and humidity variations affect the performance of electronic circuits and optical detectors, which can offset results on low power or current measurements. To compensate for this offset and improve power (or current) accuracy, you can zero the dark current on each module detector.

To zero the dark current on a connector:

1. Do one of the following:

➤ Cover the connector with the provided protective cap (see *Installing FOA on Detectors* on page 31).

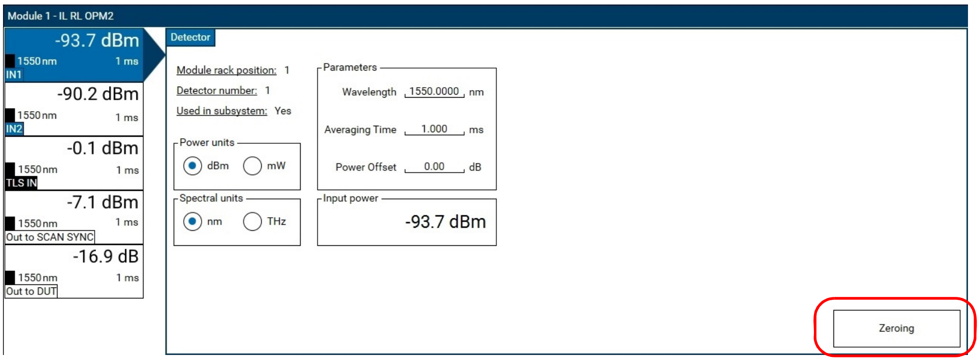
➤ Connect a fiber with absolutely no light source.

➤ On a PCM module: connect a photodiode to the module connector and make sure that there is no light source on it.

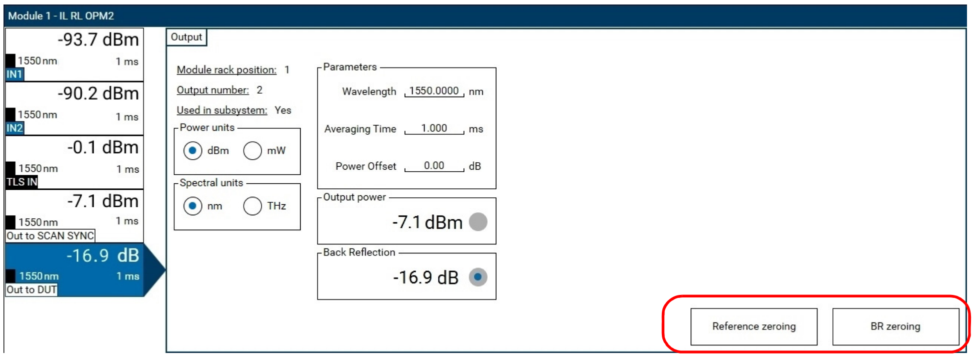
2. In the **Modules and Lasers** window, click the module connector for which you want to zero the dark current.

3. Click the following button:

➤ On detectors, click the **Zeroing** button.



➤ On signal output connectors used for TF, PDL or BR measurements (OUT TO DUT or OUT2 on IL RL OPM2, IL PDL and IL PDL OPM2 modules), click the following buttons:



Reference zeroing button to zero the dark current of the monitoring detector used during TF, PDL or BR measurements. The correction will apply to the TLS and OUT TO SCAN SYNC (or OUT1) power measurements.

BR zeroing button (on IL RL OPM2 modules only) to zero the dark current on BR measurements.

A confirmation window appears.

The date and time of the dark current measurement is displayed above the button. The connector dark current measured will be subtracted from the next power measurements.

Restoring the Factory Settings of a Module

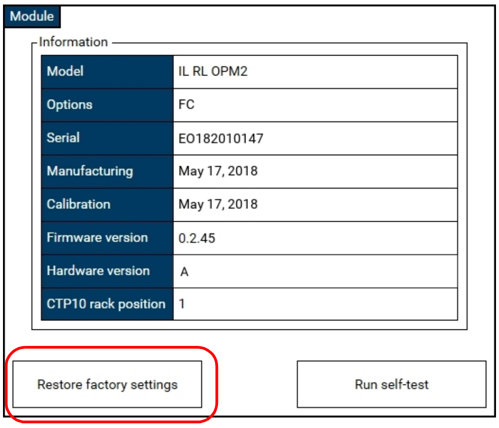
Restoring factory settings deletes all the user customized settings on the module (units, parameters, dark current zeroing) and restores the original default settings.

On SCAN SYNC module, it cancels the referencing performed on the module (if any). For more details on wavelength referencing, see *Performing Wavelength Referencing* on page 134.

To restore factory settings of a module:

1. In the **Modules and Lasers** window, click the module for which you want to restore factory settings.

   At the right of the window, the **Information** area enables you to restore the factory settings.



2. In the module **Information** area, click the **Restore factory settings** button.

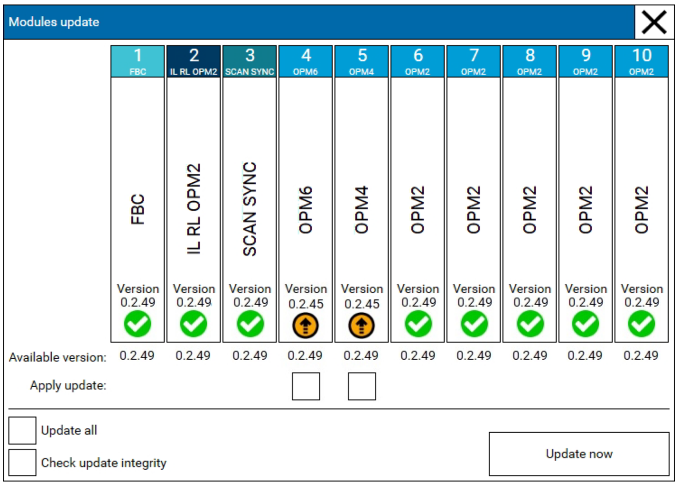
Updating a Module System Version

When you install a new version of the CTP10 firmware package (see *Updating the CTP10 System Version* on page 219), it may include module version updates. Also, the version installed on a module may not correspond to the firmware package version installed on the CTP10 mainframe.

In these cases, the icon appears on the module overview window and you must manually update the modules, as explained in the following procedure.

To update a module system version:

1. In the **Modules and Lasers** window, click the module you want to update.
2. In the module **Information** area, click the **Update...** button.
   The Modules update window appears, enabling you to select the modules to update.



3. Select the wanted check box according to the instructions given in the following table.

Button	Description
Apply update	Select the check boxes corresponding to the modules you want to update.
Update all	Select this check box to automatically select all the available module updates.
Check update integrity	Select this check box to make sure that the module update is properly installed: after installation, the CTP10 verifies that the update is perfectly applied to the module. **Integrity checking takes time, it approximately doubles the module update time. The update time is indicated on the Update now button.**
Update now	The button indicates the approximate update time. Click this button to start the update process.

4. Click the **Update now** button.
   A confirmation window appears.
5. Click **Start update**.

6 Defining and Controlling Your Laser(s)

The CTP10 embedded software (GUI) enables you to add and configure the external lasers you want to control from the CTP10.

You can directly control up to 10 tunable lasers from the CTP10 (static control of lasers from the **Modules and Lasers** window).

CAUTION

To avoid permanent damage to the CTP10 module detectors, do not apply a higher output power value than the maximum safe power specified for the connector to which the laser is connected: refer to *Optical Measurement Specifications* on page 3.

The CTP10 can connect to the following lasers:

- EXFO T200S
- EXFO T500S
- EXFO T100S-HP
- VIAVI mSWS-A1SLS

For more details on TLS requirements and compatibilities, see *TLS Requirements* on page 6.

The lower part of the **Modules and Lasers** window enables you to add, configure and control the lasers connected to the CTP10, as explained in the following sections:

- *Adding and Connecting the Laser(s)* on page 88
- *Controlling the Lasers* on page 92
- *Controlling the Laser Output* on page 94

Once created, you can select the lasers to setup a subsystem (for more details, see *Defining Your Subsystem* on page 101).

Laser Sharing

In laser sharing mode, you define and control the lasers from the Controller CTP10. The Distributed CTP10s use the lasers defined on the Controller CTP10, so a CTP10 used as "Distributed" cannot add, configure nor control lasers. For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.

Adding and Connecting the Laser(s)

To properly control the laser(s) you want to use with the CTP10, you must first connect your laser(s) to the CTP10 and set the communication connection as explained in the following procedures.

CAUTION

- **To achieve optimum system performance, keep fiber-optic connectors clean at all times (see *Cleaning Optical Connectors* on page 226).**
- **Make sure you have the appropriate fiber connector type corresponding to the module connectors you want to connect. Never connect another type of connector to the optical output. For details on the appropriate optical fiber type, see the *Technical Specifications* on page 3.**

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you can connect the lasers to the Controller CTP10 as you would do in a standard configuration.

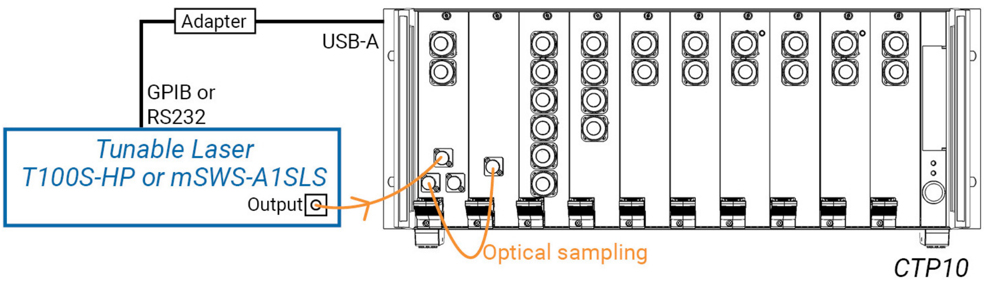
On the Distributed CTP10s, the laser(s) connected to the Controller automatically appear in the **Laser** pane. They cannot be modified nor controlled from the Distributed CTP10s.

To connect a laser to the CTP10:

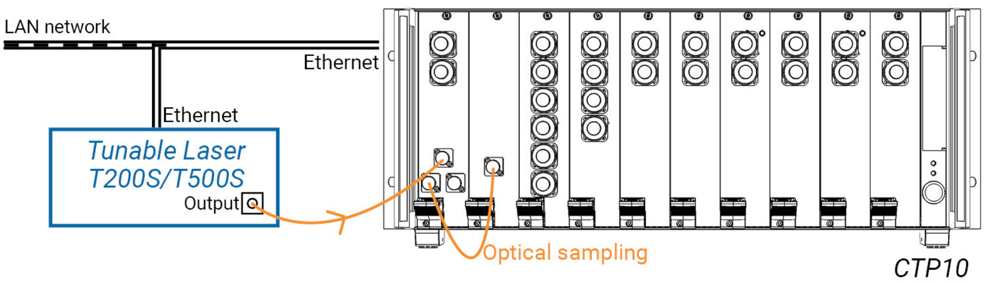
1. Physically connect your tunable laser source(s) to the CTP10 as described below and illustrated in the following figures (examples with IL RL OPM2 module):

   The tunable laser must be equipped with a PMF fiber output type to be connected to an IL PDL or IL PDL OPM2 module (with a PM fiber).

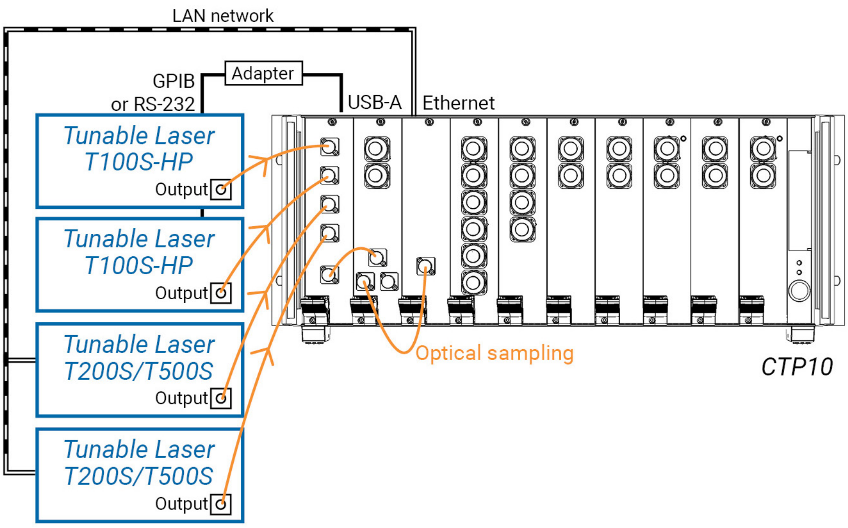
   - Connection of one T100S-HP or mSWS-A1SLS tunable laser to the CTP10 (no FBC module):



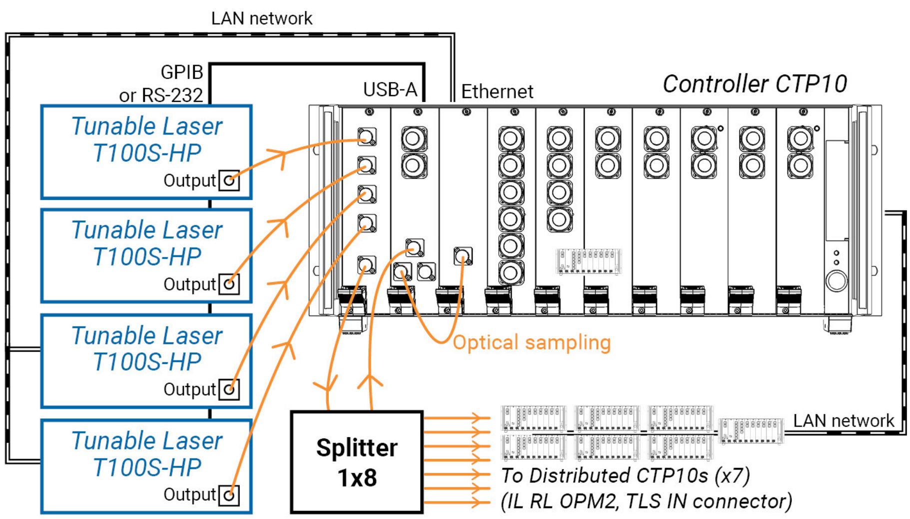
   - Connection of one T200S or T500S tunable laser to the CTP10 (no FBC module):



➤ Connection of four tunable lasers to the CTP10, with the use of an FBC module:



➤ Connection of four tunable lasers to a Controller CTP10 used in laser sharing mode:



For static control of lasers from the **Modules and Lasers** window (without the use of a subsystem), you can connect up to 10 tunable lasers to the CTP10.

For dynamic measurements from the **Subsystem** window (with the use of a subsystem), you can connect up to four tunable lasers to the CTP10, by using an FBC module.

1a. Connect the CTP10 to the laser(s) using one of the following methods:

GPIB, using a GPIB-USB adapter: use the GPIB-USB-HS+ adapter from National Instrument (only available with EXFO T100S-HP).
In case of multiple TLS, do not use multiple adapters: connect one GPIB-USB-HS+ adapter to the CTP10 and connect all the lasers with a GPIB cable.

Ethernet, with an Ethernet cable (only available with EXFO T200S and T500S lasers).

RS232, using a USB-RS232 adapter (only available with EXFO T100S-HP and VIAVI mSWS-A1SLS lasers). In case of multiple TLS, use one USB-RS232 adapter per TLS.

1b. Connect the optical output of the laser(s) to one of the following connectors, depending on your setup:

Single laser: **TLS IN** port of the IL RL OPM2 or IL PDL (with PM fiber) or IL PDL OPM2 (with PM fiber) module, or

Multiple lasers: **TLS IN** ports of the FBC module (only compatible with an IL RL OPM2 or IL PDL OPM2 module).

In case of multiple TLS, the CTP10 will sweep all lasers selected for the scan (see *Defining the Scanning Lasers* on page 118) from TLS1 to TLS4 (if any), whatever the wavelength ranges defined for each laser.

1c. If you use an FBC module, connect the **FBC OUT** port to the **TLS IN** port of the IL RL OPM2 or IL PDL OPM2 module.

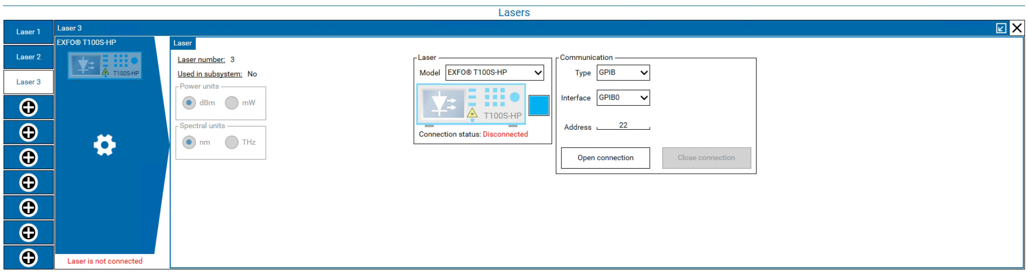
1d. For data sampling, connect the **OUT TO SCAN SYNC** (or **OUT1**) port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module to the **TLS IN** port of the SCAN SYNC module.

2. Turn on the laser and wait until it is fully initialized and ready to use.

3. In the task bar, click the Modules and Lasers button.

4. In the lower part of the **Modules and Lasers** window, click the icon to add a new laser.

The laser menu appears.



5. In the **Model** list, select the laser you have connected to the CTP10.

A default color is used for each laser model.

6. Click the colored square and select a color to associate with the laser. The color enables you to distinguish two lasers of the same model.

7. In the **Communication** area, in the **Type** list, select the communication port you use to connect the CTP10 to the laser and configure the connection parameters as explained in the following table.

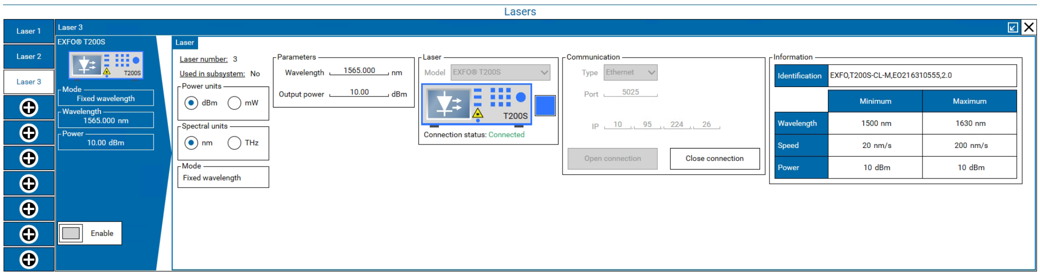
Communication Type	Parameter	Description
GPIB	**Interface**	GPIB interface ID of the laser GPIB controller.
	Address	GPIB address of the laser.

Communication Type	Parameter	Description
Ethernet	**Port**	TCP destination port to be used by the socket to allow data transmission between the CTP10 and the external laser.
	IP	IP address used by the connected laser.
USB	**Port**	COM port on which the laser is connected.
	Parity	Configure the USB (serial port) settings according to the instructions given in your laser's user guide.
	Flow control	
	Speed	
	Stop bit	

8. Click the **Open connection** button.

The CTP10 retrieves available information from the connected laser: the **Information** area appears and displays the laser characteristics.
The laser is fully connected when its model appears in the **Identification** field.

If you open connection to a T200S/T500S laser while it is warming up, the warmup is automatically skipped so that the CTP10 can connect to the laser.



In laser sharing mode, the laser added from the Controller CTP10 appears in the **Laser** pane of all the Distributed CTP10s and cannot be modified from the Distributed CTP10s.

9. Perform steps 2 to 8 with all the lasers you have connected to the CTP10.

Controlling the Lasers

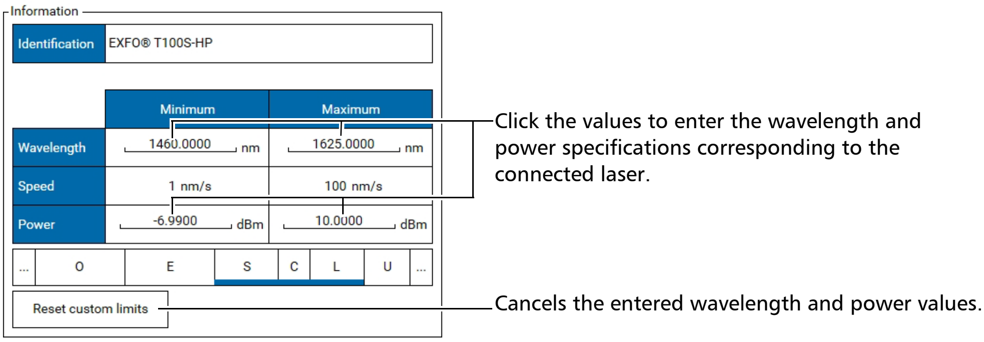
Once you have connected the laser to the CTP10 and opened the connection, the laser settings are available for configuration and control.

To control the laser settings:

1. In the laser menu: in the **Laser** area under the model picture, make sure the laser connection status is set to **Connected**.

Once connected to the laser, the CTP10 retrieves available information from the laser: the **Laser information** area appears and displays the laser characteristics.

2. On some models of T100S-HP and mSWS-A1SLS lasers, enter the wavelength and power limits of the laser model: for some models of these lasers, the CTP10 cannot retrieve the model information directly from the instrument so you must enter manually the wavelength and power limits of the connected laser model, as explained in the following figure.



3. Configure and control your lasers.

Laser settings are not the same for all laser types. The following table details all possible parameters.

Parameter	Description
Power/Spectral units	Power and wavelength units to use in the laser settings.
Mode	➤ **Fixed wavelength**: sets the laser emission wavelength/frequency to a fixed value defined in the **Parameters** area (see *Parameters* below). ➤ **Sweep continuous** (T100S-HP and mSWS-A1SLS lasers only): sets the laser to perform continuous wavelength/frequency sweep according to the parameters set in the **Parameters** area (see *Parameters* below).

<table>
<tr><th colspan="2">Parameter</th><th>Description</th></tr>
<tr><td colspan="2">Parameters</td><td>The laser parameters depend on the selected sweep mode.</td></tr>
<tr><td rowspan="8"></td><td>Wavelength/ Frequency</td><td>Fixed wavelength mode only.
Click the value to enter the wanted fixed laser emission wavelength/frequency.</td></tr>
<tr><td>Start wav./freq.</td><td>Sweep continuous mode only.
Click the value to enter the wanted lower wavelength/frequency sweep limit.</td></tr>
<tr><td>Stop wav./freq.</td><td>Sweep continuous mode only.
Click the value to enter the wanted upper wavelength/frequency sweep limit.</td></tr>
<tr><td>Speed</td><td>Sweep continuous mode only.
Click the value to enter the wanted sweep speed of the laser.</td></tr>
<tr><td>Output power</td><td>Click the value to enter the wanted output power.
On T500S lasers, the maximum power is limited to 13 dBm. To avoid permanent damage to the CTP10 module detectors, do not apply a higher output power value than the maximum safe power specified for the detector to which the laser is connected (refer to Optical Measurement Specifications on page 3).</td></tr>
<tr><td>Coherence control</td><td rowspan="3">For more details on these functions, refer to the user manual delivered with the laser.</td></tr>
<tr><td>Backlash suppression control</td></tr>
<tr><td>Cavity control</td></tr>
<tr><td colspan="2">Repeat Mode</td><td>Sweep continuous mode only.
➤ Cycles: number of sweep cycles in case of continuous sweep. Enter 0 for limitless sweep (if supported by the connected laser).
➤ Delay: pause between two sweep cycles. This parameter defines the period of time during which the laser stays at the upper wavelength of the sweep range before it returns to the lower wavelength to restart a new sweep cycle.</td></tr>
</table>

Controlling the Laser Output

The laser menu enable you to control the laser sweep and to enable/disable the optical output.

Two buttons are available to control the laser:

➤ The **Enable** button controls the laser output. If the laser is set to sweep mode, you must also activate the sweep.

➤ The **Sweep** button controls the laser sweep independently from the optical output on EXFO T100S-HP and VIAVI mSWS-A1SLS laser models.

In laser sharing mode, the laser state is handled by the Controller CTP10 only and displayed in the **Laser** pane of all the Distributed CTP10s.

Before starting:

Make sure the laser is connected and properly configured (see *Controlling the Lasers* on page 92).

To enable/disable the laser output:

➤ To enable the laser output, click the **Enable** button located at the bottom left of the **Laser** menu.

  The button lights in yellow and a red light flashes to indicate that the laser is emitting.

  ➤ If the **Sweep** button (availability depending on laser model) is selected, the laser sweeps according to the parameters set in the laser menu.

  ➤ If the **Sweep** button (availability depending on laser model) is not selected, the laser emits at the last set wavelength.

➤ To disable the laser output, click the yellow **Enable** button

To start/stop the laser sweep:

(only available on EXFO T100S-HP and VIAVI mSWS-A1SLS laser models)

1. Set the laser to **Sweep continuous** or **Sweep stepped** mode.

   The **Sweep** button appears.

2. To enable the laser sweep, click the **Sweep** button located at the bottom left of the **Laser** menu.

   The button flashed in yellow to indicate that the laser is sweeping according to the parameters set in the laser menu.

3. To stop the laser sweep, click the yellow **Sweep** button.

Sharing the Lasers with Several CTP10s

The **Laser Sharing** function enables you to perform simultaneous measurement scans on eight CTP10s using the tunable lasers connected to a single CTP10, as illustrated in *Typical IL/RL test setup with multiple lasers shared between several CTP10* on page 57.

The CTP10 controlling the lasers is defined as the **Controller** CTP10 and the seven other CTP10s are defined as the **Distributed** CTP10s.

Once a CTP10 is defined as the Controller, it controls the lasers and scanning parameters for all the Distributed CTP10s.

A Distributed CTP10 uses the lasers and scan parameters defined on the Controller. These parameters cannot be modified from the Distributed CTP10s.

Requirements:

- All CTP10 mainframes must be connected to the LAN network, with different names (see *Renaming the Instrument* on page 50).
- All CTP10 mainframes must be equipped with the same software package version.
- All CTP10 mainframes (Controller and Distributed CTP10) must be equipped with a SCAN SYNC module for optical sampling
- All CTP10 mainframes (Controller and Distributed CTP10) must be equipped with the same measurement module: an IL RL OPM2 module for IL and RL measurements or an IL PDL module for IL and PDL measurements.
- Laser sharing is not compatible with the IL PDL OPM2 module.
- Laser sharing is not compatible with the PCMx modules.
- You cannot use the Laser sharing function in combination with the Daisy chaining function.

Connecting the CTP10 Laser Controller to Distributed CTP10s

As soon as you connect a CTP10 to another CTP10 in the **Laser sharing** menu, you enter the laser sharing mode: the CTP10 from which you have open the connection becomes the Controller and the CTP10 connected to the Controller is immediately set to Distributed.

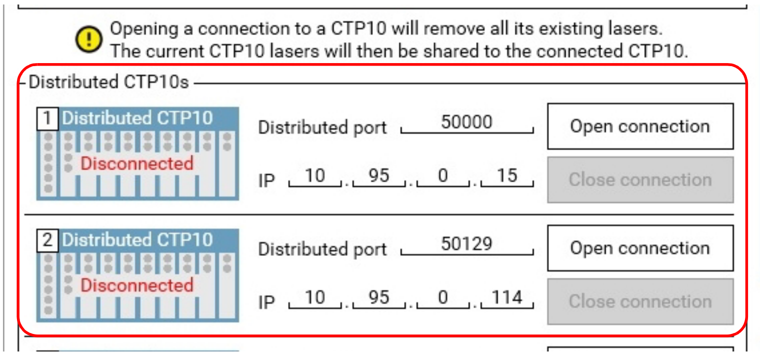
The **Laser sharing** menu enables you to connect the current CTP10 to up to seven CTP10s with which you want to share the lasers.

To enter the laser sharing mode:

1. Before starting, make sure that all the CTP10 you want to use are connected by LAN, with different names (see *Renaming the Instrument* on page 50).
   For optimum performance, make sure that all CTP10 are part of a dedicated network, or a VLAN.

2. In the task bar, click the **Laser sharing** menu.

   The lower part of the menu enables you to connect to remote CTP10s.



3. In the **Laser sharing** menu, in the **Distributed CTP10s** area, enter the Distributed port and IP address of the CTP10 with which you want to share the lasers:

   ➤ **Distributed port**: enter the laser sharing distributed port of the CTP10 to which you want to connect. The Distributed port of a CTP10 is displayed in the **Laser sharing** menu, in the **Current laser sharing Distributed port** field.
   Default value: 50000.

   ➤ **IP**: enter the IP address of the CTP10 to which you want to connect. The IP address of a CTP10 is displayed in the **Laser sharing** menu, in the **Current CTP10 IP** field.

4. Make sure that the CTP10 with which you want to share the lasers is not busy (not scanning nor analyzing) and is not a already a Controller or a Distributed CTP10.

5. Click the **Open connection** button.

   The current CTP10 is automatically set to Controller and the connected CTP10 is immediately set to Distributed:

   ➤ On the Distributed CTP10, in the lower part of the **Modules and Lasers** window, the local laser(s) (if any) are replaced by the shared lasers and cannot be modified from the Distributed CTP10.

   ➤ In the **Subsystem setup** menu, the laser configuration made on the Controller subsystem is automatically applied to the Distributed CTP10 and cannot be modified from the Distributed CTP10.

- ➤ In the **Scan** menu, the scan parameters defined on the Controller are applied to the Distributed CTP10 and cannot be modified from the Distributed CTP10.

6. Perform steps 2 to 4 with all the CTP10s with which you want to share the lasers.

To modify the laser sharing ports:

The laser sharing ports enable the Controller CTP10 to set the communication with the Distributed CTP10s.

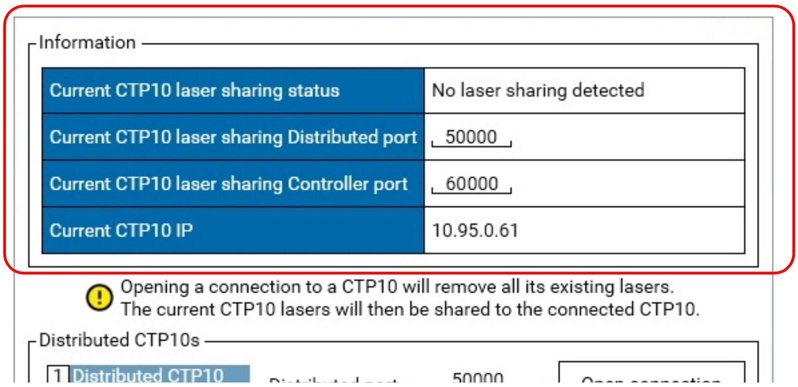
You can use the default laser sharing ports to set the communication between the Controller CTP10 and Distributed CTP10s. These ports can be identical on all CTP10s involved in the laser sharing configuration.

You should modify the default laser sharing ports only in case a specific network inconsistency occurs (firewall restriction or application already running on the same port).

1. Make sure that the CTP10 is not busy (not scanning nor analyzing).

2. In the task bar, click the **Laser sharing** menu.

The upper part of the menu enables you to modify the laser sharing ports.



3. To modify the Controller port of the current CTP10, click the **Current CTP10 laser sharing Controller port** field (default value: 60000).

4. To modify the Distributed port of the current CTP10, click the **Current CTP10 laser sharing Distributed port** field (default value: 50000).

Disconnecting the CTP10 Laser Controller from Distributed CTP10s

You can stop sharing lasers with a Distributed CTP10 from the Controller, or directly from a Distributed CTP10.

When you disconnect a Distributed CTP10 from the Controller, the laser configuration that was retrieved from the Controller is immediately removed from the CTP10.

To stop laser sharing from the Controller CTP10:

1. On the Controller CTP10: in the task bar, click the **Laser sharing** menu.

   The menu displays all the connected CTP10s.

2. Click the **Close connection** button corresponding to the Distributed CTP10 with which you want to stop sharing lasers.

   The CTP10 is immediately disconnected from the Controller CTP10. The Controller still shares its lasers with the remaining Distributed CTP10s. If there is not more Distributed CTP10 connected to the Controller, the laser sharing function is automatically stopped on the Controller CTP10.

To stop laser sharing from a Distributed CTP10:

1. On the Distributed CTP10: in the task bar, click the **Laser sharing** menu.

2. Click the **Close connection** button.

   The CTP10 is immediately disconnected from the Controller CTP10. The laser configuration is removed from the CTP10. The Controller still shares its lasers with the remaining Distributed CTP10s. If there is not more Distributed CTP10 connected to the Controller, the laser sharing function is automatically stopped on the Controller CTP10.

Operating CTP10s in Laser Sharing Mode

Once you have entered the laser sharing mode, you can operate the Controller CTP10 as you would do in standalone mode (without laser sharing), as illustrated in *Overview Diagram* on page 51. The Distributed CTP10s can use the lasers shared by the Controller for their acquisition scans.

To operate CTP10s in laser sharing mode:

1. Connect the Controller CTP10 to the lasers as explained in *Defining and Controlling Your Laser(s)* on page 87.

The Controller CTP10 controls the lasers for all Distributed CTP10s. You cannot modify the laser configuration from the Distributed CTP10s.

2. Define your subsystems (on the Controller CTP10 and on the Distributed CTP10s) as explained in *Setting up Your Subsystem* on page 103.

You select the lasers you want to use on the Controller CTP10. The laser configuration made on the Controller subsystem is automatically applied to the Distributed CTP10s and cannot be modified from the Distributed CTP10s.
Any other element of the subsystem (OPMx, DUT) can be configured independently on the Controller and on Distributed CTP10s.
For optimum performances, use more detectors and/or traces on the Controller CTP10 than on the Distributed CTP10.

All CTP10s must be equipped with the same measurement module: IL RL OPM2 module for IL and RL measurements or IL PDL module for IL and PDL measurements.

3. Define the scan parameters as explained in *Defining the Scan Parameters* on page 117.

On the Controller CTP10, the scan parameters that you define are applied to all the Distributed CTP10s.

On the Distributed, you can only select the scan mode and the scan trigger output. All other parameters are defined by the Controller CTP10.

4. Reference the subsystem as explained in *Referencing the Subsystem* on page 130.

You can perform the wavelength referencing operation independently on the Controller CTP10 and on the Distributed CTP10s.

On the Distributed CTP10s, you can only perform the referencing scan if the Controller is scanning (measurement scan or referencing scan). If the Controller is not scanning, the Distributed CTP10s wait for the next sweep from the Controller CTP10 to synchronize with it and perform the referencing scan.

5. Perform measurement scans as explained in *Performing Acquisition Scans* on page 136.

The acquisition scans you perform on the Controller CTP10 synchronize with all the Distributed CTP10s and enable them to perform acquisition scans.

On the Distributed CTP10s, you can start and stop single or continuous measurement scans. The acquisition on Distributed CTP10s is only possible if a scan is in progress on the Controller CTP10.

6. Configure, display and analyze traces: see *Displaying and Handling Traces* on page 147, *Analyzing Traces* on page 159 and *Handling Subsystem Data* on page 114.

You can configure, display and analyze traces on Controller and Distributed CTP10s as you would do in standalone mode (without laser sharing). There is no difference between Controller and Distributed CTP10s on these operations.

7 Defining Your Subsystem

A subsystem is a measurement system made of:

➤ One to four laser source(s) that the CTP10 will sweep.

➤ One device under test (DUT).

➤ One IL RL OPM2 or IL PDL or IL PDL OPM2 module to perform measurements.

➤ One SCAN SYNC module for optical sampling.

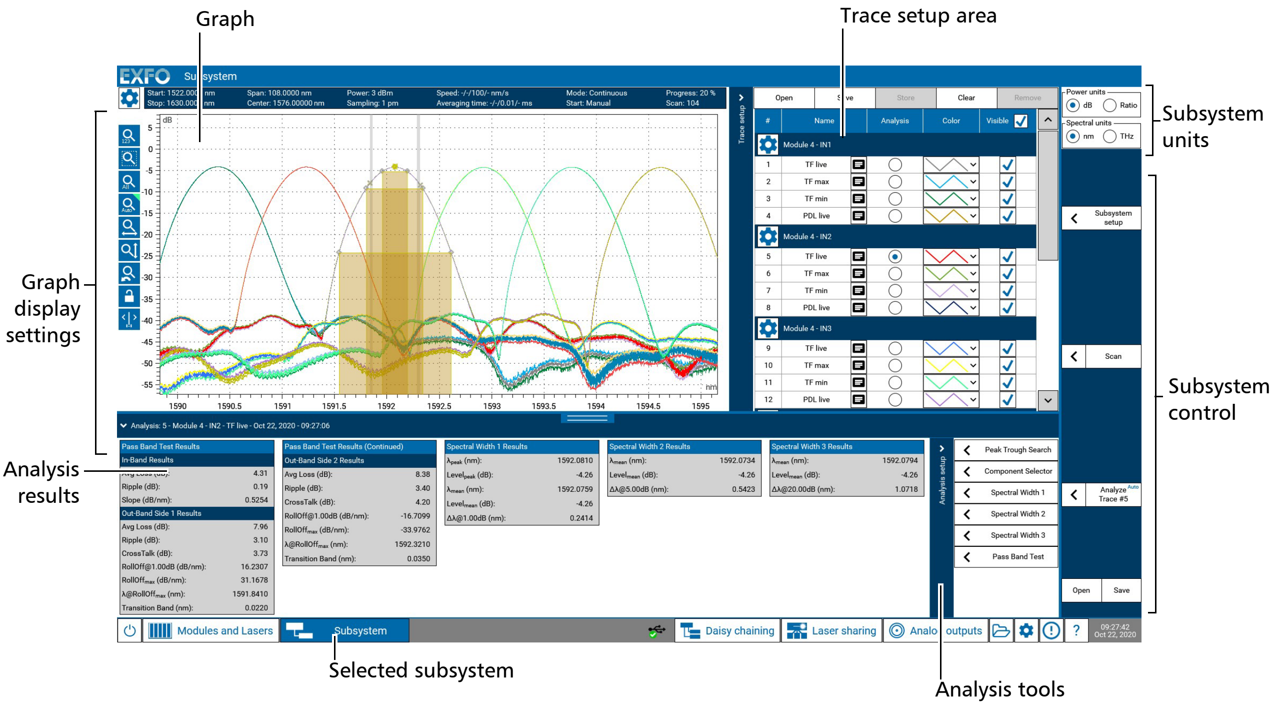
➤ OPMx modules providing detectors for IL and/or PDL measurements.

If your IL/PDL test setup requires more than 42 detectors, the daisy chaining mode enables you to use additional detectors from another CTP10 (up to 60 additional detectors) for simultaneous IL and/or PDL measurements. For more details, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.

➤ PCMx modules providing detectors for photocurrent measurements.

PCM modules are not available in Laser Sharing and Daisy chaining modes, and if multiple lasers are used to perform a scan.

The **Subsystem** window enables you to configure, display and analyze your measurements:



Creating a Subsystem

The following procedure gives all the steps to create an entire subsystem.

To create an entire subsystem:

1. In the task bar, click the 

button.

   The **Subsystem** main window appears, it enables you to configure, display and analyze your measurements.

2. Configure your subsystem as follows:

a	Only if needed: if your test setup requires more than 42 detectors, enter the Daisy chaining mode as explained in *Using Additional OPMs (Daisy Chaining mode)* on page 109.
b	Graphically configure your test setup using the **Subsystem setup** menu as explained in *Setting up Your Subsystem* on page 103.
c	Define the scan measurement parameters and reference your subsystem: see *Defining the Scan Parameters* on page 117 and *Referencing the Subsystem* on page 130.
d	Configure the wanted trace settings: see *Selecting the Traces to Acquire* on page 126.
e	Test your DUT: see *Performing Acquisition Scans* on page 136.
f	Adapt the graph display to your needs: see *Adjusting the Graph Display* on page 152.
g	Analyze the traces: *Analyzing Traces* on page 159.

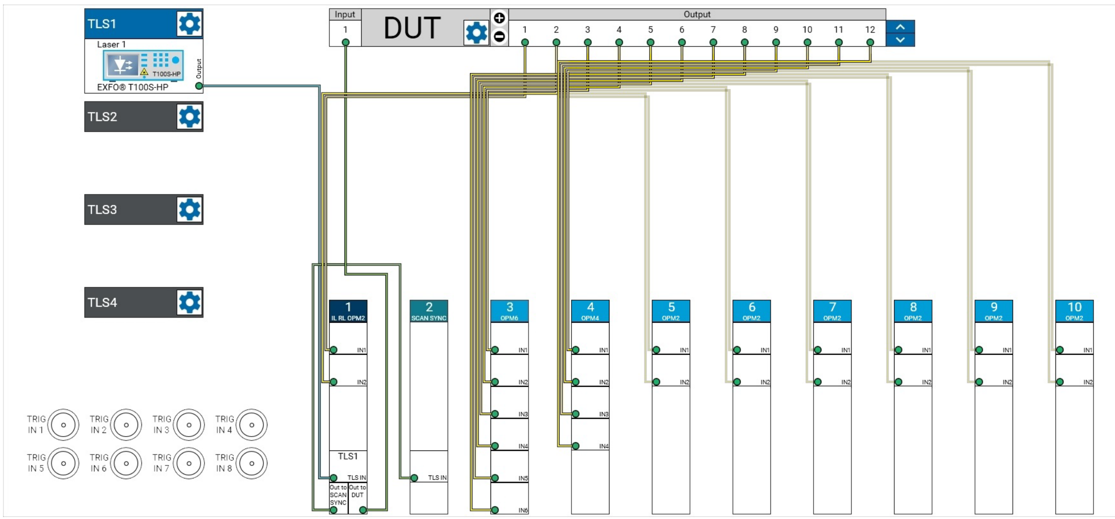
3. Handle traces and subsystem data: see *Handling Subsystem Data* on page 114 and *Handling Traces Displayed on Graph* on page 147.

Setting up Your Subsystem

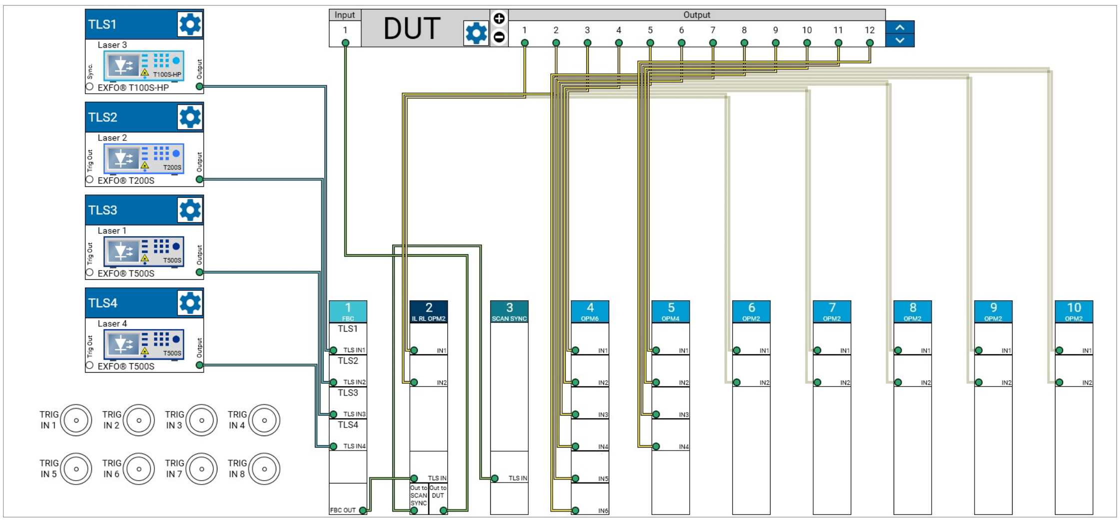
The **Subsystem setup** menu enables you to graphically configure your physical test set-up and define all the modules and instruments that are part of your setup.

To set up a subsystem, you first need to define the instruments to connect to the CTP10, and then connect the instruments to each others the same way they are physically connected.

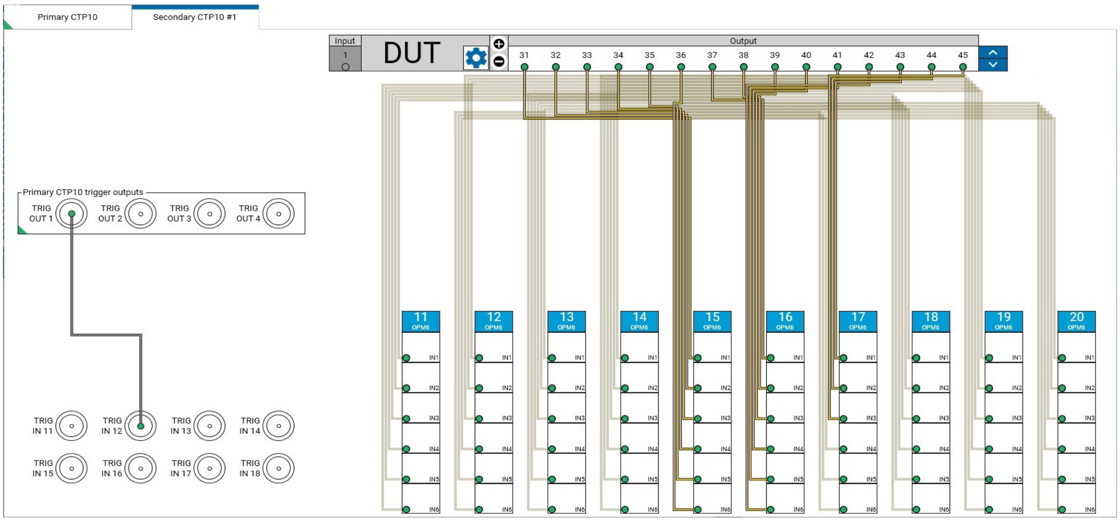
The following figure gives an example of a subsystem setup with one laser.



The following figure gives an example of a subsystem setup with four lasers connected to an FBC module.



The following figure gives an example of a subsystem setup in Daisy chaining mode (see *Using Additional OPMs (Daisy Chaining mode)* on page 109 for details): the Primary CTP10 is connected to an additional CTP10 (Secondary) through a BNC cable to be able to use its OPMs for measurements. An additional tab is available for the Secondary CTP10. The following figure displays the Secondary tab.



Selecting/Removing the Laser(s)

This section explains how to select the laser(s) that you want to add to the subsystem.

With the FBC module, you can add up to four lasers in the subsystem; once added to the subsystem, the lasers become available for scanning (see *Performing Measurement Scans* on page 117).

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you select the lasers you want to use on the Controller CTP10. The laser configuration made on the Controller subsystem is automatically applied to the Distributed CTP10s and cannot be modified from the Distributed CTP10s.

To add a laser to the subsystem:

1. In the task bar, click the Subsystem button.
2. Make sure the lasers you want to add to the subsystem are connected to the CTP10 and properly configured (see *Controlling the Lasers* on page 92).
3. In the **Subsystem** window, click the **Subsystem setup** button.
4. In the TLS1 rectangle, click the button.

   The **Laser** menu displays all lasers that have been added to the laser window (see *Adding and Connecting the Laser(s)* on page 88).
   If a laser is already selected, the trigger method and destination is also displayed in the menu: it depends on the links set for the laser and it is automatically selected.
5. Select the laser you want to add to the subsystem.

   If you add multiple lasers: the CTP10 will sweep all lasers selected for the scan (see *Defining the Scanning Lasers* on page 118) from TLS1 to TLS4 (if any), whatever the wavelength/frequency limits set for the lasers.

   The selected laser appears as TLS1 of the subsystem, with its corresponding output ports. It is also automatically selected for scanning in the **Scan** menu (see *Defining the Scan Parameters* on page 117).

   In laser sharing mode the laser selected on the Controller CTP10 automatically appears on the Distributed CTP10s subsystem setup.
6. If needed, perform step 4 and 5 with TLS2, TLS3 and TLS4.

   For continuous traces, make sure that the maximum wavelength physical limit of a laser overlaps by 5 nm the minimum wavelength limit of the next laser.

To remove a laser:

To remove a selected laser from the subsystem, click the laser button and click the **Clear Selection** button.

Defining your DUT

The DUT has one laser input and up to 120 output ports. You can define the number of outputs and the way to display them.

In laser sharing mode, you can perform this operation independently on the Controller CTP10 and on the Distributed CTP10s.

In daisy chaining mode, the Secondary tab displays the available DUT outputs.

To define the DUT of your subsystem:

1. In the Subsystem window, click the < Subsystem setup button.
2. In the DUT rectangle, click the button and define your DUT as explained in the following table.

Parameter	Description
Name	Click the field to modify the DUT name in the **Subsystem setup** menu.
Number of outputs	Number of output ports of your DUT. Click the value to modify it. You can also use the and buttons at the left of the DUT output ports to increase/decrease the number of ports.
Outputs per line	Display setting: number of output ports you want to display in the visible line of the DUT panel. Click the value to modify it.
Automatic output links	Automatically links all the output ports of the DUT to the available detectors of the modules plugged into the CTP10 mainframe. In daisy chaining mode, this button only applies to the module detectors displayed in the current tab.
Disconnect output links	Automatically disconnect all the existing links between the output ports of the DUT and the CTP10 detectors. In daisy chaining mode, this button only applies to the module detectors displayed in the current tab.

Linking Instruments of the Subsystem

Once all instruments are defined and selected, you can graphically link the instruments to each others to set-up your subsystem and have it ready for measurements.

If a laser is selected for scanning in the **Scan** menu (see *Defining the Scan Parameters* on page 117) but is not connected to another instrument of the subsystem, the scan won't be able to start.

For each measuring connector (detector or TF/BR output) used in the subsystem, a trace group is created in the **Trace setup** pane.

If you physically remove a module from the mainframe, all corresponding subsystem links and traces are deleted.

➤ In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you define the links between the TLS, the FBC (if any) and the IL RL OPM2 or IL PDL modules on the Controller CTP10. These links are automatically applied to all the Distributed CTP10s and cannot be modified from the Distributed CTP10s (synchronization between the Controller CTP10 and Distributed CTP10s may take a few seconds).
All Distributed CTP10s must use the same measurement module as the Controller CTP10 (IL RL OPM2 module or IL PDL module).
You can define any other link (between the IL RL OPM2 or IL PDL module, the SCAN SYNC module and the DUT) independently on the Controller CTP10 and on Distributed CTP10s.

➤ In daisy chaining mode (see *Using Additional OPMs (Daisy Chaining mode)* on page 109), an additional tab is available in the **Subsystem setup** menu for the Secondary CTP10 that is connected to the Primary CTP10. This tab enables you to define the trigger ports used to link the Primary and Secondary CTP10s, and to define the measuring detectors that you want to use in your test setup.

To define links between instruments:

1. Make sure you have physically connected your instruments to each others: see *Installing Your Test Setup* on page 51.

2. In the Subsystem window, click the **Subsystem setup** button.

3. Link the instruments by drag & drop so that it reflects your physical test setup: click the output port icon of an instrument, drag the link to the input port of the instrument to which you want to connect it, and release it to create the link.

   3a. Link the TLS **Output** port to the **TLS IN** port of the IL RL OPM2, IL PDL or IL PDL OPM2 module, or to the **TLS IN** ports of the FBC module, depending on your setup.

   If you use an FBC module, link the **FBC OUT** port to the **TLS IN** port of the IL RL OPM2 or IL PDL OPM2 module (the FBC module is not compatible with the IL PDL module).

   3b. If you want to perform High res. sampling scans (see **Sampling on page 123**) or generate pulse trigger signals (see *Generating Pulse Trigger Signals* on page 142), link the **Trig out** (or **Sync.**, depending on the laser model) port of the TLS to one of the **TRIG IN** ports of the CTP10.

3c. For data sampling: link the **OUT TO SCAN SYNC** (or **OUT1**) port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module to the **TLS IN** port of the SCAN SYNC module to use the optical trigger.

3d. If you use the daisy chaining mode: in the Secondary tab, link a **TRIG OUT** port of the Primary to the **TRIG IN** port used on the Secondary.

3e. Link the **OUT TO DUT** port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module to the **Input** port of the DUT.

3f. Link the output ports of the DUT to the **IN** detector ports of:
- The OPMx modules (and of the IL RL OPM2 or IL PDL OPM2 module if it is used for acquisition) for IL and/or PDL measurements.
In daisy chaining mode, link all the output ports of your DUT to the **IN** ports of the OPMx modules in the Secondary CTP10 tab.
- The PCMx modules for photocurrent measurements.

Impossible connections are grayed and the color of the links depends on the source of the links:

➤ If the link source is a laser, the link is blue.

➤ If the link source is the DUT, the link is yellow.

➤ If the link source is a CTP10 module, the link is green.

➤ If the link source is a CTP10 trigger (in daisy chaining mode), the link is gray.

➤ A selected link is red.

The connection between two instruments is created and configured.

To modify/remove links:

➤ To modify a link, re-define the link by drag & drop.

The existing link is automatically replaced by the new one.

➤ To remove a link between two instruments, do one of the following:

  ➤ Right-click the link and select **Remove Link**.

  ➤ Click the input or output port for which you want to remove the link, drag the link to a blank area of the subsystem setup menu and release it to remove the link.

➤ To remove all the output links of a DUT: in the DUT rectangle, click the button and click the **Disconnect output links** button.

Using Additional OPMs (Daisy Chaining mode)

The **Daisy chaining** function enables you to use additional detectors to perform your IL/PDL measurements by using the OPM modules located into another CTP10 mainframe, as illustrated in *Typical IL/PDL test setup with 2 CTP10s connected in a daisy chain* on page 58.

The CTP10 displaying measurement results is defined as the **Primary** CTP10 and the other CTP10 from which the optical detectors are used is defined as the **Secondary** CTP10.

Once you have entered the daisy chaining mode and defined a CTP10 as Primary, you control all detectors located on Secondary CTP10s from the Primary CTP10 and you cannot perform any configuration or measurement operation from the Secondary CTP10s.

The following sections gives details on how to use the daisy chaining function:

- *Connecting the Primary CTP10 to a Secondary CTP10* on page 110.
- *Disconnecting the Primary CTP10 from the Secondary CTP10* on page 112
- *Operating CTP10s in Daisy Chaining Mode* on page 112.

Requirements:

- All CTP10 mainframes must be connected to the LAN network, with different names (see *Renaming the Instrument* on page 50).
- All CTP10 mainframes must be equipped with the same software package version.
- The Primary CTP10 mainframe must be equipped with a SCAN SYNC module for optical sampling and an IL PDL or IL PDL OPM2 module for measurements.
- Daisy chaining is not compatible with the IL RL OPM2 module.
- Daisy chaining is not compatible with PCM modules.
- The Secondary CTP10 mainframe must be equipped with OPM modules.
- You cannot use the Daisy chaining function in combination with the Laser sharing function.

Connecting the Primary CTP10 to a Secondary CTP10

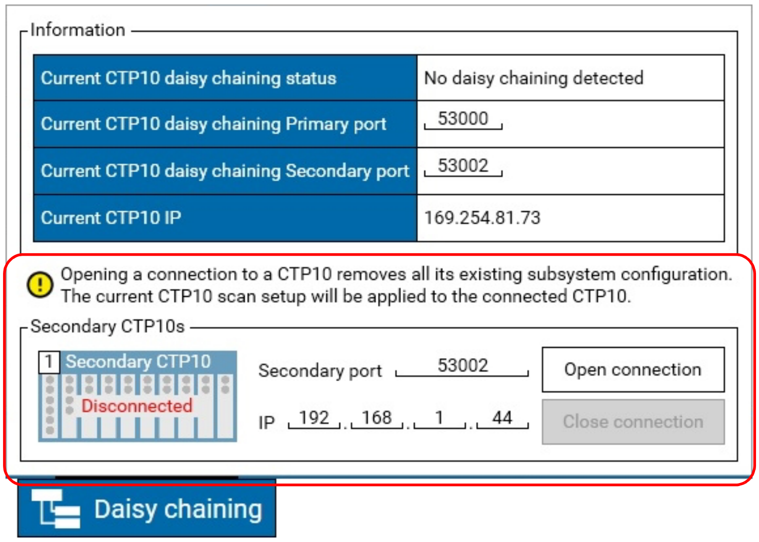
As soon as you connect a CTP10 to another in the **Daisy chaining** menu, you enter the daisy chaining mode: the CTP10 from which you have open the connection becomes the Primary and the CTP10 connected to the Primary is immediately set to Secondary.

Before starting, make sure that the CTP10s you want to use are connected by LAN, with different names (see *Renaming the Instrument* on page 50).

To enter the daisy chaining mode:

1. In the task bar, click the **Daisy chaining** menu.

The lower part of the menu enables you to connect to remote CTP10s.



2. In the **Daisy chaining** menu, in the **Secondary CTP10s** area, enter the Secondary port and IP address of the CTP10 with which you want to share the lasers:

- **Secondary port**: enter the daisy chaining secondary port of the CTP10 to which you want to connect. The Secondary port of a CTP10 is displayed in the **Daisy chaining** menu, in the **Current daisy chaining Secondary port** field.
Default value: 53002.

- **IP**: enter the IP address of the CTP10 to which you want to connect. The IP address of a CTP10 is displayed in the **Daisy chaining** menu, in the **Current CTP10 IP** field.

3. Make sure that the CTP10 from which you want to use the detectors is not busy (not scanning nor analyzing) and is not already a Primary or a Secondary CTP10, or used in laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95).

4. Click the **Open connection** button.

The current CTP10 is automatically set to Primary and the connected CTP10 is immediately set to Secondary:

- On the Secondary CTP10, the GUI is not available (except the **Close connection** button, see *Disconnecting the Primary CTP10 from the Secondary CTP10* on page 112).

- The subsystem configuration made on the Primary is automatically applied to the Secondary CTP10 and cannot be modified from the Secondary CTP10.

To modify the daisy chaining ports:

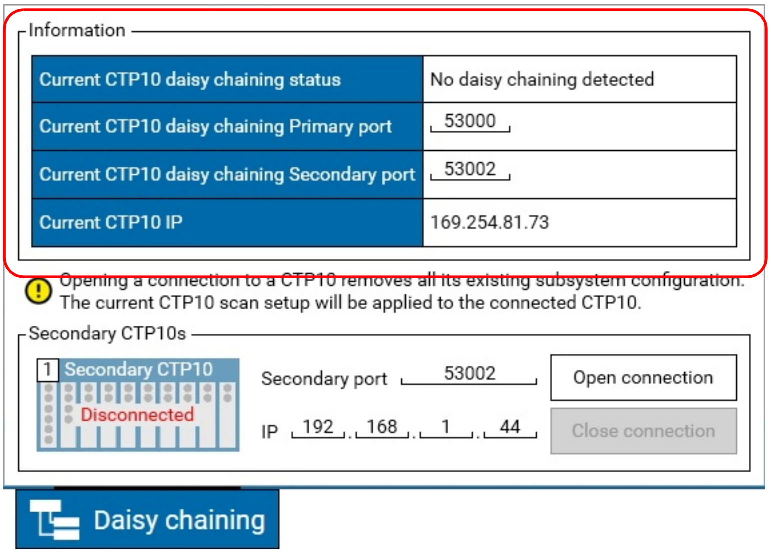
The daisy chaining ports enable the Primary CTP10 to set the communication with the Secondary CTP10s.

You can use the default daisy chaining ports to set the communication between the Primary CTP10 and Secondary CTP10s. These ports can be identical on all CTP10s involved in the daisy chaining configuration.

You should modify the default daisy chaining ports only in case a specific network inconsistency occurs (firewall restriction or application already running on the same port).

1. Make sure that the CTP10 is not busy (not scanning nor analyzing).
2. In the task bar, click the **Daisy chaining** menu.

   The upper part of the menu enables you to modify the daisy chaining ports.



3. To modify the Primary port of the current CTP10, click the **Current CTP10 daisy chaining Primary port** field (default value: 53000).
4. To modify the Secondary port of the current CTP10, click the **Current CTP10 daisy chaining Secondary port** field (default value: 53002).

Disconnecting the Primary CTP10 from the Secondary CTP10

You can close the Daisy chaining connection from the Primary CTP10, or directly from the Secondary CTP10. Closing the Daisy chaining connection clears the analysis data.

When you disconnect the Secondary CTP10 from the Primary, the entire configuration used by the Primary CTP10 is immediately removed from the CTP10.

To close the daisy chaining connection from the Primary CTP10:

1. On the Primary CTP10: in the task bar, click the **Daisy chaining** menu.

   The menu displays the connected CTP10.

2. Click the **Close connection** button corresponding to the Secondary CTP10 from which you want to stop using detectors.

   The CTP10 is immediately disconnected from the Secondary CTP10, and the daisy chaining function is automatically stopped on the Primary CTP10.

To close the daisy chaining connection from a Distributed CTP10:

On the Secondary CTP10, click the **Close connection** button.

The CTP10 is immediately disconnected from the Primary CTP10. The configuration used by the Primary CTP10 is removed from the CTP10.

Operating CTP10s in Daisy Chaining Mode

Once you have entered the daisy chaining mode, you can operate the Primary CTP10 as you would do in standalone mode (without daisy chaining), and include the detectors located into the Secondary CTP10 mainframe in your acquisition scans and measurements, as if the detectors were all located into the same mainframe.

To operate CTP10s in daisy chaining mode:

1. Connect the laser to the Primary CTP10 (as explained in *Defining and Controlling Your Laser(s)* on page 87).

2. From the Primary CTP10, define your subsystem as explained in *Setting up Your Subsystem* on page 103.
   In the Subsystem setup menu, in the Secondary CTP10 tab:

   ➤ define the additional detectors located into the Secondary CTP10 mainframe that you want to include in your acquisition scans and measurements.

   ➤ define the triggers used for daisy chaining by linking a **TRIG OUT** port of the Primary to the **TRIG IN** port used on the Secondary.

3. From the Primary CTP10, define the scan parameters as explained in *Defining the Scan Parameters* on page 117.

   On the Primary CTP10, the scan parameters that you define are applied to all the detectors selected on the Secondary CTP10s.

4. From the Primary CTP10, reference the subsystem as explained in *Referencing the Subsystem* on page 130.

   ➤ You can reference all the detectors located on the Secondary CTP10 from the Primary CTP10.

- ➤ You cannot use a detector located on the Secondary CTP10 to perform the wavelength referencing operation.

5. From the Primary CTP10, perform measurement scans as explained in *Performing Acquisition Scans* on page 136.

The acquisition scans you perform on the Primary CTP10 includes all the detectors located on the Secondary CTP10.

6. From the Primary CTP10: configure, display and analyze traces (see *Displaying and Handling Traces* on page 147, *Analyzing Traces* on page 159 and *Handling Subsystem Data* on page 114).

All traces acquired from detectors located on the Primary and on the Secondary CTP10 are displayed on the same graph on the Primary CTP10. The traces acquired from detectors located on the Secondary CTP10 are displayed on graph underneath the traces acquired from detectors located on the Primary CTP10.

You cannot analyze live traces acquired from detectors located on the Secondary CTP10.

Handling Subsystem Data

You can save the entire subsystem configuration, the screenshots of the subsystem and the analysis results. See the following sections for details:

- *Saving a Subsystem* on page 114
- *Loading an Existing Subsystem* on page 115

In daisy chaining mode, you can save the entire subsystem configuration, including all data retrieved from the detectors located on the Secondary CTP10. To load a subsystem saved in daisy chaining mode, make sure to enter the daisy chaining mode before loading the subsystem.

Saving a Subsystem

You can save the entire subsystem configuration into a *.CTP10 file, screenshots of the subsystem in *.jpg or *.png files and analysis results in *.csv format.

See the following procedure for details.

To save a subsystem:

1. In the **Subsystem** window, click the **Save** button located at the bottom right of the window.
2. Select the type of file to save:
   - **Settings (*.CTP10)**: saves the whole subsystem setup, all the measurement and display parameters set for the subsystem. It also saves in a separate folder (same name as the settings file: *<filename>.CTP10 Traces*) all the traces in their current state (in *.tra format), analysis parameters (*.ana format file), analysis results (*.anaresu format file), detectors reference data (.trc format file) and detectors quick reference data (.trc format file).
   - **Analysis Results (*.csv)**: saves the analysis results in a .csv file. You cannot load analysis results back to the system.
   - **Screenshot (*.jpg)**: saves the displayed window in .jpg format.
   - **Screenshot (*.png)**: saves the displayed window in .png format.
3. Select a location and type a name for the file to save.
4. Click the **Save** button.

   A confirmation message appears.

Loading an Existing Subsystem

A *.CTP10 file contains the subsystem setup, all the referencing, measurement and analysis parameters set for the subsystem and analysis results. When you open a *.CTP10 file on a subsystem, all this configuration and the traces associated with the subsystem are retrieved.

To open an existing subsystem:

1. In the Subsystem window, stop the scanning process (see *Performing Acquisition Scans* on page 136).
2. In the **Subsystem** window, click the **Open** button located at the bottom right of the window.
3. Select the location of the subsystem.
4. Select the type of file to open
   - **Settings (*.CTP10)**: to open a previously saved subsystem.
   - **Default Settings**: to open a new blank subsystem.
5. Click the **Open** button.

   A confirmation window appears.
6. Click **Continue**.

   The subsystem setup is loaded, with all the configuration settings and associated traces.

   If an element is missing (the lasers connected to the CTP10 have changed, instruments are unavailable, the trace folder is missing), the subsystem is still loaded but some parts may be missing. A message informs you of the incompleteness of the loaded subsystem.

Defining Subsystem Spectral and Power/Current Units

You can change the spectral and power/current units for the whole subsystem: graph scales, scan and analysis settings, measured values, analysis results as explained in the following procedure.

If you use PCM modules in the subsystem, the graph also displays the currents units.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), the subsystem units are defined on the Controller CTP10 and apply to all the Distributed CTP10s (synchronization between the Controller CTP10 and Distributed CTP10s may take a few seconds). You cannot modify the subsystem units from the Distributed CTP10s.

To define the spectral and power units:

In the **Subsystem** window, click one of the following option located at the top-right of the window:

- Select **dB/Ratio** to modify the power or current unit.
- Select **nm/THz** to modify the spectral unit.

8 Performing Measurement Scans

Once your subsystem is properly configured, you can start to test the DUT scanning, as explained in this section.

Measurement requirements for optimum system performance:

- Reference the optical path to every detector prior to connect the DUT to the setup: after each module removal and module insertion, or after any change in environmental conditions (see *Referencing the Subsystem* on page 130).
- Keep fiber optic connectors clean at all times (see *Cleaning Optical Connectors* on page 226).
- Avoid tight bends of fibers.
- For IL and RL measurements: if you use an SMF patchcord to link the laser to the IL RL OPM2 module (or SMF patchcords if you use an FBC module), maintain static these fibers between the referencing scan and the measurement scans.
- For RL measurements: use APC connectors on the OPMs.
- For PDL measurements:
  - Use PC connectors on the OPMs.
  - Maintain static the fibers during the four sweeps of the IL/PDL reference or measurement.

Defining the Scan Parameters

You can access the scan parameters from the subsystem main window. The scan parameters you select to perform the acquisition must be similar to the one selected for the referencing measurements.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), the following scan parameters defined on the Controller CTP10 are applied to all the Distributed CTP10s: **TLS parameters**, **Sweep** parameters (range, span, center and sampling), **Scan start** and **TLS outputs**. Modifying a shared parameter on the Controller CTP10 aborts the scanning operations in progress on all Distributed CTP10s.

On the Distributed CTP10s, you can only select the scan mode and output trigger. All other parameters are defined by the Controller CTP10.

Before starting:

- Make sure your instruments are physically connected to each others (see *Installing Your Test Setup* on page 51).
- Make sure your subsystem is properly configured in the **Subsystem Setup** panel (see *Defining Your Subsystem* on page 101) and reflects the physical connections.

To set scan parameters:

1. In the **Subsystem** window, click the < button located at the left of the **Scan** button.

   The scan menu appears.
2. Set the scan parameters for you measurement according to the instructions given in the following sections:
   - *Defining the Scanning Lasers* on page 118
   - *Defining the Sweep Parameters* on page 121
   - *Defining the General Scan Settings* on page 124

3. Reference your subsystem using the parameters selected for measurement: see *Referencing the Subsystem* on page 130.

4. Click the button or anywhere on the screen outside the menu to exit.

Defining the Scanning Lasers

The lasers displayed in the **Scan** menu are the one that have been added to the CTP10 in the **Subsystem setup** menu. The **Scan** menu enables you to select and configure the lasers you want to use for scanning.

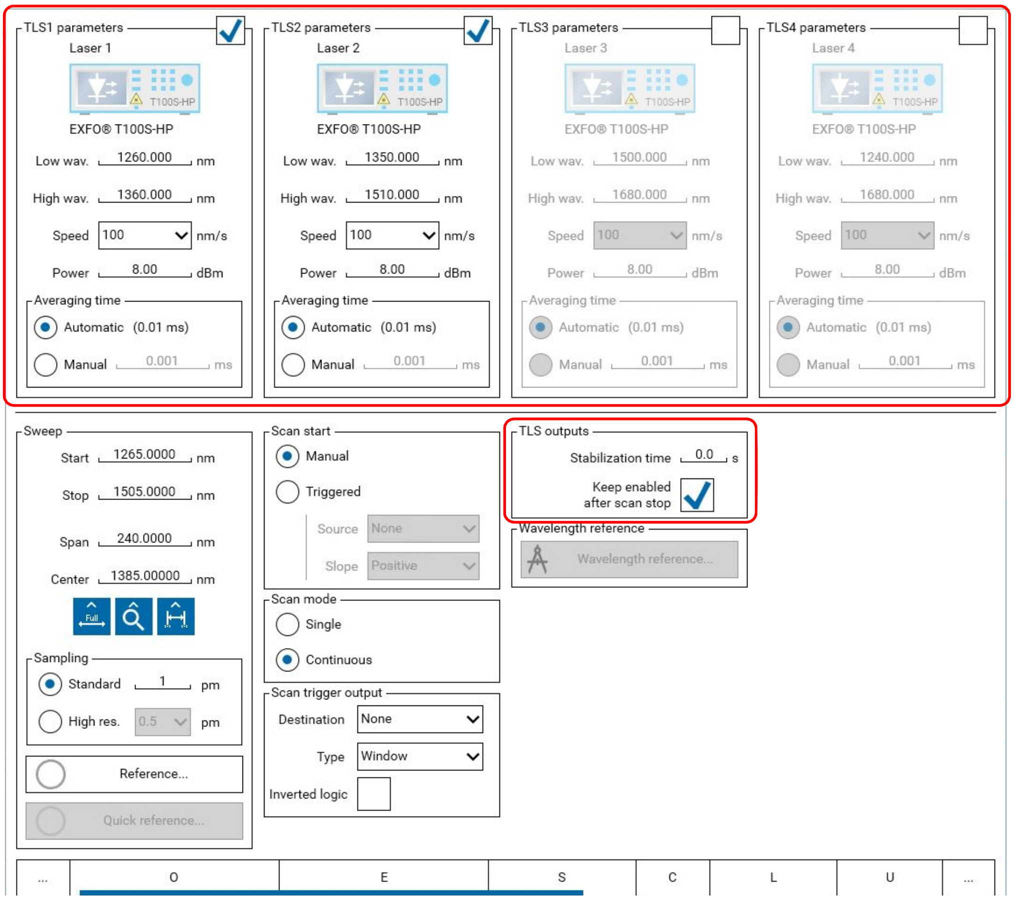
The CTP10 sweeps the lasers you select for the scan from TLS1 to TLS4 (if any), whatever the wavelength/frequency limits set for the lasers.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you must define the scanning lasers and TLS output settings on the Controller CTP10. These parameters are automatically applied to all the Distributed CTP10s (this operation may take a few seconds) and cannot be modified from the Distributed CTP10s.

To define the laser parameters for scanning:

1. In the **Scan** menu, select the check box of the laser(s) you want to use for scanning.

Make sure the selected lasers are connected to the appropriate module of the subsystem in the **Subsystem setup** menu. Otherwise the scan won't be able to start.



2. For each selected laser, define the scanning parameters according to the instructions given in the following table:

Setting	Description
Low wav./freq. **High wav./freq.**	Wavelength/Frequency sweeping range of the laser: the **Low wav.** value must be 2.5 nm higher than the minimum wavelength limit of the laser, and the **High wav.** value must be 2.5 nm lower than the maximum wavelength limit of the laser. In case of multiple lasers, the minimum and maximum physical wavelength limits of each laser cannot be reached: for a continuous trace, make sure that the maximum wavelength limit of a laser overlaps by 5 nm the minimum wavelength limit of the next laser. If sweeping ranges of lasers overlap, the first laser sweeps until it reaches the center wavelength of the overlapping range (between the low wavelength of the second laser and the high wavelength of the first laser).
Speed	Laser sweeping speed. The value set here replaces the speed value set in the laser configuration menu (see *Controlling the Lasers* on page 92). Available speed values depend on the laser model. Please note that modifying the speed value automatically modifies the **Automatic** averaging time value (see **Averaging Time on page 119** below). If you use multiple TLS, you can set a different speed value for each laser.
Power	Optical output power of the laser used for the scan. The value set here replaces the power set in the laser configuration menu (see *Controlling the Lasers* on page 92). Recommended values are: ➤ EXFO T100S-HP O and CL models: +10 dBm. ➤ EXFO T100S-HP O+, ES, SCL and CLU models: +8 dBm. ➤ VIAVI mSWS-A1SLS: +3 dBm. ➤ T200S: +10 dBm (unchangeable). ➤ T500S: +10 dBm. The recommended value depend on the laser model: refer to the T500S specifications. On T500S lasers, the maximum power value is limited to 13 dBm to ensure a reliable acquisition on the maximum wavelength/frequency range.
Averaging Time	Period of time during which you want the laser power to be averaged on all the detectors of the subsystem: ➤ **Automatic**: the averaging time is automatically set regarding the laser **Speed** and the **Sampling** (if High res.) value. The higher you set the speed, the shorter the automatic averaging time is. ➤ **Manual**: enter the wanted time value. If you use multiple TLS, you can set a different averaging time value for each laser.

3. Define the optical output settings of the lasers used for the scan, as follows:

Setting	Description
Stabilization Time	Period of time during which you want the laser to stabilize before starting the acquisition. This period of time only applies if the laser output is disabled at the beginning of the scan. In case of multiple lasers selected for the scan, each laser stabilizes one after the other before the first laser sweep. If the laser output is already enabled at scan start, this parameter is not taken into account.
Keep enabled after scan stop	➤ ☑ (default): the laser optical output stays enabled after scan stop. The laser stabilization time will not be applied for the next scan. In case of multiple lasers selected for the scan, this parameter applies to all lasers. ➤ ☐ the laser optical output is disabled when the scan stops.

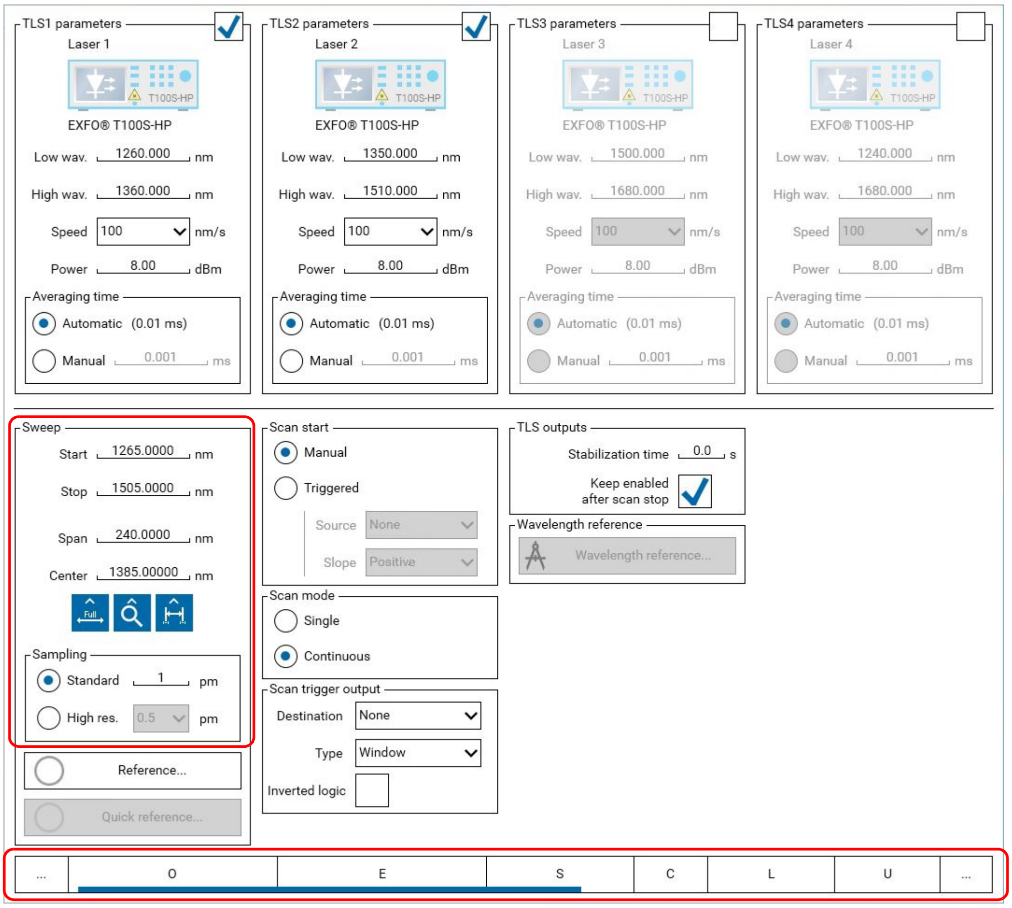
Defining the Sweep Parameters

In the **Scan** menu, the **Sweep** area enables you to specify the sweep range and sampling for your measurements. It also enables you to reference your test setup with the parameters defined. The sweep settings you use to perform the power referencing must be the same as the one you intend to use for measurements.

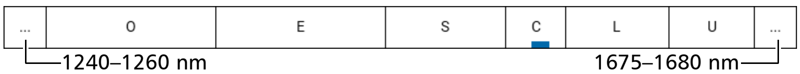
In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you define the sweep parameters on the Controller CTP10. These parameters are automatically applied to all the Distributed CTP10s and cannot be modified from the Distributed CTP10s.

To set the sweep parameters:

1. In the **Subsystem** window, click the button located at the left of the **Scan** button to access the sweep parameters.



2. In the **Scan** menu, set the sweep range by using one of the available range parameters described in the following table.

Setting	Description
Start/Stop	Wavelength/frequency overall sweeping range. The max/min wavelength or frequency range is defined in *Technical Specifications* on page 3). The sweep start wavelength must be 2.5 nm higher than the minimum wavelength limit of your lowest wavelength laser; and the sweep stop wavelength must be 2.5 nm lower than the maximum wavelength limit of your highest wavelength laser.
Span/Center	Wavelength/frequency sweeping span.
	Sets the sweeping range to the maximum possible wavelength range (see *Technical Specifications* on page 3).
	Sets the sweeping range to the zoom parameters displayed on graph.
	Sets the sweeping range to the limits specified by the positions of A and B markers (for more details on markers, see *Performing Manual Measurements With Markers* on page 156).
O/E/S/C/L/U buttons	Wavelength sweeping range, defined by ITU band selection. The blue line pictures the selected bandwidth. ➤ To select a single band, click the corresponding button twice. ➤ To select several bands, click the corresponding adjacent buttons one after another. ➤ To modify the boundaries of a band, use the **Sweep** area of the scan menu.  Selecting a band modifies the values defined in the **Sweep** area.

3. Define the sampling parameter using the instruction given in the following table.

Setting	Description
Sampling	Spectral sampling resolution: the value sets the sampling resolution of the SCAN SYNC module. ➤ **Standard**: sampling resolution value between 1 and 250 pm. ➤ **High res.**: high resolution sampling value. Selecting a high resolution sampling value reduces the possible sweep span and laser speed: ➤ For sampling values of 0.5 to 0.1 pm: speed of 20 to 100 nm/s, with a maximum span 200 nm. ➤ For a sampling value of 0.02 pm: 20 nm/s speed, with a maximum span of 35 nm. ➤ For a sampling value of 0.05 pm: 20 nm/s speed, with a maximum span of 99 nm. Selecting a high resolution sampling value limits the maximum number of measured traces to 20. To perform high resolution sampling scans, you need to link the **Trig out** (or **Sync.**, depending on the laser model) port of the TLS to one of the **TRIG IN** ports of the CTP10.

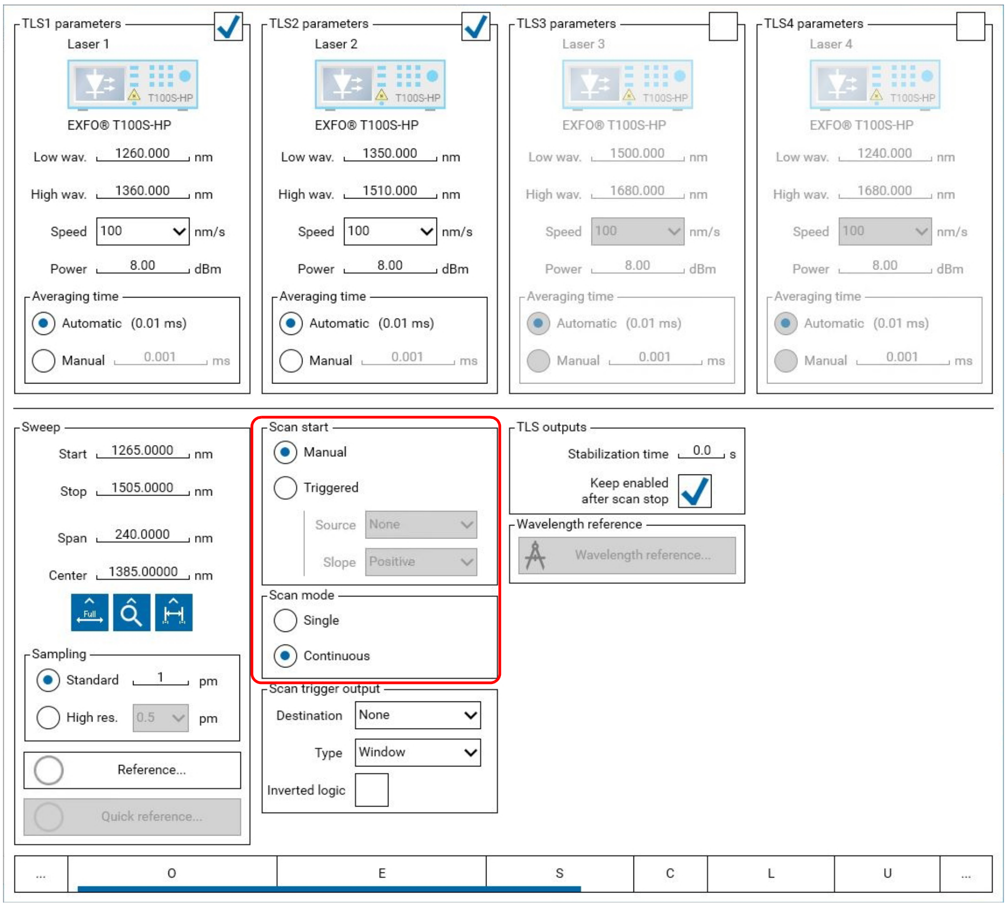
Defining the General Scan Settings

The following procedure explains how to set the general scan parameters.

In laser sharing mode, all the general settings are available on the Controller CTP10, and some of them are not applied to the Distributed CTP10s: **Scan start**, **Scan mode** and **Scan trigger output** (for more details on **Scan trigger output**, see *Generating Output Trigger Signals* on page 140).
On the Distributed CTP10, the **Scan start** can only be manual. You can select the **Scan mode** and **Scan trigger output** independently from the Controller.

To set the general scan parameters:

1. In the Subsystem window, click the < button located at the left of the **Scan** button to access the scan parameters.



2. In the **Scan** menu, configure the scan by using the parameters described in the following table.

Setting	Description
Scan start	➤ **Manual** You perform the acquisition manually, by following the procedure detailed in *Performing Acquisition Scans* on page 136. ➤ **Triggered** The CTP10 waits for the defined trigger signal to perform the optical acquisition. In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), this function is not available on Distributed CTP10s. ➤ **Source**: select the TRIG IN port that provides the triggered signal. ➤ **Slope**: slope of the signal that triggers the scan: **- Positive**: the scan is performed when the received signal rises. **- Negative**: the scan is performed when the received signal falls.
Scan mode	➤ **Single** The CTP10 performs a single sweep of the transfer function (according to the defined measurement traces) and then stops. ➤ **Continuous** The CTP10 performs a continuous series of sweeps until you click the **Abort** button.

Selecting the Traces to Acquire

For each optical detector used in the subsystem, a trace group is created in the **Trace setup** pane.

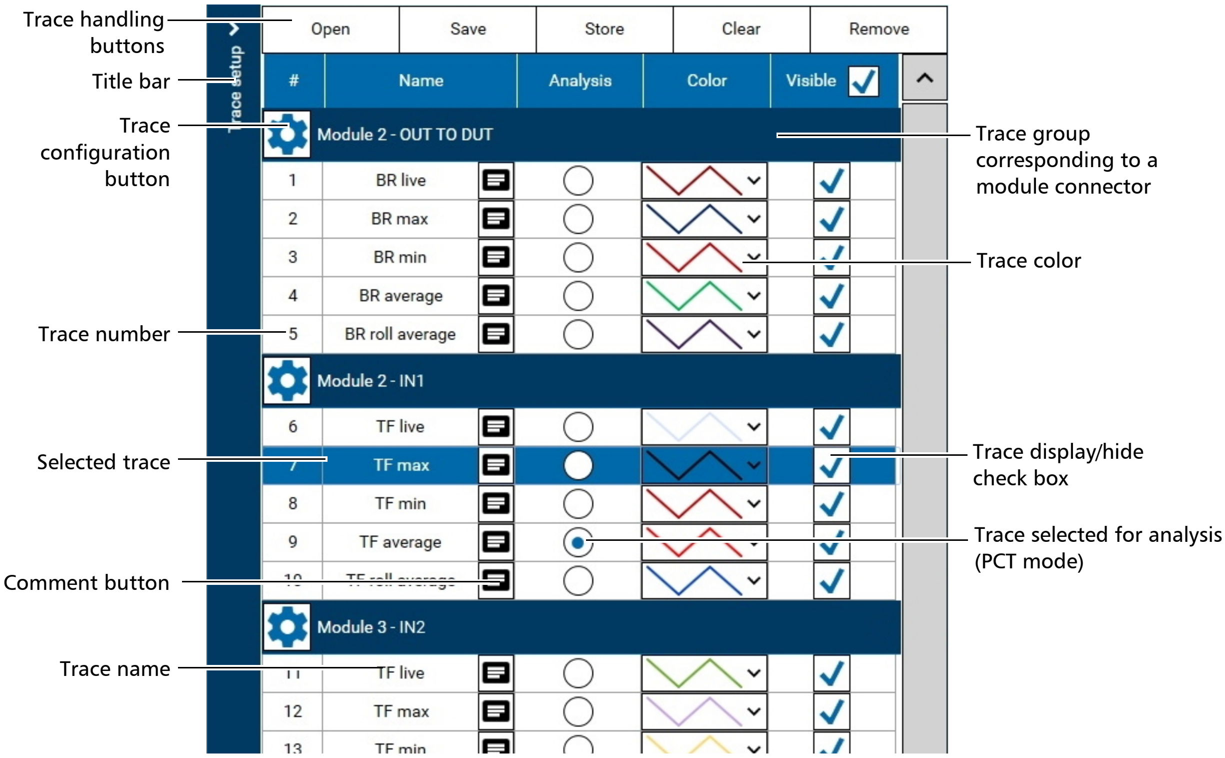
The trace groups displayed in the **Trace setup** pane correspond to the measuring connectors that you have defined in the **Subsystem setup** menu.

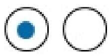
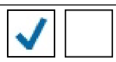
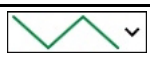
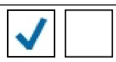
An additional group corresponds to stored traces (for more details, see *Storing a Trace* on page 148).

For each detector, you can activate and display several trace types corresponding to various measurements, depending on the measuring module used.

- With the IL RL OPM2 module:
  - For each optical detector (OPM), a trace group is created for insertion loss measurements.
  - For the OUT TO DUT (or OUT2) port (internal RL detector), a trace group is created for return loss measurements. To perform a BR measurement, you must also activate at least one TF trace (for the reference to be taken into account).
  - For each photocurrent detector (PCM), a trace group is created for photocurrent measurements.
- With the IL PDL or IL PDL OPM2 module:
  - For each optical detector (OPM), a trace group is created for insertion loss and polarization dependent loss measurements.
  - For each photocurrent detector (PCM), a trace group is created for photocurrent measurements.

Trace setup Pane Description



Command	Description
	Trace handling buttons. For more details, see *Displaying and Handling Traces* on page 147.
	Trace configuration button. For more details, see the procedure below this table.
	Trace comment button. For more details, see *Adding a Comment to Trace* on page 147.
	Trace analysis selection button in PCT analysis mode. For more details, see *Analyzing Traces* on page 159.
Analysis column 	Trace analysis selection button in PCT WDM analysis mode. For more details, see *Analyzing Traces* on page 159.
	Trace color. For more details, see *Defining the Trace Color* on page 147.
Visible column 	Trace display/hide check box. For more details, see *Displaying/Hiding a Trace* on page 147.

For each connector used in the subsystem, you can select the trace types you want to acquire. The selected traces will be added to the trace list. You can add a maximum of 330 measured traces in a subsystem.

To select the trace types to acquire:

1. Make sure your subsystem is properly configured in the **Subsystem setup** menu (see *Defining Your Subsystem* on page 101) and reflects the physical connections.
2. Expand the trace pane by clicking the **Trace setup** title bar.
3. In the **Trace setup** pane, click the button corresponding to the connector you want to configure.

   The available traces depend on the selected connector.

<table>
<tr><th rowspan="2">Measuring module</th><th colspan="3">Available traces on connectors</th></tr>
<tr><th>OUT TO DUT</th><th>OPM</th><th>PCM</th></tr>
<tr><td>IL RL OPM2</td><td>➤ BR live
➤ BR max
➤ BR min
➤ BR average
➤ BR roll average</td><td>➤ TF live
➤ TF max
➤ TF min
➤ TF average
➤ TF roll average</td><td rowspan="3">➤ I live
➤ I max
➤ I min
➤ I average
➤ I roll average</td></tr>
<tr><td>IL PDL</td><td>None</td><td rowspan="2">➤ TF live
➤ TF max
➤ TF min
➤ TF average
➤ TF roll average
➤ PDL live
➤ PDL max
➤ PDL min
➤ PDL average
➤ PDL roll average</td></tr>
<tr><td>IL PDL OPM2</td><td>None</td></tr>
</table>

4. Select the traces you want to acquire and display on graph, as explained in the following table.

   If you want to perform a BR measurement, you must also select at least one TF trace (for the reference to be taken into account).

   With the IL PDL or IL PDL OPM2 module, the trace selection determines the number of sweeps that will be performed during the scanning operation:

   - If you only select TF or I trace types, one sweep will be performed to acquire the selected traces.

- If you select one or more PDL traces, four sweeps will be performed to acquire the selected traces. In this case, the 4 sweeps are used to calculate TF traces (if any): the displayed TF traces correspond to the depolarized IL.

Parameter	Description
TF/BR/PDL/I Measured traces	Trace type you want to display on graph. The measured value depends on the measuring module used and on the selected connector (I, TF, BR or PDL): ➤ **live**: the trace represents the TF/BR/PDL/I of the last scan. ➤ **max**: the trace represents all the maximum scanned values point to point from the first scan. ➤ **min**: the trace represents all the minimum scanned values point to point from the first scan. ➤ **average**: the trace represents the average of all scans performed from the first scan. This trace type is useful to reduce the noise level if necessary. ➤ **roll average**: the trace represents the rolling average of a defined number of previous scans. This trace type is useful to reduce the noise level if necessary. To set the number of scans to take into account to calculate the average, click the roll average numeric field. Maximum value: 10 scans For average trace types, make sure the scan mode parameter is set to **Continuous** (see *Defining the Scan Parameters* on page 117).
Apply to all detectors of this subsystem button	Detector connectors only. Click this button to apply the settings defined for the connector to all connectors of the same type.

To remove a trace type:

To remove a selected trace type from the **Trace setup** pane and from the graph (and its associated analysis results), do one of the following:

- Click the appropriate button and clear the trace type check box.

  OR

- In the **Trace setup** pane, select the trace type and click the **Remove** button.

Referencing the Subsystem

CAUTION

- **To achieve optimum system performance, keep fiber-optic connectors clean at all times (see *Cleaning Optical Connectors* on page 226).**
- **Make sure you have the appropriate fiber connector type corresponding to the module connectors you want to connect. Never connect another type of connector to the optical output. For details on the appropriate optical fiber type, see the *Technical Specifications* on page 3.**

Before performing TF, BR and/or PDL acquisition scans, you must first reference your subsystem, as explained in the following sections.

Referencing is not required for I measurement on PCM detectors.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you can perform the referencing operation independently on the Controller CTP10 and on the Distributed CTP10s.

- On the Controller CTP10, you can reference the subsystem as you would do in a standard configuration, as explained in this section.
- On the Distributed CTP10s, you can reference the subsystem as you would do in a standard configuration, but the referencing scan can only be performed if the Controller is scanning (measurement scan or referencing scan). If the Controller is not scanning, the Distributed CTP10 waits for the next sweep from the Controller CTP10 to synchronize with it and perform the referencing scan.

In daisy chaining mode (see *Using Additional OPMs (Daisy Chaining mode)* on page 109), you perform all referencing operations from the Primary CTP10.

Performing TF/BR or TF/PDL Referencing

The subsystem referencing function enables you to eliminate from the results the contribution of connection elements (patchcord, splitter) between the OUT TO DUT (or OUT2) output and the detector inputs, to only display the TF, PDL or BR of the tested device.

Referencing every single detector of the subsystem is required before performing test scans, using the following functions:

- **Reference**: enables you to perform a reference measurement on each detector used in the subsystem:
  - If you use the IL RL OPM2 module in the subsystem, this function enables you to perform a TF/BR reference measurement. The BR reference is automatically performed on the first detector (from the left) of the subsystem.
  - If you use the IL PDL or IL PDL OPM2 module in the subsystem, this function enables you to perform a TF/PDL reference measurement: the CTP10 performs 4 sweeps to reference a detector.

  You must perform a new referencing every time you perform a change in the subsystem setup that could alter the referencing. For example, you must perform a new referencing if you replace a module or if you change a module position into the CTP10 mainframe.

➤ **Quick reference**: this function is only available once all detectors of the subsystem have already been referenced. It adjusts the TF reference offset measured on one detector and applies the adjustment offset to all other detectors at once.
This function is not available if you use an IL PDL or IL PDL OPM2 module.

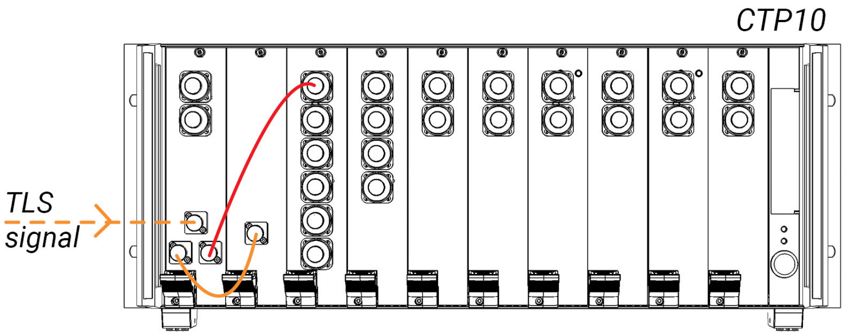
You can use the quick reference function if you change the DUT patchcord, if you restart the CTP10 without any change in the subsystem or if you open an existing subsystem.

For BR reference, this function performs a BR reference measurement on the selected detector.

The referencing is performed on the defined wavelength/frequency range and referencing information is saved in the subsystem (*.CTP10 file).

To perform TF/BR or TF/PDL referencing:

1. Connect the patchcord that you intend to use for the DUT to one of the detectors used in the subsystem, as illustrated in the following figure.



2. In the **Subsystem** window, open the **Scan** menu:

2a. Verify that the scan parameters are properly configured for your test setup and are the one you intend to use to test the DUT.

2b. For laser safety, verify that the **Keep enabled after scan stop** check-box is cleared.

3. Click the **Reference** button.

The **Reference** window displays all the connectors used in the subsystem and indicates the connections required to reference the system.

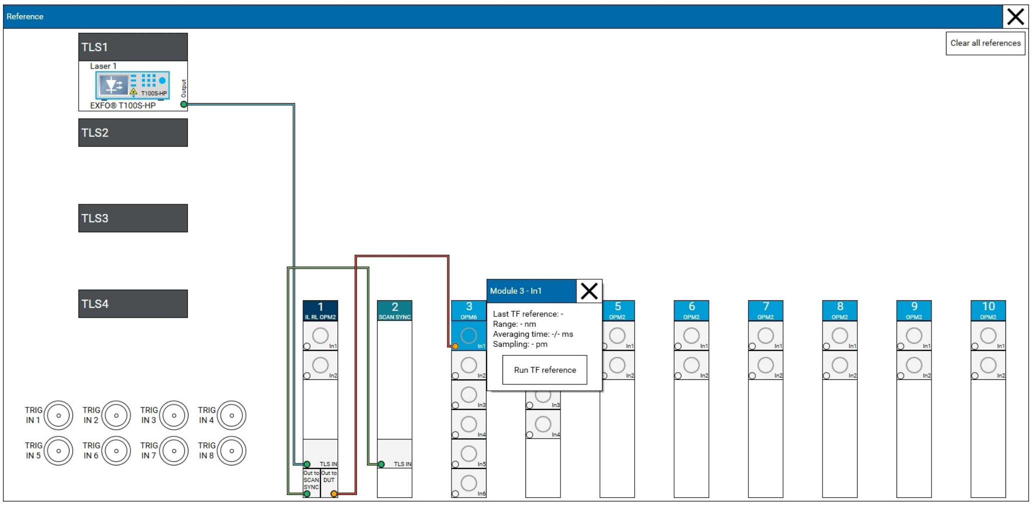
: the detector is not referenced.

: the detector reference is completed.

: an error occurred on the detector.

4. In the **Reference** window, click the first detector to reference.

The link is automatically created.



5. Verify that the selected detector is physically connected to the OUT TO DUT (or OUT2 port), as indicated in the Reference window.

6. Click **Run reference**.

The CTP10 performs a scan: 1 sweep with the IL RL OPM2 module, 4 sweeps with the IL PDL or IL PDL OPM2 module.

In laser sharing mode, the Distributed CTP10 waits for the next sweep (TF/BR or TF/PDL referencing sweep or measurement sweep) of the Controller CTP10 to synchronize with it and perform the referencing scan.

Once completed, the  icon appears on the referenced detector, indicating that the reference was performed successfully on the detector.

If you want to stop the referencing operation, close the **Reference** window and in the subsystem window, click the **Abort** button to abort the referencing scan.

7. Perform steps 4 to 6 for all detectors of the subsystem.

The BR reference is automatically performed when you reference the first detector (from the left) of the subsystem.

In daisy chaining mode, click the **Secondary CTP10** tab and perform steps 4 to 6 on all detectors located on the Secondary CTP10.

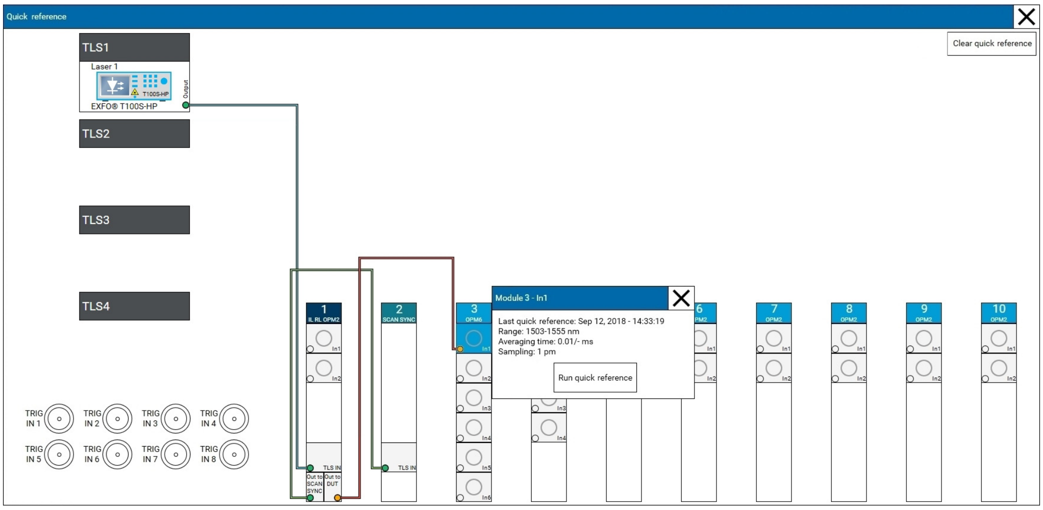
To perform quick referencing:

Quick referencing is not available with an IL PDL or IL PDL OPM2 module, or on a PCM detector.

1. In the **Scan** menu, click the **Quick reference** button.

The **Quick reference** window displays all the referenced detectors used in the subsystem.

2. In the **Quick reference** window, select the detector you want to use for BR and TF adjustment.



3. Physically connect the patchcord that you intend to use for the DUT to the selected detector (in the **Quick reference** window).

4. Click the **Run quick reference** button.

The CTP10 performs a scan.

In laser sharing mode, the Distributed CTP10 waits for the next sweep (TF/BR referencing sweep or measurement sweep) of the Controller CTP10 to synchronize with it and perform the referencing scan.

Once completed, the  icon appears on the detector used to perform the TF adjustment offset and the BR referencing.

If you want to stop the referencing operation, close the **Quick reference** window and in the subsystem window, click the **Abort** button to abort the referencing scan.

Performing Wavelength Referencing

In the subsystem **Scan** menu, the **Wavelength reference** menu enables you to improve the accuracy of the wavelength referencing if needed by referencing the SCAN SYNC module, in case of temperature variation or environmental condition change.

You can perform a wavelength referencing on all OPM detectors included in the subsystem.

In daisy chaining mode, you can only perform wavelength referencing on an OPM detector located on the Primary CTP10. The wavelength referencing function is not available on detectors located on the Secondary CTP10.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you can perform the wavelength referencing operation independently on the Controller CTP10 and on the Distributed CTP10s.

- On the Controller CTP10, you can perform wavelength referencing as you would do in a standard configuration, as explained in this section (the wavelength referencing sweep on the Controller is not shared with the Distributed CTP10s).
- On the Distributed CTP10s, the sweep range set on the Controller CTP10 must cover the sweep range of the gas cell used for referencing on the Distributed CTP10. Then you can reference the subsystem as you would do in a standard configuration, but the referencing scan can only be performed if the Controller is scanning (measurement scan or referencing scan). If the Controller is not scanning, the Distributed CTP10 waits for the next sweep from the Controller CTP10 to synchronize with it and perform the referencing scan.

To perform wavelength referencing:

1. Make sure you have one of the following gas cell (the necessary sweep range is indicated in parentheses for each gas cell):
   - Acetylene $^{12}C_2H_2$ 50 Torr (1512–1543 nm)
   - Acetylene $^{12}C_2H_2$ 200 Torr (1512–1543 nm)
   - Hydrogen Fluoride HF (1253–1363 nm)
   - Hydrogen Cyanide HCN 25 Torr (1528–1563 nm)
   - Hydrogen Cyanide HCN 100 Torr (1528–1563 nm)
   - Carbon Monoxide $^{12}C^{16}O$ 1000 Torr (1561–1595 nm)
   - Carbon Monoxide $^{13}C^{16}O$ 1000 Torr (1595–1637 nm)
2. Connect your instruments as follows:

   2a. Connect your tunable laser source to the CTP10 (see *Defining and Controlling Your Laser(s)* on page 87). Make sure that the wavelength limits of the connected laser cover the sweep range of the selected gas cell.

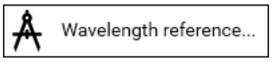
   2b. Connect the TLS IN port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module to the optical output of the laser (or the TLS OUT port of the FBC module, if you are using several laser sources).

   2c. Connect the OUT TO SCAN SYNC (or OUT1) port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module to the TLS IN port of the SCAN SYNC module.

2d. Connect the input port of the gas cell (DUT) to the OUT TO DUT (or OUT2) port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module.

2e. Connect the output port of the gas cell to one of the available OPM detector port in the subsystem.

3. To perform wavelength referencing on a Distributed CTP10 (in laser sharing mode), make sure that the sweep range set on the Controller CTP10 covers the range of the gas cell connected to the Distributed CTP10.

4. In the **Scan** menu, click the 

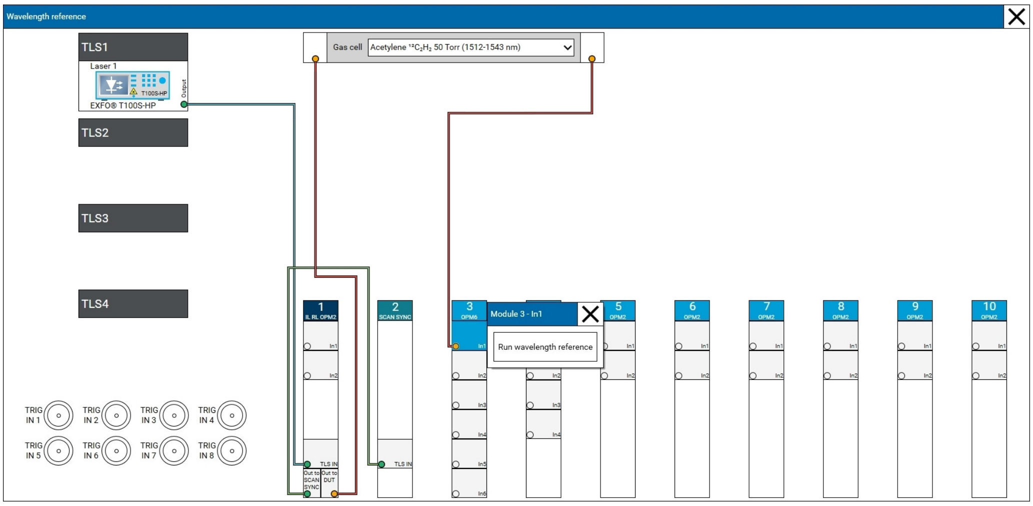
button.

The **Wavelength reference** window appears.

5. In the **Gas cell** list, select the gas cell type that you have connected as DUT.

6. Click the OPM detector you have physically connected to the gas cell.

The link is automatically created between the gas cell and the detector.



7. Click the **Run wavelength reference** button.

The CTP10 performs a scan of the gas cell and references the SCAN SYNC module.

In laser sharing mode, the Distributed CTP10 waits for the next sweep performed on the Controller CTP10 (TF/BR or TF/PDL referencing sweep or measurement sweep) to perform the referencing scan.

If you want to stop the referencing operation, close the **Wavelength reference** window and in the subsystem window, click the **Abort** button to abort the referencing scan. In this case, the last referencing value is taken into account as the reference value.

If the referencing fails (no absorption lines were detected), the referencing value is reset to 0.

Performing Acquisition Scans

The transfer function (TF), polarization dependent loss (PDL), photocurrent (I) and back reflection (BR) acquisition (depending on the module used for measurements) is performed according to the scanning parameters defined in *Defining the Sweep Parameters* on page 121, on selected trace types.

The number of sweeps per scan depend on the trace selection (see *Selecting the Traces to Acquire* on page 126):

➤ With the IL PDL or IL PDL OPM2 module:

  ➤ If you only select TF and I trace types, one sweep will be performed to acquire the selected traces.

  You can select the state of polarization for the IL-only measurements by using the following command: *INITiate:SOP* on page 478.

  On PCM modules, the I traces displayed correspond to the absolute trace acquired during this single sweep.

  ➤ If you select one or more PDL traces, four sweeps will be performed to acquire the selected traces.
  In this case, if you also select TF or I traces, the four sweeps are used to calculate the TF traces: the displayed TF trace corresponds to the depolarized IL, and the displayed I trace corresponds to the average I trace (Live trace calculated with the Mueller formalism).

➤ With the IL RL OPM2 module, one sweep will be performed to acquire TF and/or BR traces.

See the following sections for details:

➤ *Manually Starting/Stopping the Acquisition* on page 136.

➤ *Triggering the Acquisition* on page 138.

Manually Starting/Stopping the Acquisition

This section explains how to manually start and stop acquisition scans. You can also trigger the acquisition, as explained in *Triggering the Acquisition* on page 138.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95), you can perform acquisition scans independently on the Controller CTP10 and on the Distributed CTP10s.

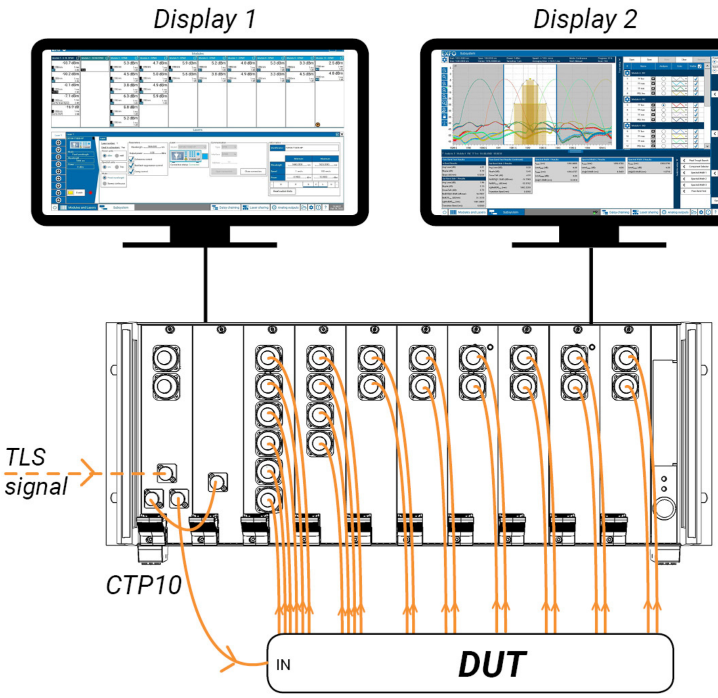
➤ On the Controller CTP10, you can perform measurement scans as you would do in a standard configuration, as explained in this section. The acquisition scans synchronize with all the Distributed CTP10 and enable them to perform acquisition scans.

➤ On the Distributed CTP10s, you can start and stop single or continuous measurement scans. The acquisition on Distributed CTP10 is only possible if a scan is in progress on the Controller CTP10. If the Controller is not scanning, the Distributed CTP10 waits for the next sweep from the Controller CTP10 to synchronize with it and to perform the scan. If you modify a shared scan parameter on the Controller while the Distributed CTP10s are waiting for a scan, the waiting state is stopped.

To manually perform test measurement scans:

1. Make sure that all the OPM detectors you intend to use are properly referenced, with the same scan parameters than the one you intend to use for DUT test measurement.

2. Connect your DUT patchcords to the CTP10 as illustrated in the following figure (example with one laser source and an IL RL OPM2 module):



   2a. Connect the input port of the DUT to the OUT TO DUT (or OUT2) port of the IL RL OPM2, IL PDL or IL PDL OPM2 module.

   2b. On OPM modules: connect the output port(s) of the DUT to the referenced detector ports of the OPMx modules, or of the IL RL OPM2 module if it is used for acquisition.

   2c. On PCM modules: connect the output port(s) of the DUT to the external detector ports (or remote optical head) connected to the PCMx modules with a triaxial cable (see *Connecting an External Photodiode to the PCM Module* on page 32).

3. If you want to output trigger signals when the CTP10 performs a scan, connect the external instrument to one of the TRIG OUT port of the CTP10 rear panel.

4. If you want to output CTP10 measurements as analog signals, connect your external analog instrument to the output ANLG OUT1 and/or ANLG OUT2 of the CTP10 rear panel.

5. Make sure you have select the traces you want to acquire, as explained in *Selecting the Traces to Acquire* on page 126.

6. In the **Scan** menu, set the **Scan Start** parameter to **Manual**.

7. Click the **Scan** button.

   The **Scan** button label displays **Abort** and the acquisition starts using the selected parameters (see *Defining the Scan Parameters* on page 117).

In the scan parameters area above the graph, you can follow the scan progress (in percent) and number of scans.

The CTP10 performs 1 or 4 sweeps per scan, depending on the traces selected for acquisition (1 sweep for TF and BR acquisition, 4 sweeps for PDL acquisition).

In laser sharing mode, the Distributed CTP10 waits for the next sweep performed on the Controller CTP10 to perform the scan.

If the **Single** scan mode is selected, the acquisition stops automatically.

To stop the acquisition:

➤ To stop the acquisition, click the **Abort** button.

The acquisition does not finish the scan and stops as quickly as possible.

In laser sharing mode:

- ➤ Aborting a scan on the Controller aborts the scan on all Distributed CTP10s. The Distributed CTP10s do not enter the waiting state even if their scan mode was set to Continuous.
- ➤ Modifying a shared scan parameter on the Controller aborts the scan on all Distributed CTP10s.

Triggering the Acquisition

The **TRIG IN** BNC connectors (see *Rear panel* on page 9) allow you to externally trigger the acquisition, as explained in the following procedure.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 95). this function is not available on Distributed CTP10. You can only trigger the acquisition on the Controller CTP10.

To trigger the acquisition:

1. Physically connect the external trigger generator to the wanted **TRIG IN** BNC connector of the CTP10 rear panel.
2. In the **Scan** menu, in the **Scan start** area:

   2a. Select **Triggered**.

   2b. Select the **Source** and **Slope** of the trigger (for more details, see *Defining the Scan Parameters* on page 117).

   The CTP10 scans as soon as it received the defined trigger signal, according to the parameters set in the scan menu.

   If you click the **Scan** button, the CTP10 performs a manual scan.

Retrieving Raw Data from a Detector

You can retrieve the traces corresponding to the unreferenced transfer function received on the detectors during the scan. This function is only available by using remote commands.

The following traces are available:

- "Raw Live" trace (trace type #11) is the unreferenced "TF live", "I Live" or "PDL live" trace:
  - After an IL or I measurement (1 sweep): you retrieve the unreferenced IL or I trace.
  - After a 4-state IL-PDL measurement (4 sweeps): you retrieve the four unreferenced IL traces or I traces.
- "Raw Reference" trace (trace type #12) is the reference trace (not available on I traces):
  - With the IL RL OPM2 module, you retrieve the reference trace of the "TF live" trace.
  - With the IL PDL or IL PDL OPM2 module, you retrieve the four IL reference traces of the "TF live" trace or of the "PDL live" trace.
- "Raw Quick Reference" trace (trace type #13, only available with the IL RL OPM2 module) is the quick reference trace of the "TF live" trace. This trace is not available on I traces.

To retrieve raw data from a trace:

1. Configure your test setup (see *Defining Your Subsystem* on page 101).
2. Configure the scan parameters and reference the subsystem (see *Performing Measurement Scans* on page 117).
3. Perform a scan to acquire the wanted "TF live" or "PDL live" trace on the detector.
4. Use the following commands to retrieve raw data, using TYPE11 (for "Raw Live" trace), TYPE12 (for "Raw Reference" trace) or TYPE13 (for "Raw Quick Reference" trace):
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA [:Y][:IMMediate]?* on page 535.
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :X[:IMMediate]?* on page 533.
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :STARt?* on page 537.
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :LENGth?* on page 536.
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :SAMPling?* on page 537.
   - *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:SAVE* on page 540 (only in .csv format).

Generating Output Trigger Signals

The **TRIG OUT** BNC connectors (see *Rear panel* on page 9) allow you to output electrical trigger signals when the CTP10 performs a scan.

Two types of output triggers are available:

➤ Window trigger: see *Generating Window Trigger Signals* on page 140.

➤ Pulse triggers: see *Generating Pulse Trigger Signals* on page 142.

Generating Window Trigger Signals

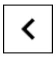
If the Window trigger output is activated on a CTP10, the trigger signal is output during the time of an acquisition or referencing scan (not only during the sweep(s)).

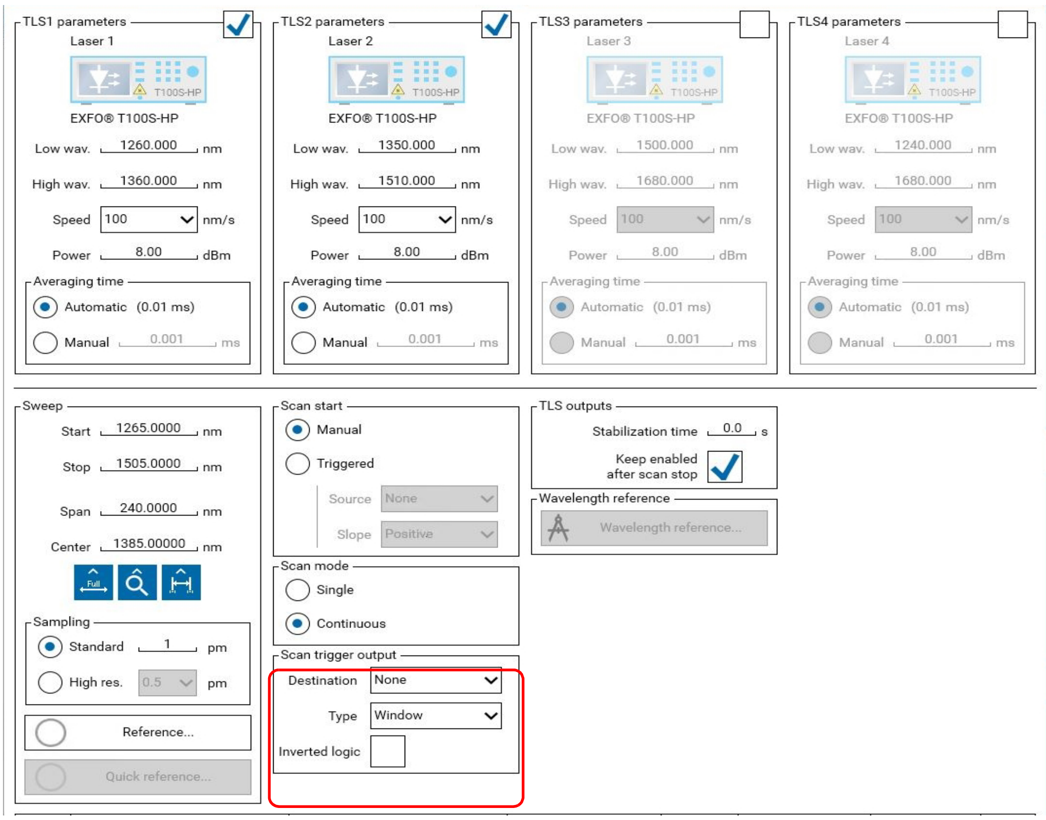
In laser sharing mode, if the scan trigger output function is activated on a Distributed CTP10s, the signal is output when the Distributed CTP10s is "Waiting for the Controller CTP10" for scanning.

To output Window trigger signals:

1. Make sure that the instrument to which you want to output the signal meets the electrical requirements detailed for the TRIG OUT connector in *Technical Specifications* on page 3.

2. Physically connect the external instrument to the wanted **TRIG OUT** BNC connector.

3. In the Subsystem window, click the  button located at the left of the **Scan** button to access the scan parameters.



4. In the **Scan trigger output** area, in the **Destination** field, select the TRIG OUT port that outputs the signal.
5. In the **Type** field, select **Window**.
6. Select or clear the **Inverted logic** check box as follows:

   : the CTP10 outputs a low level signal during the time of the scan.

    (default): the CTP10 outputs a high level signal during the time of the scan.

   The scanning operation will trigger an output signal (during the time of the scan) according to the selected parameters.

Generating Pulse Trigger Signals

If the Pulse trigger output is activated on a CTP10, pulse triggers are generated during the acquisition sweep(s) at a regular time interval calculated from the laser sweep speed and sampling resolution.

The time interval (t) between pulse triggers is calculated as follow:
t (in μs) = sampling (in pm) x 1000 / sweep speed (in nm/s)

For example, a 100 nm/s sweep with a sampling of 10 pm will generate a pulse every 100 μs. No pulse triggers are generated during the reference sweeps.

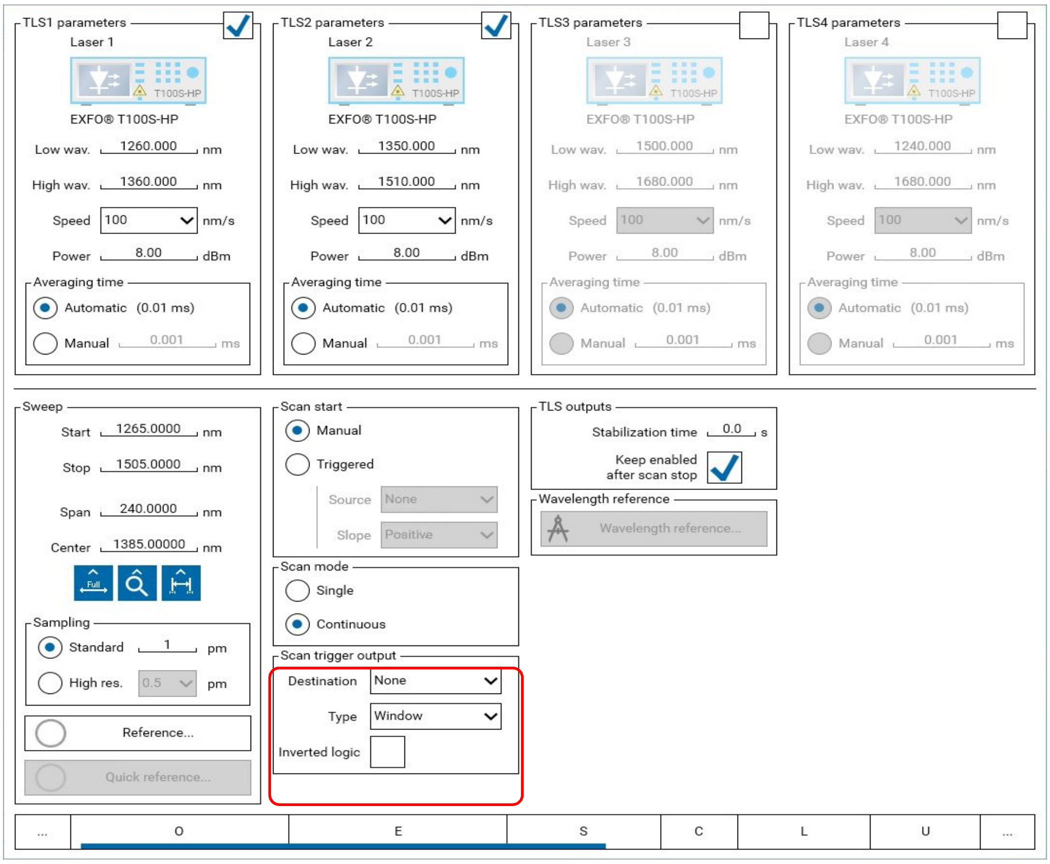
You can retrieve the wavelength array corresponding to the pulse triggers generated during the acquisition sweep(s) by using the following remote query at the end of the sweep: *TRIGger:OUT:LLOG?* on page 554.

As the CTP10 needs an electrical trigger from the laser to provide Pulse triggers, this trigger type is not available with the VIAVI mSWS-A1SLS laser.

Pulse trigger is not available in laser sharing and daisy chaining modes, and if multiple lasers are used to perform a scan.

To output pulse trigger signals:

1. Make sure that the instrument to which you want to output the signal meets the electrical requirements detailed for the TRIG OUT connector in *Technical Specifications* on page 3.
2. Use a BNC cable to physically connect the external instrument to the wanted **TRIG OUT** BNC connector of the CTP10.
3. Physically connect the laser to one of the **TRIG IN** port of the CTP10 with a BNC cable:
   - On the T100S-HP laser, connect the **Sync** output port to one of the **TRIG IN** port of the CTP10.
   - On a T200S/T500S laser: connect the **Trig out** output port to one of the **TRIG IN** port of the CTP10.
4. In the **Subsystem setup** menu, link the **Sync** (for T100S-HP) or **Trig Out** (for T200S/T500S) port of the laser to the **TRIG IN** port of the CTP10 on which you have physically connected the laser, so that it reflects your physical setup.
5. In the Subsystem window, click the **<** button located at the left of the **Scan** button to access the scan parameters.



6. Make sure that the **Sampling** is set to **Standard** (Pulse trigger is not compatible with High res. sampling).
7. In the **Scan trigger output** area, in the **Destination** field, select the TRIG OUT port that outputs the signal.
8. In the **Type** field, select **Pulse**.

   The scanning operation will generate pulse triggers according to the selected parameters.

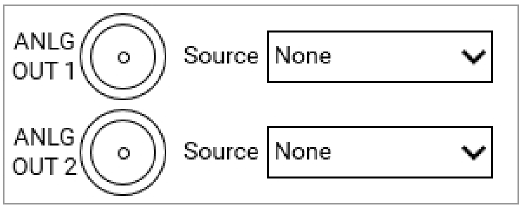
Generating Output Analog Signals

The **ANLG OUT** BNC connectors (see *Rear panel* on page 9) allow you to output internal measurements as analog signals in log scale to be displayed on external analog instruments.

You can output two signals coming from two different CTP10 modules detectors. Any detector (except monitoring and BR detectors) can be used, even if it is not part of a subsystem. The analog voltage is output as soon as you select a connector, even if no measurement is running.

To output analog signals

1. Make sure that the instrument to which you want to output the signal meets the electrical requirements detailed for the Analog out connector in *Technical Specifications* on page 3 (*Analog out (x2)*).
2. Physically connect the external instrument to the wanted **ANLG OUT** BNC connector.
3. In the CTP10 task bar, click the **Analog outputs** button and in the **Source** list, select the detector from which you want to output the signal.



The selected signal(s) are output as analog signals and can be read on the connected instruments.

To calibrate the analog output

1. Connect an optical signal to the detector from which you want to output the analog signal.
2. Connect an external analog instrument to one of the **ANLG OUT** BNC connector and associate it to the detector as described in the above procedure.
3. In the **Modules and Lasers** window, set the unit to **dBm** and select the wanted parameters for the detector (wavelength/frequency, averaging time).
4. Make the following measurements:

   4a. Adjust the optical power to display a first power value (P1) on the detector.

   4b. Measure the corresponding analog output voltage (V1).

   4c. Adjust the optical power to display the second power value (P2) on the detector.

   4d. Measure the corresponding analog output voltage (V2).

   These measurements give the α parameter: $\alpha = \frac{P_2 - P_1}{V_2 - V_1}$

   The power difference between two points whose corresponding voltage are Va and Vb is: $\Delta P^{dB} = \alpha \cdot (V_a - V_b)$

   (applicable if V1 ≤ Va; Vb ≤ V2).

   To get the best homogeneity over an extended range, the recommended values are P1= 0 dBm and P2= -50 dBm.

9 Displaying and Handling Traces

All traces selected for acquisition are measured after each scan and can be displayed in the graph area.

Handling Traces Displayed on Graph

Defining the Trace Color

You can define the color of each available trace, as explained in the following procedure.

To modify the trace color:

1. In the **Trace setup** pane, click the **Color** menu corresponding to the trace you want to configure.
2. Select the wanted color for the trace.

   The appearance of the selected traces automatically changes on graph.

Adding a Comment to Trace

You can associate a comment or description (maximum 240 characters) to a trace by using the trace note field. If you save the trace, the content of the note field is saved with the trace.

To associate a comment with a trace:

1. In the **Trace setup** pane, click the button of the trace to which you want to add a comment.

   The note field appears.
2. Type your comment in the field.

   The comment is automatically associated with the trace.
3. To hide the comment, click the button

Displaying/Hiding a Trace

By default, all traces are displayed on graph (the **Visible** check box is selected).

To display a trace:

In the **Trace setup** pane, select the corresponding **Visible** check box.

The trace is displayed on graph.

To hide a trace:

In the **Trace setup** pane, clear the corresponding **Visible** check box.

The trace disappears from the graph.

Selecting a Trace

Selecting a trace on the graph automatically selects it in the **Trace setup** pane.

In Daisy chaining mode, you cannot select a trace on the graph.

To select a displayed trace:

Click the trace on the graph or in the **Trace setup** pane.

➤ In the **Trace setup** pane, the trace is highlighted in blue

➤ On the graph, the trace width is thicker.

To select multiple traces:

To select multiple traces simultaneously on the graph or in the **Trace setup** pane, you need to use a keyboard:

➤ Ctrl + click on traces: to make multiple individual selections.

➤ Shift + click on traces: to make a continuous selection (only available in the **Trace setup** pane).

➤ Ctrl + a in the **Trace setup** pane: selects all traces.

To unselect traces:

Click anywhere on the graph background.

Storing a Trace

Storing a trace duplicates it (on the graph and in the **Trace setup** pane) and freezes the duplicate, which won't be modified by next scans. You cannot have more than 20 traces of type Store in the subsystem.

To store a trace:

In the **Trace setup** pane, select the trace you want to store and click the **Store** button.

The trace is added to the **Store** trace group as it is.

At the next scan, traces of type Store won't be modified.

Deleting a Trace

If you physically remove a module from the mainframe or if you remove links in the **Subsystem setup** menu, all corresponding traces are deleted.

To delete traces, two command buttons are available as explained in the following procedures.

To delete trace data from the graph (except Store traces) and all analysis results:

1. Click the **Clear** button.

   A confirmation window appears.

2. Click **Yes**.

To delete the selected trace from the graph and from the Trace setup pane:

➤ To delete the selected trace type from the graph and from the **Trace setup** pane, and all the associated analysis results, click the **Remove** button.

Saving/Loading Traces

You can save traces in *.tra (CTP10 specific format) or *.csv formats on the internal CTP10 drive (D:\), on an external USB key or hard drive, or on a network drive (if any: see *Adding/Removing a Network Drive* on page 200).

You can save traces as follows:

➤ Save each traces individually in *.tra (CTP10 specific format) or *.csv formats.
You cannot load traces in *.csv format, so if you want to be able to load a trace at a later date, you must save it in *.tra format.

➤ Save all traces at once (except traces of type **Store**) in a single *.csv file.
To save all traces at once in individual *.tra files, you can save the entire configuration as explained in *Saving a Subsystem* on page 114.

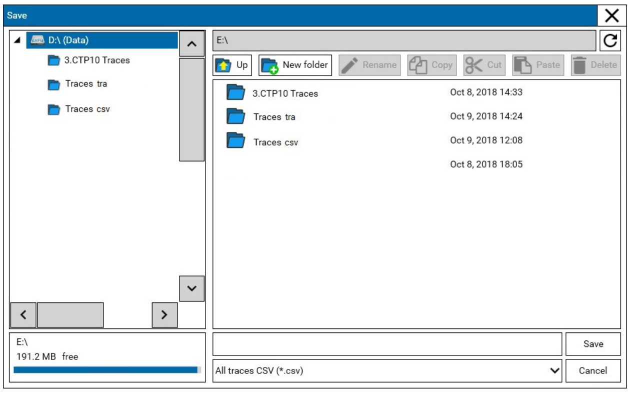
To save traces:

1. If necessary, connect to one of the USB ports the device on which you want to save the trace.

2. In the **Trace setup** pane, do one of the following:

To save a single trace, select the trace you want to save and click the **Save** button.
OR
To save all traces at once, do no select any trace and click the **Save** button.

The saving window appears. All connected drives are displayed.



3. Click the wanted drive and folder.
If you want to create a new folder: touch the  button and type a name for the folder (using the on-screen keyboard or a normal keyboard if connected to the CTP10) and click the **Create** button.

4. Type a name for the trace: click the text box at the left of the **Save** button to display the keyboard.

5. If you have selected a single trace to save, select a format for the trace (if you have not selected any trace, the *.csv format is automatically selected to save all traces):

➤ **Single selected trace Binary (*.tra)**: binary CTP10-specific format (smaller size than .csv format).

- **Single selected trace CSV (*.csv)**: ASCII file for export in Excel or similar program. The data unit in the file is the unit set on the graph when the trace is saved. You cannot load a trace in *.csv format back to the system.
- **All traces CSV (*.csv)**: in case you want to save all traces (except for **Store** traces) instead of the selected one.

The selected format is kept in memory for the next trace saving.

6. Click the **Save** button.

A confirmation message appears.

The .csv ASCII file contains a header providing information about the trace acquisition conditions.

Example header of a .csv file with a single trace:

EXFO CTP10
Format,6.0
SystemPackageVersion,2.x.x
S/N,EO123456789
Time,10:41:32.794 AM 7/31/2023
Module,5
Detector,1
Start,1522.0000,nm
Stop,1630.0000,nm
Sampling,0.0010,nm
Type,TF live
Unit,nm,dB
Length,108001
WithGap,0
GapBounds,
SweepSpeed,100 ,nm/s
AveragingTime,0.010 ,ms
LaserPower,3.00 ,dBm
ScanCount,1
Reference,EO987654321 7/31/2023 10:15:38 PM
Note,

Wavelength	Level
1522.0000	-2.25075
1522.0010	-2.25295

...

Example header of a .csv file of multiple traces:

EXFO CTP10

Format,All6.0

SystemPackageVersion,2.x.x

S/N,EO123456789

Time,10:41:32.794 AM 7/31/2023

Start,1521.5000,nm

Stop,1632.5000,nm

Sampling,0.0010,nm

SpectralUnit,nm

Length,111001

WithGap,0

GapBounds,,nm

SweepSpeed,100 ,nm/s

AveragingTime,0.010 ,ms

LaserPower,3.00 ,dBm

Type;I live;I min;I live;I min;TF live;TF max;PDL live;TF live;PDL live

ScanCount;1;2;1;2;1;2;1;1;1

Module;1;1;1;1;9;9;9;9;9

Detector;1;1;2;2;5;5;5;6;6

Reference;;;;;7/31/2023 10:14:01 PM;7/31/2023 10:15:38 PM;7/31/2023 10:16:00 PM;7/31/2023 10:14:38 PM;7/31/2023 10:17:30 PM

PowerUnit;dBmA;dBmA;dBmA;dBmA;dB;dB;dB;dB;dB

Wavelength;Current;Current;Current;Current;Level;Level;Level;Level;Level

1521.5000;-73.41030;-74.36654;-73.77126;-73.77126;-60.85245;-60.85245;2.03938;-61.82623;1.73918

1521.5010;-73.56893;-73.97047;-74.35107;-74.35107;-61.31856;-61.31856;1.30221;-62.27614;11.78325...

To open a trace:

1. If necessary, connect to one of the USB ports the device from which you want to load the trace.

2. In the **Trace setup** pane, click the **Open** button.

The **Open** window appears. All connected drives are displayed, with the available files in the selected format.

3. Click the wanted drive and folder and select the trace file (in *.tra format) that you want to load.

4. Click **Open**.

In the **Trace setup** pane, the trace is added to the **Store** trace group with its associated comment (if any). You cannot have more than 20 traces of type Store in the subsystem.

Adjusting the Graph Display

The graph displays the visible acquired traces. You can customize the graph layout, and adjust the scale, as explained in the following sections:

➤ *Defining the Graph Layout* on page 152

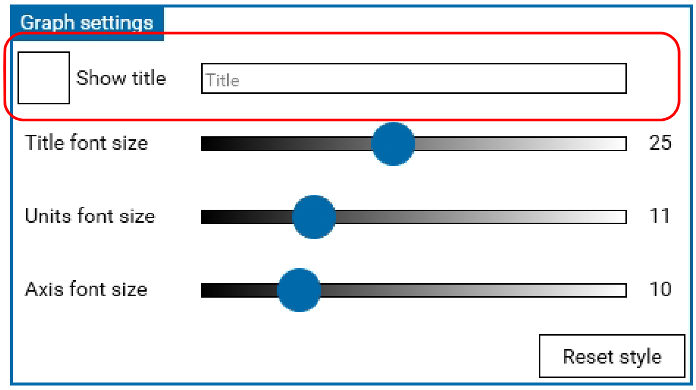
➤ *Adjusting the Scale* on page 153

Defining the Graph Layout

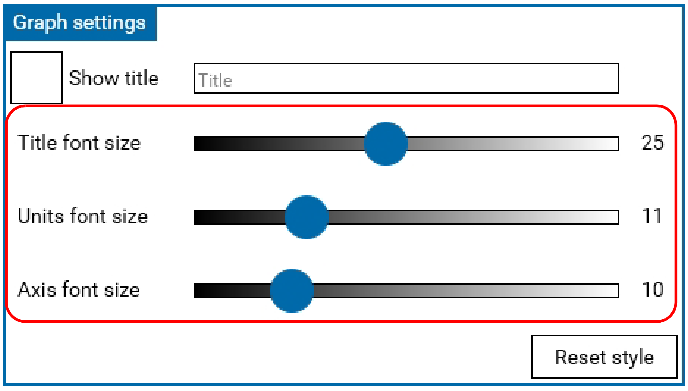
The **Graph Settings** window allows you to customize the display of scales and graph units, and add a title and a legend to the graph.

To define the graph settings:

1. In the **Subsystem** window, in the top left corner of the window, click the button.
2. If you want to add a title to your graph, select the corresponding option, then enter the title you want to use.



3. Set the font size for the various items of the graph using the sliders.



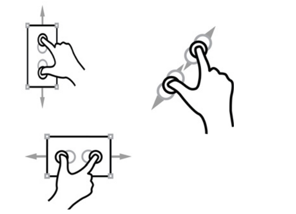
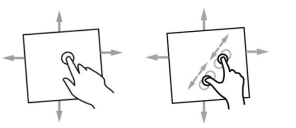
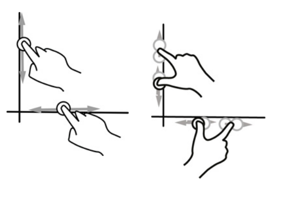
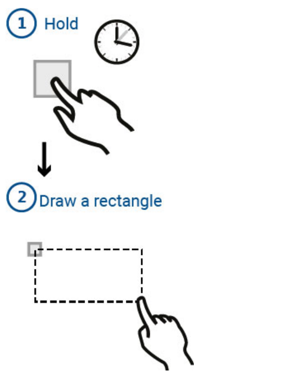
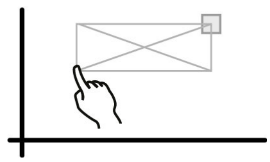
4. To restore the default graph settings, click the **Reset style** button.

Adjusting the Scale

Zoom commands enable you to adapt the scale of the graph to your needs. You can activate the zoom function by using multi-touch screen gestures (if available on the screen you use), mouse clicks on graphs or zoom command buttons.

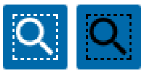
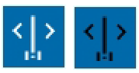
To adjust the graph display using multi-touch screen gestures:

To adjust the graph display using multi-touch screen gestures, do one of the following:

Gesture	Description
	To zoom in or out, pinch two fingers together or move them apart.
	To move in the graph, drag your finger across the screen. You can move in the graph and zoom in or out at the same time.
	➤ To browse a scale, drag your finger across the horizontal or vertical scale. ➤ To zoom in or out on an axis, pinch two fingers together or move them apart on the horizontal or vertical scale.
	To select the exact region of the graph that you want to display, hold you finger on the graph until a complete rectangle appears and draw a rectangle by dragging your finger across the graph on the region you want to zoom in (from left to right).  If you draw a rectangle from right to left, it cancels the last rectangle selection you have made.

To adjust the graph display using command buttons:

To adjust the graph display using command buttons, touch the wanted button located in the graph display settings area.

Command Button	Description
	Opens a menu that enables you to specify the minimum and maximum values of the following scales: ➤ **Horizontal scale**: used for spectral measurements. ➤ **Vertical scale**: used for power and current measurements.
	Enables you to select the exact region of the graph that you want to display: 1. Click the button to activate the rectangle zoom 2. Drag the mouse across the graph to draw a rectangle corresponding to the region you want to zoom in. To deactivate the rectangle zoom, click the button again.
	Automatically sets the display to the maximum wavelength and power/current range (defined in the technical specifications, see *Technical Specifications* on page 3).
	Fits the wavelength/frequency and power/current ranges to the total range covered by the selected trace. The colored flag on the corner of the button indicates the color of the trace on which the zoom applies.
	Fits the wavelength/frequency range to the total range covered by all displayed traces.
	Fits the power/current range to the to the total range covered by all displayed traces.
	Undoes the last zoom action.
	Disables/Enables all multi-touch screen gestures and move clicks on the graph.
	Disables/Enables markers: for more details, see *Performing Manual Measurements With Markers* on page 156.

To adjust the graph display using mouse clicks and keyboard:

➤ To zoom in and out: use the scroll wheel.

➤ To zoom in and out on the Y axis only: press **Ctrl** and use the scroll wheel.

➤ To zoom in and out on the X axis only: press **Shift** and use the scroll wheel.

➤ To move in the graph, click and drag you mouse across the graph.

➤ To select the exact region of the graph that you want to display: right-click the graph and drag the mouse across the graph to draw a rectangle corresponding to the region you want to zoom in (from left to right).
If you draw a rectangle from right to left, it cancels the last rectangle selection you have made.

Displaying Coordinates of Sampling Points

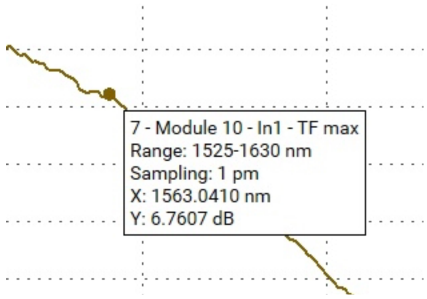
You need a mouse to display the X and Y values of specific points of a trace.

This function is not available in Daisy chaining mode.

To display the coordinates of a sampling point:

On the graph, drag you mouse on a trace until it reaches a measured point.

A point appears on graph with its corresponding coordinates.

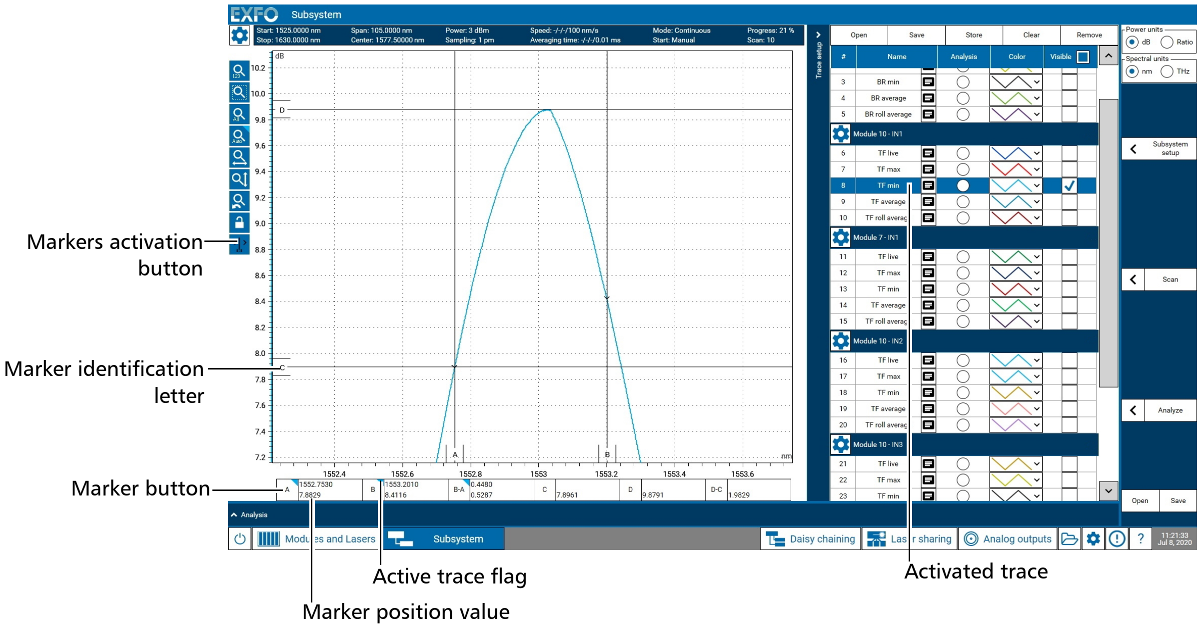


Performing Manual Measurements With Markers

You can perform measurements directly on the graph with markers. Four markers are available:

➤ Two vertical markers (A and B): associated with the selected trace, to indicate the detected power/current at the wavelength/frequency on which they are positioned.

➤ Two horizontal markers (C and D) to indicate the optical power/current.



To perform measurements using markers:

1. Select the trace on which you want to position markers by clicking it on the graph or by selecting it from the **Trace setup** pane.

The trace is highlighted on graph (thicker), which means that the trace is brought to front and activated.

2. Click the button to display markers.

The button icon turns black, the markers appears on the graph, and their corresponding values on a line below the graph.

If you do not see a marker on the graph, it is because it is located outside the zoom area. You can select the markers letter button below the graph and then click the button to automatically place the marker to the center of the zoom area.

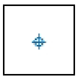
3. Place the markers at the wanted position on the graph using one of the following methods:

On the graph, click the letter corresponding to the marker you want to move and slide it to the wanted position.
To make it easier to move markers without moving the graph, you can lock the graph by clicking the button.

OR

Below the graph, click the button corresponding to the marker letter you want to set and use the following commands to position the marker more precisely:

Button	Description
< >	A and B markers only. Moves the selected marker to the right or left direction, as follows: ➤ If no trace is selected or if the marker is not on a trace, it moves 0.1 pm (or 0.00001 THz) to the right or left direction. A long click on the right or left arrow button speeds up the move to 1 pm (or 0.0001 THz). ➤ If the marker is on a selected trace, it moves according to the trace sampling resolution, point by point. A long click on the right or left arrow button speeds up the move by multiplying it by 10.
« »	A and B markers only. Moves the selected marker to the right or left direction, as follows: ➤ If no trace is selected or if the marker is not on a trace, it moves 10 pm (or 0.001 THz) to the right or left direction. A long click on the right or left arrow button speeds up the move to 100 pm (or 0.01 THz). ➤ If the marker is on a selected trace, it moves 100 times the trace sampling resolution. A long click on the right or left arrow button speeds up the move by multiplying the trace sampling resolution by 1000.
˅ ˄	C and D markers only. Moves the selected marker 0.0001 dB/dBmA (or 0.0001 e-6 ratio/mA) to the top or bottom direction (independently of the selected trace). A long click on the arrow button speeds up the move to 0.001 dB/dBmA (or 0.001 e-6 ratio).
⌄⌄ ⌃⌃	C and D markers only. Moves the selected marker 0.01 dB/dBmA (or 0.01 e-6 ratio) to the top or bottom direction (independently of the selected trace). A long click on the arrow button speeds up the move to 0.1 dB/dBmA (or 0.1 e-6 ratio/mA).

Button	Description
#	Opens a numeric keypad allowing you to type the exact marker position value (wavelength/frequency value or power/current value).
	Automatically places the selected marker to the center of the graph, so that you can immediately see them. For **B-A** and **D-C**, this button automatically places the center of B-A or D-C to the center of the graph

On non-contiguous traces, you cannot place a marker on the non-contiguous area of the trace: the marker is linked to the selected trace.

4. To hide markers, touch the  button.

   The marker positions are kept in memory.

10 Analyzing Traces

The lower part of the **Subsystem** window displays the analysis parameters and results.

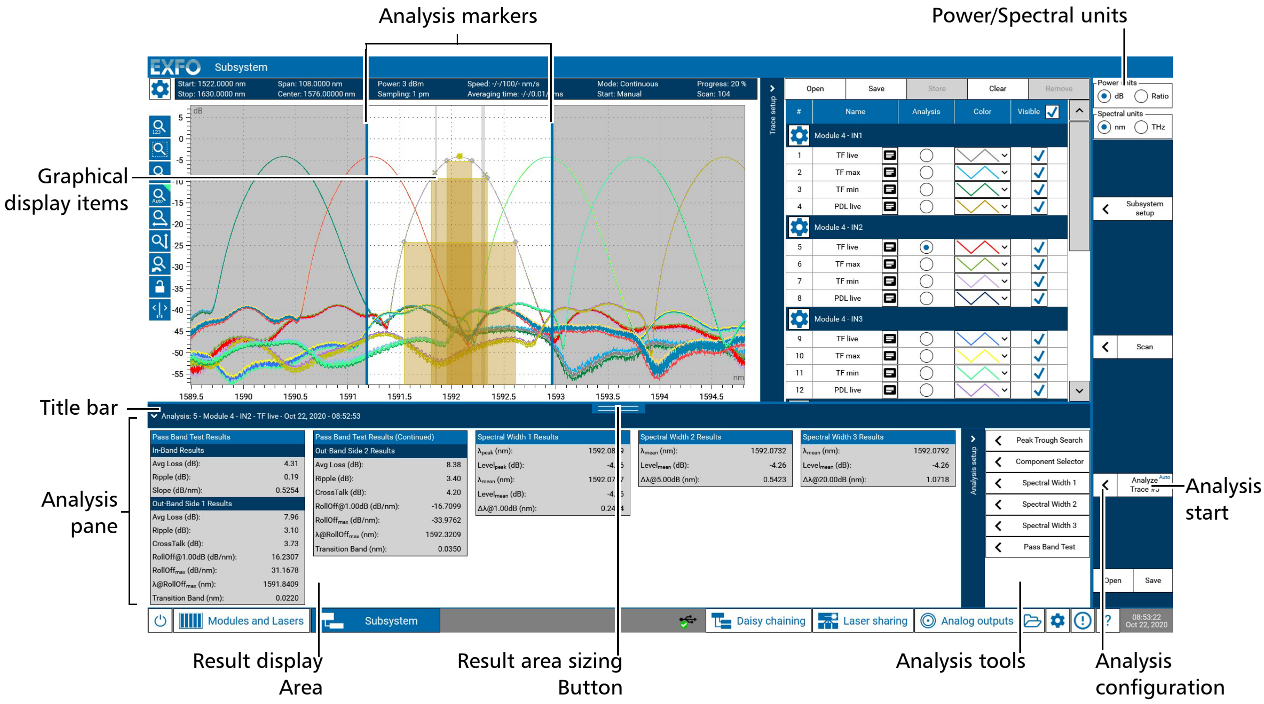
The analysis feature offers two modes:

➤ PCT mode: provides a series of tools for single peak analysis on a single trace acquired with Standard sampling (analysis is not available traces acquired with High res. sampling).
In Daisy chaining mode, the PCT mode is not available on live traces acquired on detectors located on the Secondary CTP10. To analyze a trace from a detector located on the Secondary CTP10, you must first store the trace to be able to analyze it.

➤ PCT WDM mode: provides a series of tools for multi-channel analysis on one or several traces with Standard sampling (you cannot analyze traces with High res. sampling).

The analysis setup consists of tools aimed at studying special aspects of the displayed traces.

In Daisy chaining mode, closing the Daisy chaining connection clears the analysis results.



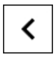
Configuring and Starting the Trace Analysis

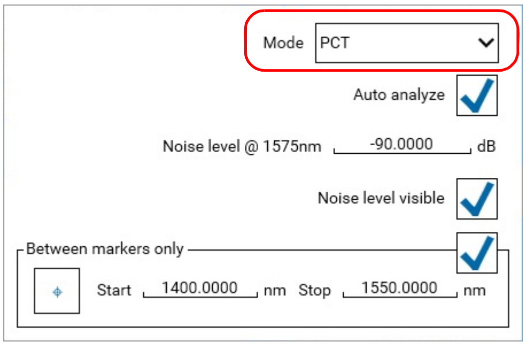
To perform an analysis, you must first select the wanted analysis mode: PCT or PCT WDM, as described in the following procedures.

The **Analyze** menu enables you to select the perimeter and the general settings of the analysis, as explained in the following procedures.

Once the analysis perimeter defined, you can configure the analysis tools and immediately see the results in the analysis pane below the graph.

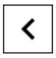
To select the analysis mode and the traces to analyze:

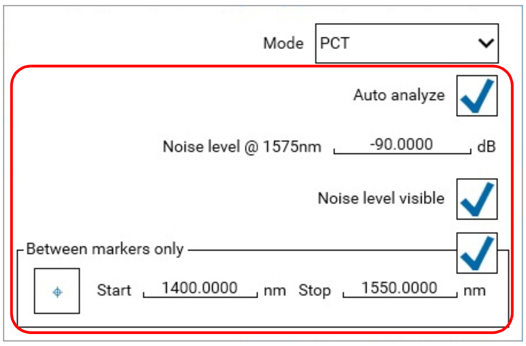
1. In the **Subsystem** window, click the  button located at the left of the **Analyze** button to display the Analyze menu.



2. Select the wanted analysis **Mode**:
   ➤ PCT mode: provides a series of tools for single channel analysis on a single trace.
   ➤ PCT WDM mode: provides a series of tools for multi-channel analysis on one or several traces.
3. In the **Trace setup** pane, select the trace(s) you want to analyze by selecting the corresponding **Analysis** check box.
   Make sure that the selected trace(s) were not acquired with High res. sampling: analysis is not possible on these traces.

To start the analysis of the selected trace(s):

1. In the **Subsystem** window, click the  button located at the left of the **Analyze** button.



Set the wanted parameters according to the following instructions:

Parameter	Description
Mode	➤ PCT mode: provides a series of tools for single peak analysis on a single trace with Standard sampling (you cannot analyze traces with High res. sampling). In Daisy chaining mode, the PCT mode is not available on live traces acquired on detectors located on the Secondary CTP10. ➤ PCT WDM mode: provides a series of tools for multi-channel analysis on one or several traces with Standard sampling (you cannot analyze traces with High res. sampling).
Auto analyze	➤ ☑: the analysis is automatically performed at the end of each scan and after the change of an analysis parameter. If the **Between Markers Only** parameter is activated and you have moved a marker, the analysis is also automatically performed. ➤ ☐: the analysis is performed when you click the **Analyze** button and if you change the power and/or spectral unit of the whole subsystem (see *Defining Subsystem Spectral and Power/Current Units* on page 115).
Noise level @ 1575 nm	Detection threshold of the analysis tools. Sets the level at 1575 nm of the noise detection curve (displayed as a dotted orange line on the graph if the **Noise level visible** check box is selected), calculated from the noise trace and dependent on wavelength below which the signal is not analyzed (this avoids the detection of unwanted peaks in the noisy regions of the trace).
Noise level visible	Only available in PCT analysis mode. ➤ ☑: the noise detection curve is displayed on graph as a dotted orange line. ➤ ☐: the noise detection curve is not displayed on graph, but is taken into account for analysis.

Parameter	Description
Between markers only	Two specific markers are available for the analysis (different from the A and B markers), colored in blue: ➤ ☑: the analysis is only performed on the part of the trace located between the two blue markers. In case you want to analyze a non-contiguous trace, use the markers to define the part of the trace to analyze: you cannot analyze an entire non-contiguous trace all at once. The area outside the analysis area is greyed, to indicate the actual analysis area: as the start point of the analysis is a measured point of the trace, the analysis area may slightly differ from the position of the markers. The ⌖ button automatically places the markers at the center of the graph, so that you can see them. ➤ ☐: the analysis is performed on the wavelength/frequency range of the trace to analyze. If the analyzed trace has non-contiguous parts, only the first contiguous part will be analyzed. If the measurement is made in THz, the analyzed part is the first from the right.

2. Click the  button or anywhere on the screen outside the menu to exit.

   The trace number to analyze appears on the **Analyze** button.

   If you have activated the automatic analysis, the "Auto" flag appears on the top right corner of the **Analyze** button.

3. Make sure the trace to analyze is not empty. If so, perform a scan to get data on the trace.

   For PDL analysis, make sure the PDL trace corresponding to the IL trace you want to analyze is enabled and available on graph.

4. If the **Auto Analysis** check box is cleared, click the **Analyze** button.

   The analysis is performed on the selected trace(s) according to the parameters set in the **Analysis** pane and in the analysis menu.

   Analysis results are displayed below the graph, in the Analysis pane (in nm or THz, and in dB or ratio, depending on the measurement unit selected in the graph **Power/Spectral units** settings):

   - In PCT mode, analysis results are displayed in boxes grouped by analysis tool.
   - In PCT WDM mode, analysis results are displayed as a table, with one line per detected channel.

IMPORTANT

The analysis is restricted to 1000 peaks. If more than 1000 peaks are detected, no result is displayed.

If the **Display on graph** option (available in some analysis tools) is activated, graphical display items are displayed on the graph.

To configure the analysis tools:

1. In the lower part of the **Subsystem** window, expand the analysis pane by clicking the **Analysis** title bar.

2. In the **Analysis setup** pane, select the **Peak Trough Search** analysis tool and define the wanted parameters as described in *Setting up Peak Trough Search Analysis* on page 164.

3. Select the component under test in the **Component Selector** analysis tool (see *Selecting the Component Under Test (Component Selector)* on page 166).

4. In PCT WDM analysis mode, select the channel detection method you want to use as described in *Setting Up Channel Detection* on page 167.

5. Define the parameters of the analysis tools corresponding to the selected component and analysis mode as described in the appropriate analysis tool section:

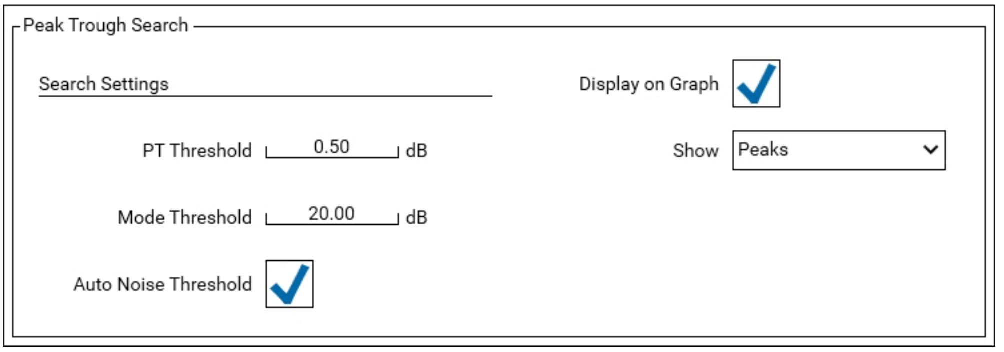
   Setting Up PDL Analysis on page 172
   Setting up Spectral Width 1/2/3 Analysis on page 174
   Setting up Notch Width 1/2/3 Analysis on page 180
   Setting Up Pass Band Test Analysis on page 183
   Setting Up Stop Band Test Analysis on page 189
   Setting Up WDM Filter Test Analysis on page 195
   Setting Up Loss Measurement Analysis on page 197

Setting up Peak Trough Search Analysis

The **Peak Trough Search** tool allows you to identify in a spectral trace all high and low values separated from the detected local noise by a given threshold.

Peaks and troughs are only detected above the dotted orange line of **Noise Level @ 1575 nm** defined in the **Analysis** menu (see *Configuring and Starting the Trace Analysis* on page 160).

The tool is automatically activated as all other tool results are calculated from the values detected from this **Peak Trough Search** tool.



To define the Peak Trough Search analysis parameters:

In the **Analysis** pane, click the **Peak Trough Search** tool and modify the parameters using the instructions given below.

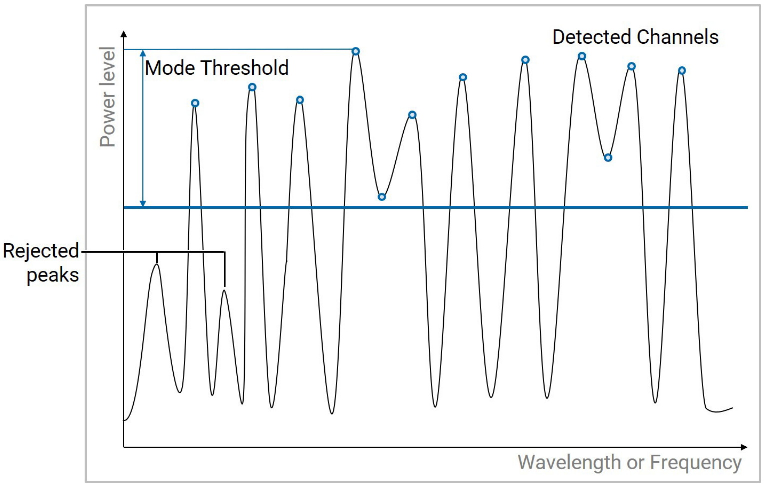
Search Settings

➤ **PT Threshold**

Threshold value for the discrimination of peaks and troughs in the trace.

Default value: 0.50 dB

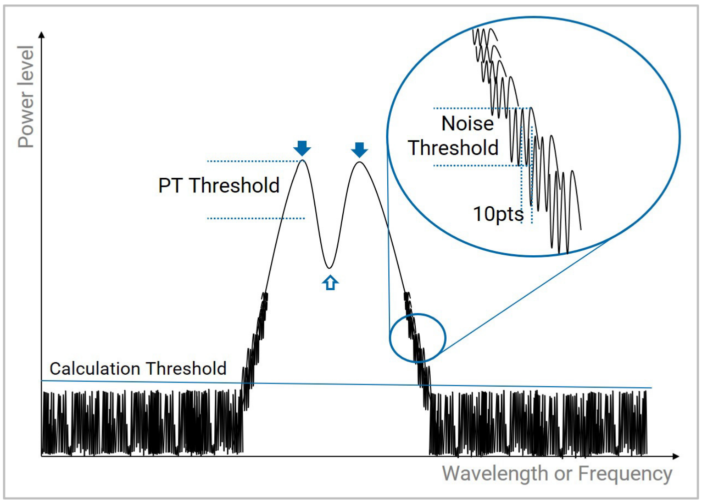
➤ **Mode Threshold**



The only peaks retained are the ones with power level higher than: [Max power level]-[Mode Threshold].

Default value: 20 dB

- **Auto Noise Threshold**
  - (default): the algorithm automatically detects the localized root mean square (RMS) noise of the measurement (over 10 points surrounding the point of interest) and deduces a value of noise threshold, below which a peak or trough cannot be effectively detected.
    This input has been introduced due to the strong dependence of spectral noise to detected power level (see the following figure, in which **Noise Level @1575nm** is represented by Calculation Threshold). This noise threshold is then added to the PT threshold for the peak and trough search.
  - : the algorithm does not filter the local noise.



Display on Graph

- (default): analysis graphical items are displayed on the graph.
  - **Peaks** (default): graphical items are displayed on peaks.
  - **Troughs**: graphical items are displayed on troughs.
  - **Both**: graphical items are displayed on peaks and troughs.
- : no graphical item is displayed on the graph.

To analyze PT Search results:

The results of Peak Trough Search tool are visible on the graph, if you have selected the **Display on Graph** option:

- : graphical display item displayed on peaks.
- : graphical display item displayed on troughs.

Result values are displayed for each detected peak, in accordance with the value set for the **Mode Threshold** parameter.

Selecting the Component Under Test (Component Selector)

The **Component Selector** tool enables you to select the component to test and automatically adapts the list of available analysis tools.

To select the component under test:

In the **Analysis** pane, click the **Component Selector** tool and select the type of component under test. The availability of components depends on the selected analysis mode (see **Mode on page 161**).

The **Component Selector** tool makes available the analysis tools adapted to the selected component.

	PCT Analysis Mode				PCT WDM Analysis Mode	Related Section
	Pass Band Filter	Stop Band Filter	Isolator	Fiber	Pass Band Filter	
PT Search						*Setting up Peak Trough Search Analysis* on page 164
Channel Detection						*Setting Up Channel Detection* on page 167
PDL Analysis						*Setting Up PDL Analysis* on page 172
Spectral Width 1 Spectral Width 2 Spectral Width 3						*Setting up Spectral Width 1/2/3 Analysis* on page 174
Notch Width 1 Notch Width 2 Notch Width 3						*Setting up Notch Width 1/2/3 Analysis* on page 180
Pass Band Test						*Setting Up Pass Band Test Analysis* on page 183
Stop Band Test						*Setting Up Stop Band Test Analysis* on page 189
WDM Filter Test						*Setting Up WDM Filter Test Analysis* on page 195
Loss Measurement						*Setting Up Loss Measurement Analysis* on page 197

 This icon means that the analysis tool is available for the component and can be modified: you can modify the analysis parameters, and view the corresponding results.

 This icon means that the analysis tool is available and cannot be modified: the analysis is performed automatically according to preset parameters, and you can view the results.

Setting Up Channel Detection

The **Channel Detection** tool is only available in PCT WDM analysis mode, for **Pass Band Filter** component type. It enables you to define a grid for the channel analysis.

See the following sections for details:

➤ *Defining Channel Detection Parameters* on page 167

➤ *Analyzing Channel Detection Results* on page 171

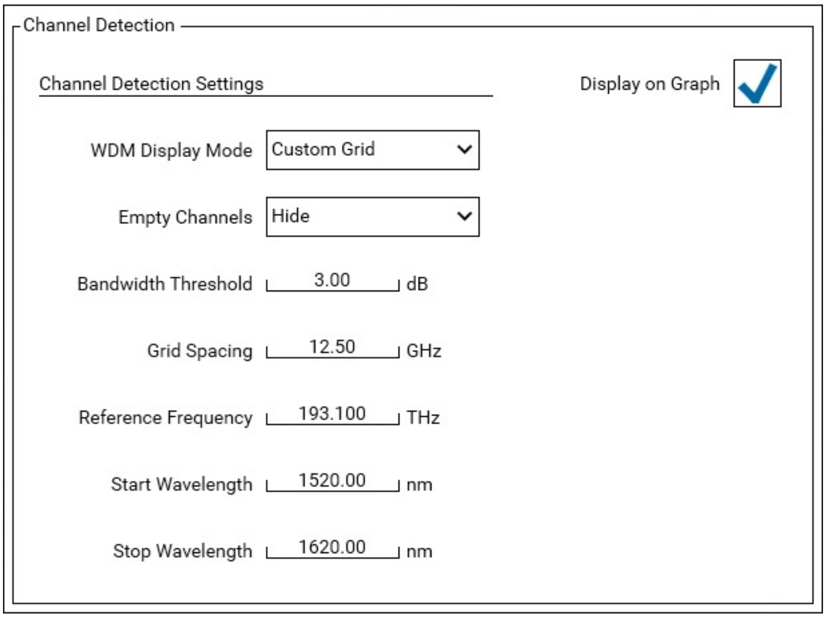
Defining Channel Detection Parameters

The **Channel Detection** tool allows you to identify in one or more spectral trace(s) the number, wavelength and power of WDM channels.

To use the Channel Detection analysis tool:

1. In the Analyze menu, select the PCT WDM analysis mode.

2. In the **Analysis** pane, click the **Channel Detection** tool and modify the parameters using the instructions given in *To define the Channel Detection parameters:* on page 168 below.



3. To make graphical display items of the analysis visible on the graph, select the **Display on Graph** check box.

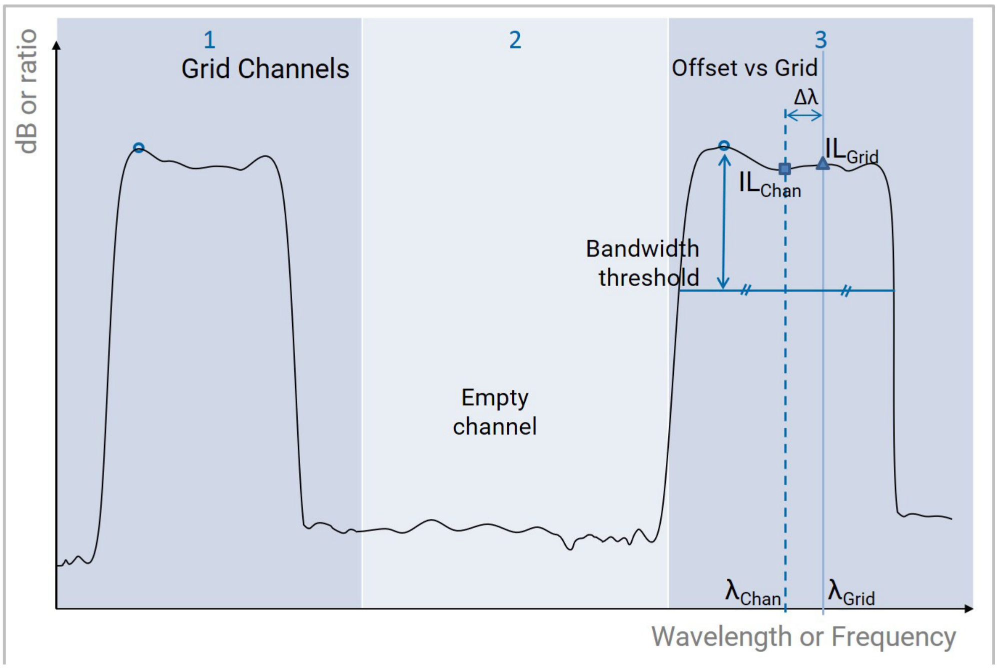
To define the Channel Detection parameters:

Channel Detection Settings

The **Peaks Trough Search** tool (see section *Setting up Peak Trough Search Analysis* on page 164) allows the identification of all candidate channels.

WDM Display Mode

Method used to calculate the results of the WDM channels detection algorithm.



➤ **Custom Grid** (default)

The grid channel array is first calculated based on the **Start Wavelength**, the **Stop Wavelength** and the **Grid Spacing**.

The reference frequency can be set to any frequency with the **Reference Frequency** parameter (see below, **Reference Frequency on page 169**). All other channels are then calculated from that reference channel labeled "Channel 0".

In this process, some of the detected peaks are rejected, either because they are not within the range of the grid, or they are duplicate peaks within a single grid channel. In the latter case, the peak with the highest power is set as the mode.

➤ **Empty Channels**

To avoid slowing the acquisition, empty channels are not displayed on graph.

Show: all available channels are displayed in the table of results.

IMPORTANT

Depending on the number of empty channels, selecting this option can slow acquisition and column sorting.

Hide (default): empty channels (i.e. with no detected power) are not displayed in the table of results.

- **Bandwidth Threshold**

  Threshold used in the calculation of the central wavelength/frequency of the signal, that defines two wavelengths λ- and λ+ with Power **P = Ppeak – Bandwidth Threshold**.

  For correct identification of channels, it is recommended that this threshold be less than **PT Threshold** (see **PT Threshold on page 164**).

  Central wavelength/frequency = (λ+ + λ-)/2

  Default value: 3 dB

- **Grid Spacing**

  Spacing value for the grid.
  Default value: 12.5 GHz

- **Reference Frequency**

  Center frequency value of the channel number 0. The center frequency of channel N is calculated from the Reference Frequency f, and the Grid Spacing. All other channels are calculated from this frequency as:
  f(channelnumberN)=f(reference)+N*GridSpacing

  Default value: 193.1 THz (ITU standard)

- **Start Wavelength/Frequency**

  Center wavelength or frequency value (depending on the selected measurement unit, see *Defining Subsystem Spectral and Power/Current Units* on page 115) of the first channel on the grid.

  Default value: 1520 nm / 197.232 THz

- **Stop Wavelength/Frequency**

  Center wavelength or frequency value (depending on the selected measurement unit, see *Defining Subsystem Spectral and Power/Current Units* on page 115) of the last channel on the grid.

  Default value: 1620 nm / 185.057 THz

- **CWDM**

  Generates a CWDM grid: 20 nm spacing and center wavelength of 1270 nm to 1610 nm or 1271 nm to 1611 nm.

  - **Empty Channels**

    To avoid slowing the acquisition, empty channels are not displayed on graph.

    Show: all available channels are displayed in the table of results.

IMPORTANT

Depending on the number of empty channels, selecting this option can slow acquisition and column sorting.

Hide (default): empty channels (i.e. with no detected power) are not displayed in the table of results.

➤ **Bandwidth Threshold**

Threshold used in the calculation of the central wavelength/frequency of the signal, that defines two wavelengths λ- and λ+ with Power **P = Ppeak – Bandwidth Threshold**.

For correct identification of channels, it is recommended that this threshold be less than **PT Threshold** (see **PT Threshold on page 164**).

Central wavelength/frequency = (λ+ + λ-)/2

Default value: 3 dB

➤ **First Channel**

Wavelength of the first channel of the CWDM grid:

1270 nm: the first CWDM channel is centered on 1270 nm.

1271 nm (default): the first CWDM channel is centered on 1271 nm.

➤ **ITU Grid**

Generates an ITU grid.

➤ **Empty Channels**

To avoid slowing the acquisition, empty channels are not displayed on graph.

Show: all available channels are displayed in the table of results.

IMPORTANT

Depending on the number of empty channels, selecting this option can slow acquisition and column sorting.

Hide (default): empty channels (i.e. with no detected power) are not displayed in the table of results.

➤ **Bandwidth Threshold**

Threshold used in the calculation of the central wavelength/frequency of the signal, that defines two wavelengths λ- and λ+ with Power **P = Ppeak – Bandwidth Threshold**.

For correct identification of channels, it is recommended that this threshold be less than **PT Threshold** (see **PT Threshold on page 164**).

Central wavelength/frequency = (λ+ + λ-)/2

Default value: 3 dB

➤ **Spacing**

Spacing value of the ITU grid.
Default value: 25 GHz

➤ **Band**

Band on which the grid should be generated.
Default value: C-Band

Analyzing Channel Detection Results

Analysis results are displayed on graph and below the graph, in the Analysis pane.

To analyze results displayed on graph:

If you have selected the **Display on Graph** check box, the following graphical items are displayed on graph:

- Areas alternately pink and gray (brown and gray in dark mode) identify the channels.
- Channel numbers are displayed at the top of the graph.

To analyze results displayed in the Analysis pane:

- **Table header**

  If no peaks are detected at the end of the scan, no value is displayed.

  - **Nbr of channels**: total number of detected channels.
  - **Slope (dB/nm or dB/THz)**: linear fit slope of all central wavelength/frequency measured on all analyzed trace channels.
  - **Uniformity (dB)**: difference between the maximum and minimum IL value measured at the central wavelength/frequency of all analyzed trace channels.

- **Table results**

Column Name	Meaning
Ch	Channel number, according to the grid channel numbering (even if **Empty Channels** is set to **Hide**).
Trace #	Trace number as displayed in the **Trace setup** pane.
λ_{Grid} **(nm)** / ν_{Grid} **(THz)**	Wavelength/Frequency of the channel of the grid.
λ_{Chan} **(nm)** / ν_{Chan} **(THz)**	Central wavelength/frequency of the trace channel, calculated from the selected **Bandwidth Threshold**.
$\Delta\lambda$ **(nm)** / $\Delta\nu$ **(GHz)**	Wavelength/Frequency offset of the channel compared to the nearest grid channel.
IL_{Grid} **(dB)**	Measured IL at central wavelength/frequency of the grid channel.
IL_{Chan} **(dB)**	Measured IL at central wavelength/frequency of the trace channel.

Setting Up PDL Analysis

PDL analysis is only available on IL traces acquired together with PDL traces using an IL PDL or IL PDL OPM2 module.

The **PDL Analysis** tool is only available in PCT WDM analysis mode, for **Pass Band Filter** component type. It enables you to get PDL levels of IL traces.

See the following sections for details:

- *Defining PDL Analysis Parameters* on page 172
- *Analyzing PDL Analysis Results* on page 173

Defining PDL Analysis Parameters

The **PDL Analysis** tool enables you to set the wanted channel window from which you want to identify the maximum PDL level (PDL_{Max}).

To use the PDL Analysis tool:

1. In the **Analyze** menu, select the PCT WDM analysis mode.
2. In the **Analysis** pane, click the **PDL Analysis** tool and modify the parameters using the instructions given in *To define the PDL Analysis parameters* on page 172 below.

3. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box.
4. Make sure that PDL traces corresponding to the IL traces you want to analyze are enabled and available on graph.

To define the PDL Analysis parameters

PDL_{Max} Calculation Settings

- **Frequency Range**

  Method used to define the spectral range from which the maximum PDL level (PDL_{Max}) of selected traces is measured.

  - **Fixed Range**

    Sets the range to a fixed calculation span in nm or THz, depending on the unit setting. The range is centered on the grid wavelength/frequency defined by the **Channel Detection** tool (see *Analyzing Channel Detection Results* on page 171).

- **% Bandwidth 1**

  Sets the range to a fraction of the bandwidth measured from the **Spectral Width 1** tool. The range is centered on the grid wavelength/frequency defined by the **Channel Detection** tool (see *Analyzing Channel Detection Results* on page 171).

- **% Channel spacing**

  Sets the range to a fraction of the grid channel spacing defined in the **Channel Detection** tool.

- **Calculation Span** (only if Frequency Range is set to **Fixed Range**)

  Fixed range centered on the central wavelength (in nm or THz) over which the maximum PDL level is measured.

  Default value: 0.1 nm

- **% Bandwidth** (only if Frequency Range is set to **% Bandwidth 1**)

  Fraction (in %) of the bandwidth (measured from the **Spectral Width 1** tool) over which the maximum PDL level is measured.

  Default value: 50 %

- **% Channel** (only if Frequency Range is set to **% Channel spacing**)

  Fraction (in %) of the channel width over which the maximum PDL level is measured.

  Default value: 20 %

Analyzing PDL Analysis Results

PDL Analysis results are available on a selected IL trace only if the corresponding PDL trace is available. For example, to display analysis results on a "TF min" trace type, the corresponding "PDL min" trace type must be enabled and available.
If the PDL trace is not available, the results are empty; if the trace is available but without enough data points to measure the PDL level, the result table display a dash,

Result	Meaning
PDL_{Grid} (dB)	PDL level measured at the grid wavelength λ_{Grid} or frequency ν_{Grid} (for more details on the grid wavelength/frequency, see *Analyzing Channel Detection Results* on page 171).
PDL_{Chan} (dB)	PDL level measured at the channel wavelength λ_{Chan} or frequency ν_{Chan} (for more details on the channel wavelength/frequency, see *Analyzing Channel Detection Results* on page 171).
PDL_{Max} (dB)	Maximum PDL level measured within the defined calculation range (see **PDLMax Calculation Settings on page 172**).

Setting up Spectral Width 1/2/3 Analysis

The **Spectral Width 1/2/3** tools are available in PCT and PCT WDM analysis modes, for **Pass Band Filter** component type.

See the following sections for details:

- *Defining Spectral Width 1/2/3 Parameters* on page 174
- *Analyzing Spectral Width Results* on page 179

Defining Spectral Width 1/2/3 Parameters

- In PCT analysis mode, the **Spectral Width 1/2/3** tools allow you to identify in a spectral trace the width of the main peak at a given threshold below the peak power level and the central wavelength.

  This tool applies only on peaks. For trough width measurement, see *Setting up Notch Width 1/2/3 Analysis* on page 180.

- In PCT WDM analysis mode, the **Spectral Width 1/2/3** tools allow you to identify in a spectral trace the spectral width at a given threshold below the peak power (same calculation as PCT mode) or following the ITU-T G.671 recommendation.

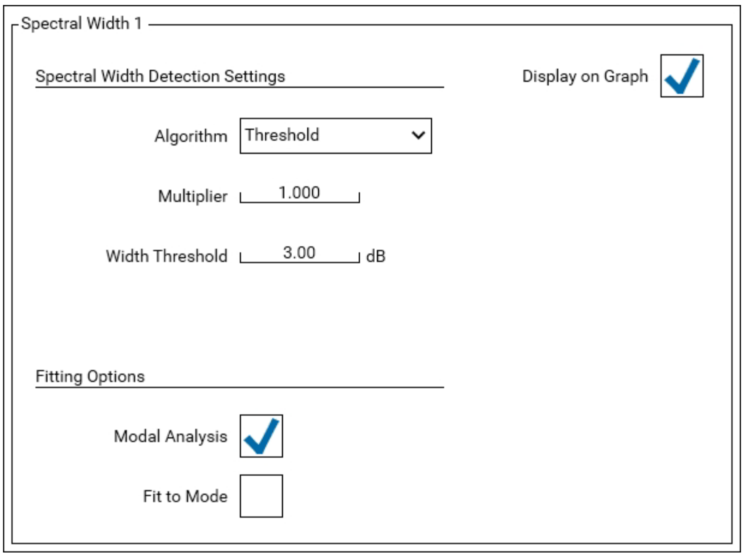
To use the Spectral Width analysis tool:

1. In the **Analysis** pane, click the **Component Selector** tool and set the **Type** parameter to **Pass Band Filter**,

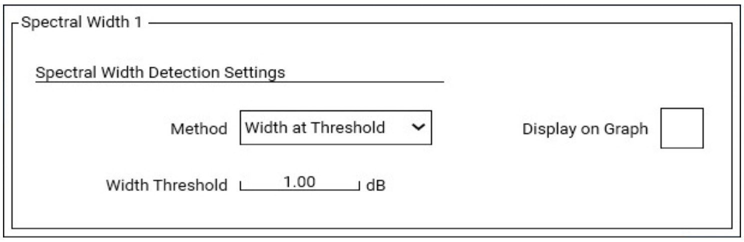
   The **Spectral Width 1**, **Spectral Width 2** and **Spectral Width 3** analysis tools become available.

2. Click the wanted **Spectral Width** tool and modify the parameters using the instructions given in *To define the Spectral Width parameters in PCT Analysis mode:* on page 175 below.

Spectral Width tool in PCT analysis mode



Spectral Width tool in PCT WDM analysis mode



3. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box (only available on **Spectral Width 2** and **Spectral Width 3**). **Spectral Width 1** is automatically activated.

4. To make graphical display items of the analysis visible on the graph, select the **Display on Graph** check box.

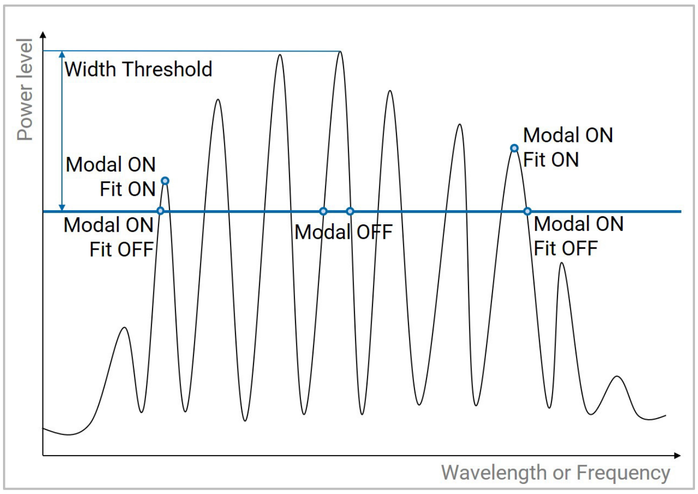
To define the Spectral Width parameters in PCT Analysis mode:

Spectral Width Detection Settings (PCT analysis mode)

➤ **Algorithm**: method used for the calculation of the width.

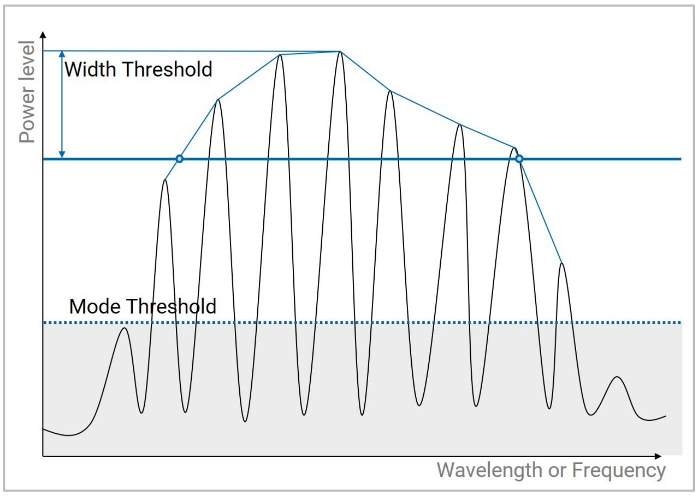
- ➤ **Threshold** (default)

  The Threshold algorithm detects the wavelengths λ- and λ+ at which the power level falls below [Peak Power level]-[Width Threshold]. Several options are available for this algorithm (see **Fitting Options on page 177**), illustrated in the following figure.



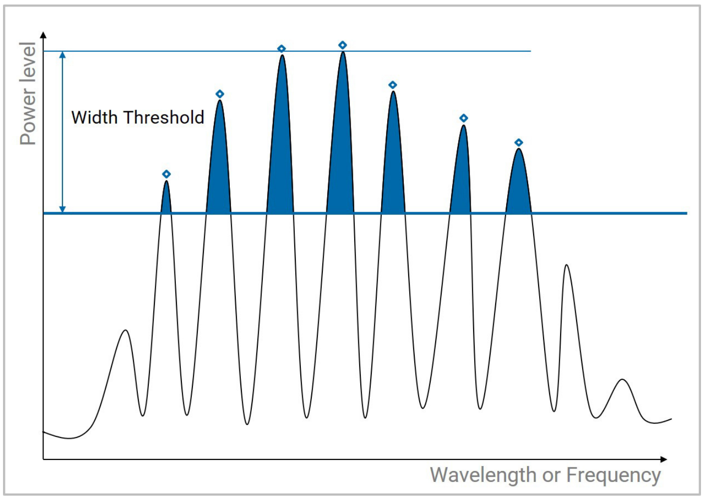
➤ Envelope

The Envelope algorithm defines an envelope from the peaks of the trace above **Mode Threshold** (linear fit between each peak on log scale) and deduces the width based on that envelope, as shown in the following figure.



➤ RMS/RMS Peak

The RMS and RMS Peak algorithms calculate the root mean square value σ of the power level data above a given **Width Threshold**, taking the full power level data (RMS) or simply the Power level at Peak (RMS Peak) for the calculation.

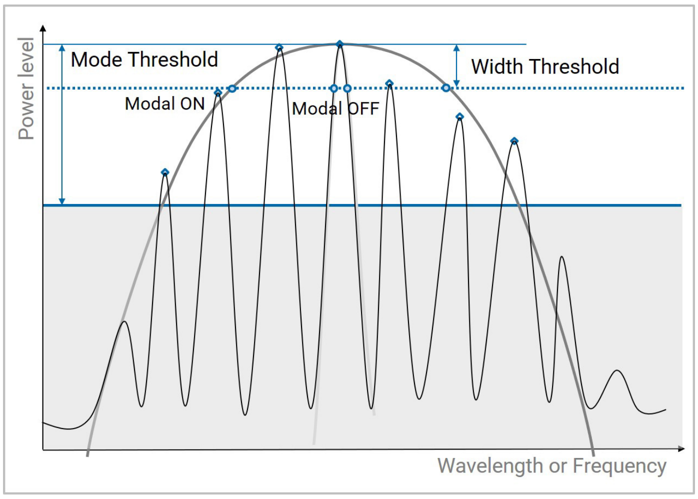


➤ Gaussian Fit/Lorentzian Fit

The Gaussian Fit and Lorentzian Fit algorithms fit a curve to the data and calculate the spectral parameters using **Width Threshold** from this fit.

If **Modal Analysis** is set to OFF (see **Fitting Options on page 177**), the curve fits a Gaussian or Lorentzian to the main peak.

If **Modal Analysis** is set to ON, the curve fits a Gaussian or Lorentzian to all peaks above **Mode Threshold**.



- **Multiplier**

  Factor to scale the measured width.

  Default value: 1

- **Width Threshold**

  Threshold level used in the calculation of the width. It defines two wavelengths **λ-** and **λ+** with Power $P = P_{peak}$ – **Width Threshold**.

  Default value: 1 dB (Spectral Width 1) or 3 dB (Spectral Width 2) or 20 dB (Spectral Width 3)

- **Mode Threshold** (only for **Envelope**, **Gaussian Fit** and **Lorentzian Fit** algorithms).

  Retains peaks with power level $P > P_{peak}$ – **Mode Threshold**.

  Default value: 50 dB

Fitting Options

- **Modal Analysis** (only for **Threshold**, **Gaussian Fit** and **Lorentzian Fit** algorithms).
  - ☑: the measurement includes all detected peaks above **Width Threshold** (Threshold algorithm) or **Mode Threshold** (Gaussian Fit/Lorentzian Fit algorithms).
  - ☐ (default): the measurement includes a single peak (the main peak).
- **Fit to Mode** (only for **Threshold** algorithm, if **Modal Analysis** check-box is selected).
  - ☑: the calculation of width is fitted to the nearest detected peaks.
  - ☐ (default): the calculation of width is fitted to the curve-threshold crossing (see the figure in **Threshold *(default)* on page 175**).

To define the Spectral Width parameters in PCT WDM Analysis mode:

Spectral Width Detection Settings (PCT WDM analysis mode)

- **Method**

  Bandwidth calculation method:

  - **Width at Threshold**

    The bandwidth is calculated at the **Width Threshold** value, using the following parameters (from PCT analysis mode): Algorithm Threshold, Multiplier 1, Width Threshold 1 dB, 3 dB, and 20 dB, no Modal Analysis, no Fit to Mode.

  - **ITU-T G.671**

    The bandwidth is calculated at the **Width Threshold** value, following the ITU-T G.671 recommendation for the calculation of the bandwidth.

- **Width Threshold**

  Threshold level used in the calculation of the width. It defines two wavelengths λ**-** and λ**+** with Power $P = P_{peak} -$ **Width Threshold**.

  Default value: 1 dB (Spectral Width 1) or 3 dB (Spectral Width 2) or 20 dB (Spectral Width 3)

Analyzing Spectral Width Results

Analysis results are displayed below the graph, in the Analysis pane.

To analyze results displayed on graph:

If you have selected the **Display on Graph** check box, the following graphical items are displayed on graph:

-  is displayed on the mean wavelength/frequency
-  is displayed on λ+ and λ-.
-  is displayed between λ- and λ+.

To analyze the PCT analysis results displayed in the Analysis pane:

Result	Meaning
λ_{mean}/ν_{mean}	Calculated central wavelength/frequency and its associated power level. For **RMS**, **RMS Peak** and **Gaussian** algorithms, the central wavelength is the mean wavelength.
$Level_{mean}$	
λ_{peak}/ν_{peak}	Calculated peak wavelength/frequency and its associated power level.
$Level_{peak}$	
Δλ@xxdB/Δν@xxdB	Width at **Width Threshold** using the selected algorithm method. For **RMS** and **RMS Peak** algorithms, the width is the standard deviation (σ).
σ	Only for **RMS** and **RMS Peak** algorithms. Standard deviation value of the measured peak.

To analyze the PCT WDM results displayed in the Analysis pane:

Result	Meaning
Δλ1@xxdB (nm)/ Δν1@xxdB (GHz)	Spectral width at **Width Threshold** using the selected calculation method.
Δλ2@xxdB (nm)/ Δν2@xxdB (GHz)	
Δλ3@xxdB (nm)/ Δν3@xxdB (GHz)	

Setting up Notch Width 1/2/3 Analysis

The **Notch Width 1/2/3** tool is only available in PCT analysis mode, for stop-band filter and isolator component types.

See the following sections for details:

➤ *Defining Notch Width Analysis Parameters* on page 180

➤ *Analyzing Notch Width Results* on page 182

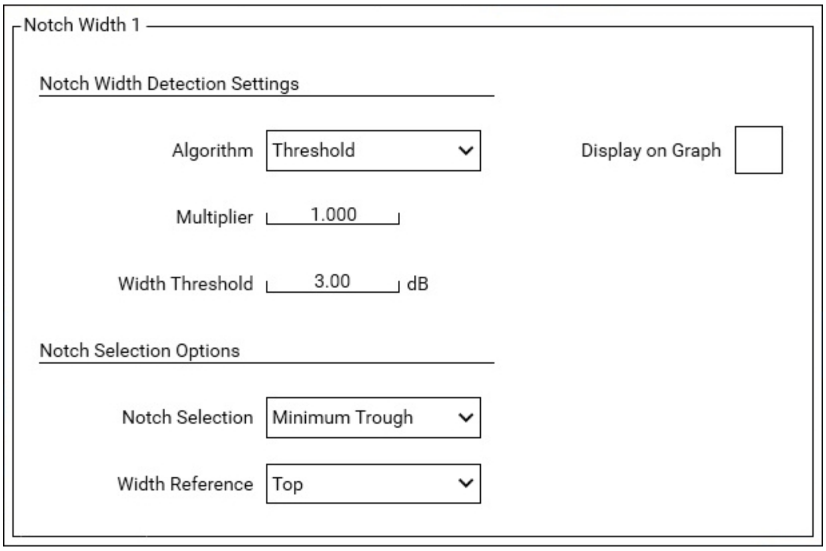
Defining Notch Width Analysis Parameters

The **Notch Width** tool allows you to identify in a spectral trace the width of a trough at a given threshold above the trough power level (see "Bottom" in **Width Reference on page 182**) or below the surrounding peaks (see "Top" in **Width Reference on page 182**).

To use the Notch Width analysis tool:

1. In the **Analyze** menu, select the PCT analysis mode.
2. In the **Analysis** pane, click the **Component Selector** tool and set the **Type** parameter to **Stop Band Filter** or **Isolator**.

   The **Notch Width 1**, **Notch Width 2** and **Notch Width 3** analysis tools become available.
3. Click the wanted **Notch Width** tool and modify the parameters using the instructions given in *To define Notch Width analysis parameters:* on page 181 below.



4. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box (only available on **Notch Width 2** and **Notch Width 3**). **Notch Width 1** is automatically activated.
5. To make graphical display items of the analysis visible on the graph, select the **Display on Graph** check box.

To define Notch Width analysis parameters:

Notch Width Detection Settings

- **Algorithm**: fit to apply for the determination of the width.
  The fitting is mono-modal (the **Modal Analysis** option is not available).
  - **Threshold** (default): no fit is applied.
  - **Gaussian/Lorentzian Fit**: the Gaussian Fit and Lorentzian Fit algorithms fit a curve to the data and calculate the spectral parameters using **Width Threshold** from this fit. The curve is fitted to the main trough.
- **Multiplier**

  Factor to scale the measured width.

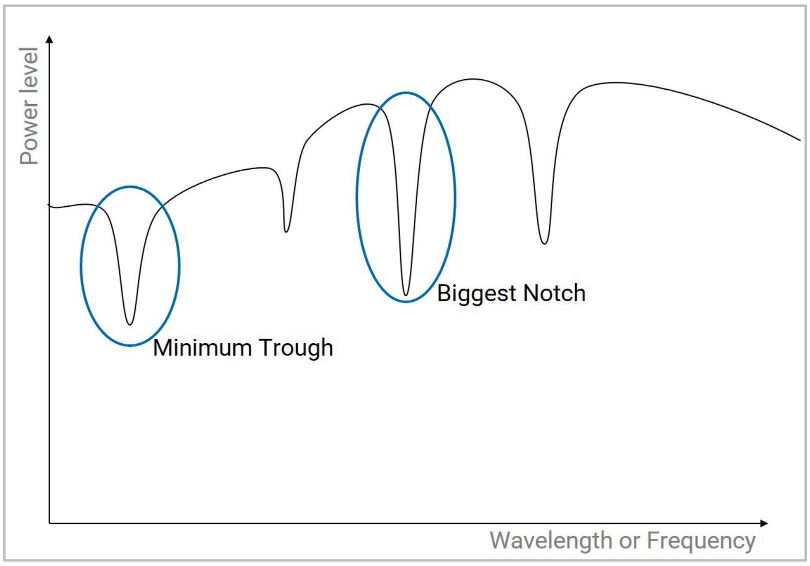
  Default value: 1
- **Width Threshold**

  Threshold level used in the calculation of the width. It defines two wavelengths **λ-** and **λ+** with Power $P = P_{peak}$ – **Width Threshold**.

  Default value: 1 dB (Notch Width 1) or 3 dB (Notch Width 2) or 20 dB (Notch Width 3)

Notch Selection Options

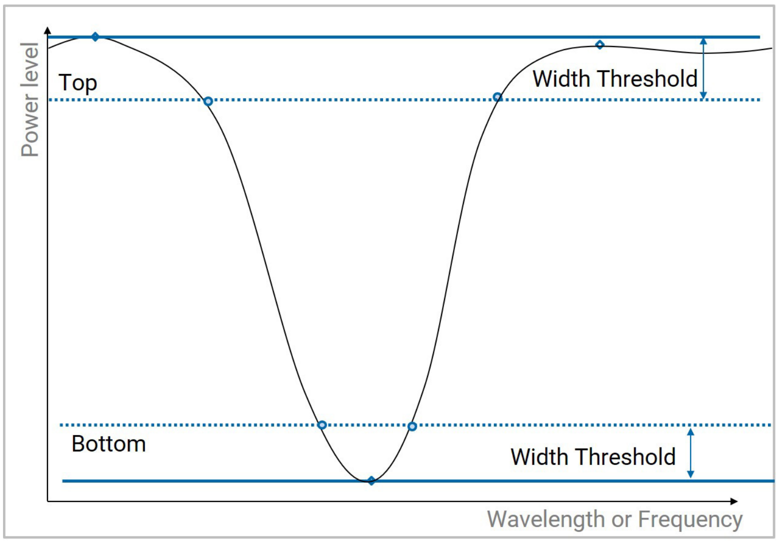
- **Notch Selection**: method used for the selection of the trough to analyze.
  - **Deepest Notch**: selection of the feature with biggest difference between trough and adjacent peaks.
  - **Minimum Trough** (default): selection of the lowest level trough.



- **Width Reference**

  Method used for the measurement of the width.

  - **Bottom** (default): the width is calculated from the trough.
  - **Top**: the width is calculated from the two surrounding peaks on either side of the notch to be analyzed.



Analyzing Notch Width Results

Analysis results are displayed below the graph, in the Analysis pane.

If no peaks are detected at the end of the scan, no value is displayed.

To analyze results displayed on graph:

If you have selected the **Display on Graph** check box, the following graphical items are displayed on graph:

-  displayed on the notch wavelength.
-  is displayed on λ+ and λ-.

To analyze results displayed in the Analysis pane:

To be detected correctly, the trough must not be below the **Noise Level @1575 nm** value (see *Configuring and Starting the Trace Analysis* on page 160).

Result	Meaning
$\lambda_{notch}/\nu_{mean}$	Calculated central wavelength/frequency and its associated power level.
$Level_{notch}$	
$\lambda_{trough}/\nu_{trough}$	**Notch Width 1/2/3** tool only.
$Level_{trough}$	Calculated trough wavelength/frequency and its associated power level.
$\Delta\lambda_{notch}/\Delta\nu_{notch}$	Spectral notch width at **Width Threshold** using the selected algorithm method.

Setting Up Pass Band Test Analysis

The **Pass Band Test** analysis tool is only available in PCT analysis mode, for **Pass Band Filter** component type.

See the following sections for details:

➤ *Defining Pass Band Test Analysis Parameters* on page 183

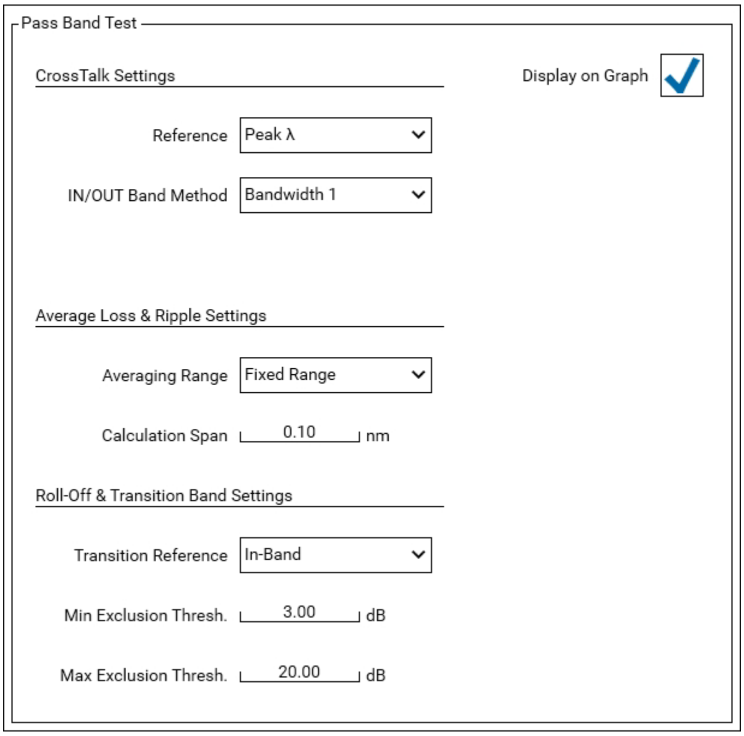
➤ *Analyzing Pass Band Test Results* on page 188

Defining Pass Band Test Analysis Parameters

The **Pass Band Test** tool allows you to get cross-talk, average loss, ripple and roll-off characteristics for a pass band filter.

To use the Pass Band Test analysis tool:

1. In the **Analyze** menu, select the PCT analysis mode.
2. In the **Analysis** pane, click the **Component Selector** tool and set the **Type** parameter to **Pass Band Filter**.
3. Click the **Pass Band Test** tool and modify the parameters using the instructions given in *To define the Pass Band Test analysis parameters:* on page 184 below.



4. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box.
5. To make graphical display items of the analysis visible on the graph, select the **Display on Graph** check box.

To define the Pass Band Test analysis parameters:

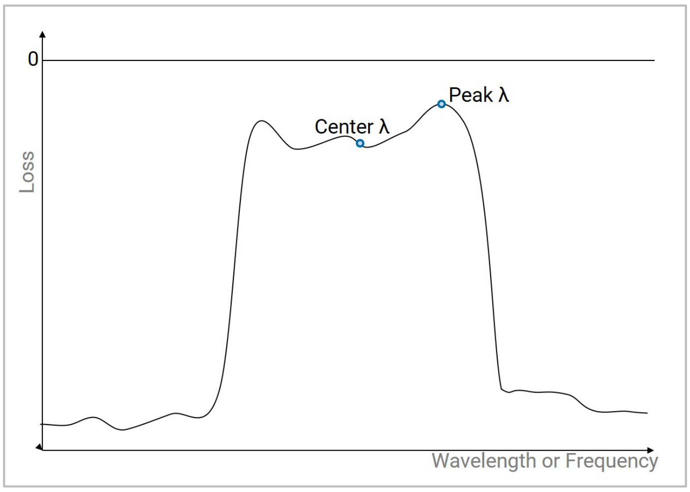
CrossTalk Settings

➤ **Reference**

Reference point taken for the analysis of the characteristics of the filter:

➤ **Peak λ** (default): peak wavelength found in the **Spectral Width 1** tool results (see *Analyzing Spectral Width Results* on page 179).

➤ **Center λ**: center wavelength found in the **Spectral Width 1** tool results (see *Analyzing Spectral Width Results* on page 179).

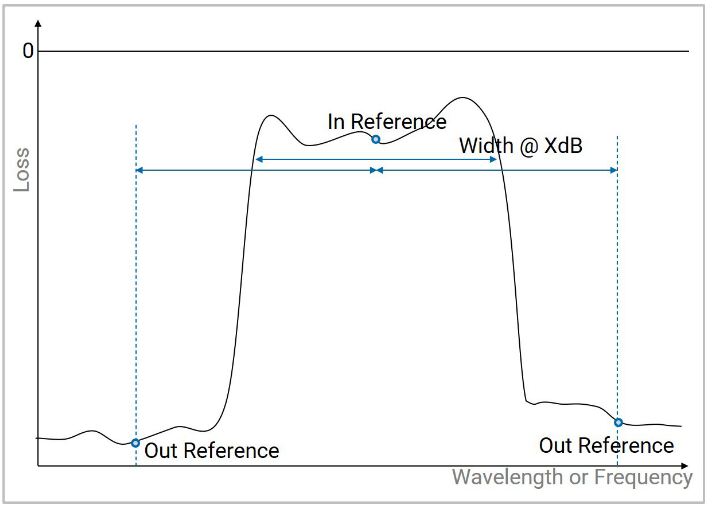


➤ **IN/OUT Band Method**

Method used in crosstalk calculation for the estimate of the spectral spacing between in and out bands:

➤ **Bandwidth 1** (default): selects the out band reference points to be exactly a bandwidth away from the in-band point, using the result in **Spectral Width 1** tool (see *Analyzing Spectral Width Results* on page 179).

➤ **Set Distance**: enables you to set the spacing via the **In/Out Band Distance** parameter.



➤ **IN/OUT Band Distance** (only if **In/Out Band Method** is set to **Set Distance**)

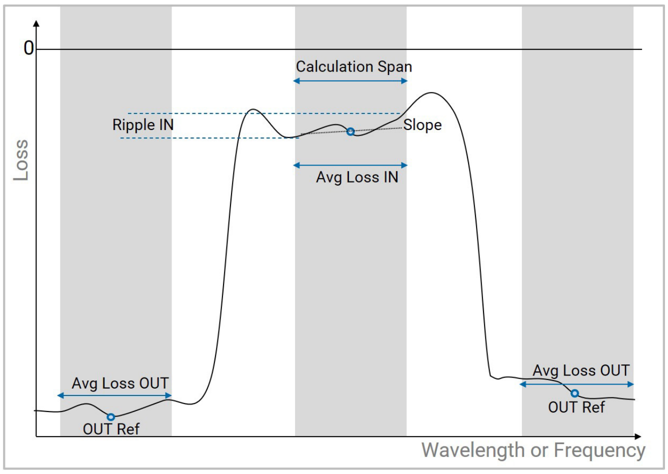
Spectral spacing in nm/THz between the in-band reference point and the out-band reference points to be used for the crosstalk calculation. Default value: 1 nm

Average Loss & Ripple Settings

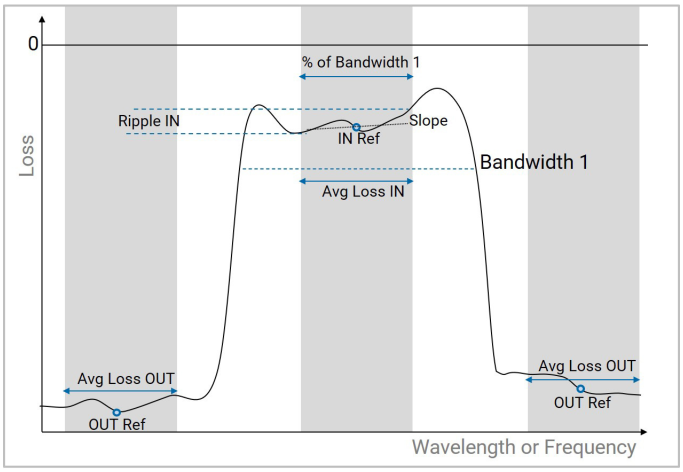
➤ **Averaging Range**

Spectral range used in the analysis of in-band and out-band average loss and ripple.

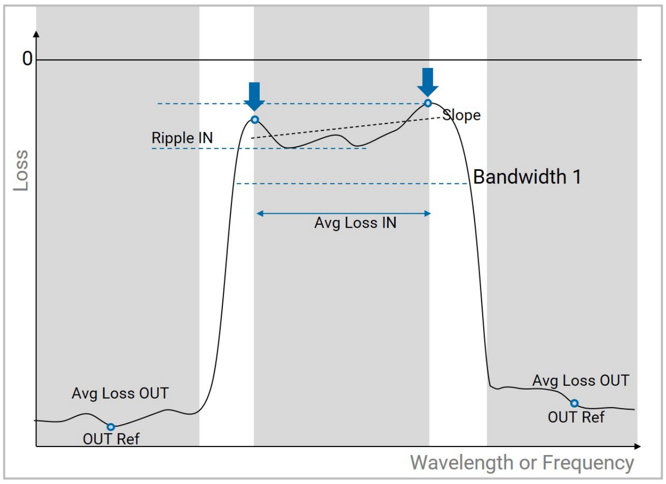
➤ **Fixed Range**: provides a fixed calculation span (see **Calculation Span *(only if Averaging Range is set to Fixed Range)* on page 186**).



➤ **% Bandwidth 1**: sets the range to a fraction of the bandwidth measured from the **Spectral Width 1** tool (see *Analyzing Spectral Width Results* on page 179).



➤ **PT Detection**: detects all peaks and troughs within the Bandwidth 1 using **Detection Threshold**. The span is then set to the distance between the first and last peak detected for a pass band filter.



In-band and out-band average loss and ripple/slope calculations are performed across a given calculation span centered on their respective reference points as defined in crosstalk settings.

➤ **Calculation Span** (only if **Averaging Range** is set to **Fixed Range**)

Fixed range in nm/THz over which calculations are done. The range is centered on the reference points for in-band and out-band (set in **CrossTalk Settings on page 184**). A range of 0 takes a single point for the calculation.

Default value: 0.1 nm

➤ **% Bandwidth** (only if **Averaging Range** is set to **% 3dB Bandwidth**)

Fraction (in %) of the bandwidth calculated in **Spectral Width 1** over which calculations are done. The range is centered on the reference points for in-band and out-band (set in **CrossTalk Settings on page 184**).

Default value: 50 %

➤ **Detection Threshold** (only if **Averaging Range** is set to **PT Detection**)

Threshold in dB for the detection of in-band extreme peaks over which calculations are done. The range is centered on the reference points for out-band (set in **CrossTalk Settings on page 184**).

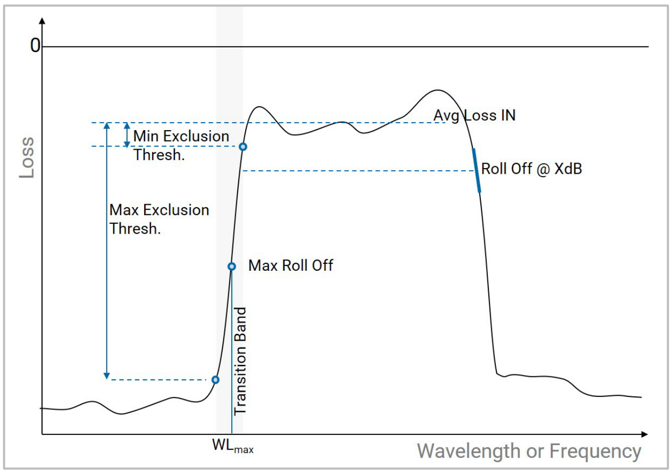
Default: 0.1 dB

Roll-Off & Transition Band Settings

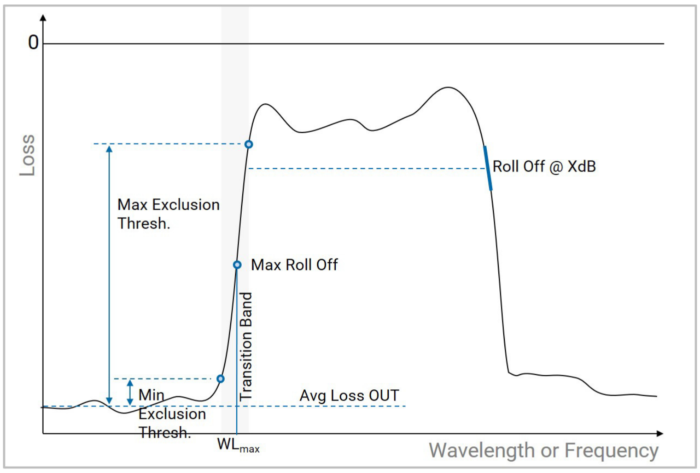
➤ **Transition Reference**

Reference to be used in the transition calculation:

➤ **In-Band** (default): the transition band is defined as the part of the trace between Level@ **Transition Reference - Min Exclusion Threshold** and Level@ **Transition Reference - Max Exclusion Threshold**.



➤ **Out-Band**: the transition band is defined as the part of the trace between Level@ **Transition Reference + Min Exclusion Threshold** and Level@ **Transition Reference + Max Exclusion Threshold**



➤ **Min Exclusion Thresh.**

(in dB) Minimum threshold for the exclusion of data outside of the transition band.

Default value: 3 dB

➤ **Max Exclusion Thresh.**

(in dB) Maximum threshold for the exclusion of data outside of the transition band.

Default value: 20 dB

Analyzing Pass Band Test Results

Analysis results are displayed below the graph, in the Analysis pane.

To analyze results displayed on graph:

-  are displayed on the reference points (in- and out-band).
-  are displayed on the maximum roll off wavelength within transition range.
-  are display on the transition range.

To analyze results displayed in the Analysis pane:

The **RollOff** measurement is performed on the CTP10 trace.

- **In-Band Results**

Result	Meaning
Avg Loss	Average loss in dB measured across **Averaging Range** around the in-band reference point.
Ripple	Uniformity in dB as the min/max level difference measured within **Averaging Range** around the **In-Band** reference point.
Slope	Linear fit slope calculated within **Averaging Range** around the **In-Band** reference point.

- **Out-Band Side 1 Results and Out-Band Side 2 Results**

Result	Meaning
Avg Loss	Average loss in dB measured across **Averaging Range** around the **Out-Band** reference point.
Ripple	Uniformity in dB as the min/max level difference measured within **Averaging Range** around the **Out-Band** reference point.
CrossTalk	Crosstalk (pass band) in dB measured between the **In-Band** Reference point and the **Out-Band** reference point. The crosstalk is given as difference between points, not between **Avg Losses**.
RollOff@XdB[1]	Roll off in dB/nm (or dB/THz) measured at XdB (set by the **Spectral Width 1** tool) from the **Transition Reference** point.
RollOffmax[1]	Maximum roll off in dB/nm (or dB/THz), within the transition band.
λ@RollOffmax	Wavelength of maximum roll off in nm.
Transition Band[1]	Wavelength region between **Transition Reference** -/+ **Minimum Threshold** and Reference point -/+ **Maximum Threshold**.

1. : This result is calculated between the two reference points set in **CrossTalk Settings on page 184**.

Setting Up Stop Band Test Analysis

The **Stop Band Test** analysis tool is only available in PCT analysis mode, for **Stop Band Filter** component type.

See the following sections for details:

➤ *Defining Stop Band Test Analysis Parameters* on page 189

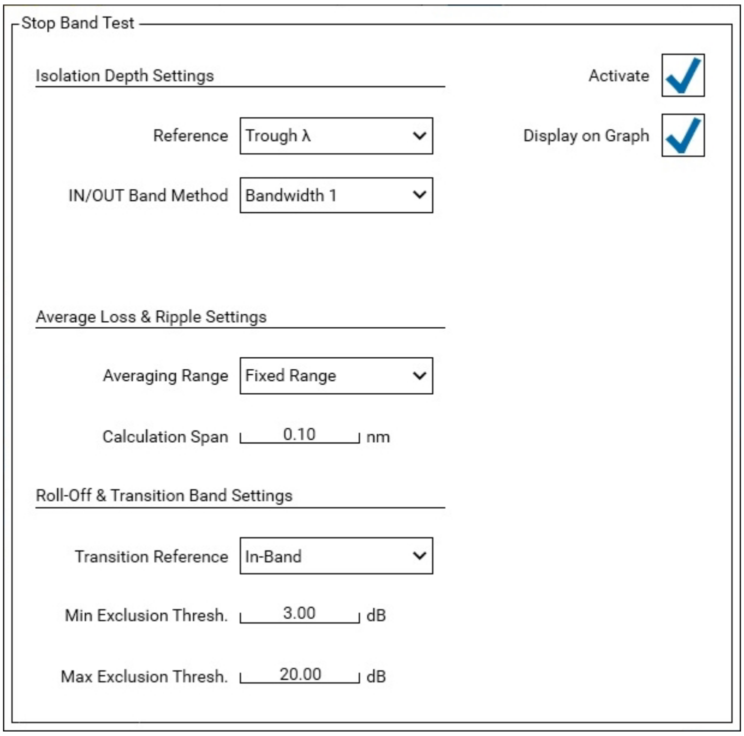
➤ *Analyzing Stop Band Test Results* on page 194

Defining Stop Band Test Analysis Parameters

The **Stop Band Test** tool allows you to get isolation depth, average loss, ripple and roll-off characteristics for a pass band filter

To use the Stop Band Test analysis tool:

1. In the **Analyze** menu, select the PCT analysis mode.
2. In the **Analysis** pane, click the **Component Selector** tool and set the **Type** parameter to **Stop Band Filter**.
3. Click the **Stop Band Test** tool and modify the parameters using the instructions given in *To define the Stop Band Test parameters:* on page 190 below.



4. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box.
5. To make graphical display items of the analysis visible on the graph, select the **Display on Graph** check box.

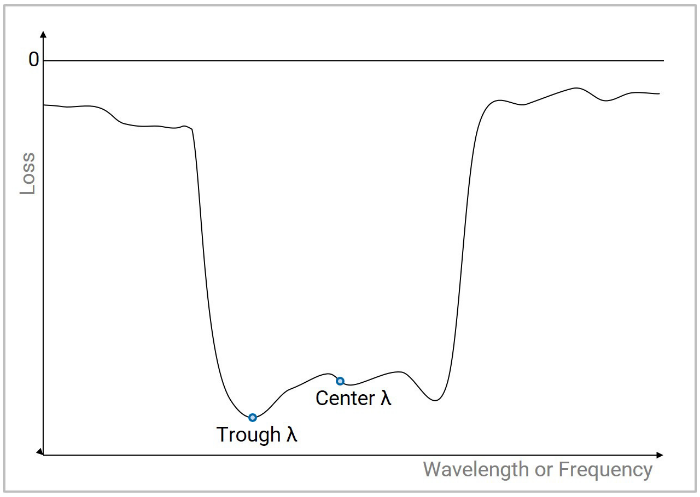
To define the Stop Band Test parameters:

Isolation Depth Settings

➤ **Reference**

Reference point taken for the analysis of the characteristics of the filter:

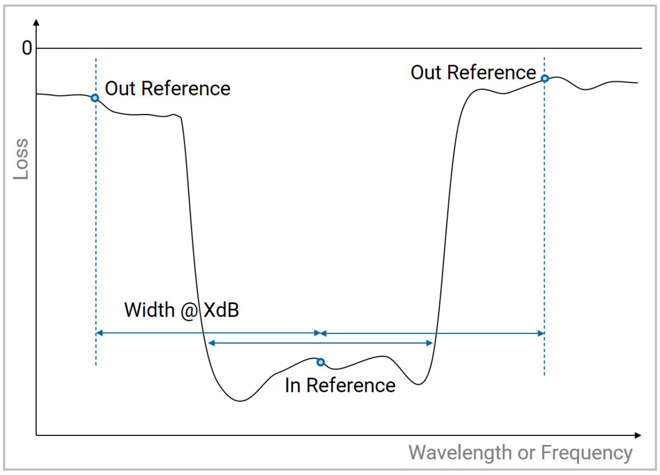
- ➤ **Trough λ** (default): peak wavelength found in the **Notch Width 1** tool results (see *Analyzing Notch Width Results* on page 182).
- ➤ **Center λ**: center wavelength found in the **Notch Width 1** tool results (see *Analyzing Notch Width Results* on page 182).



➤ **IN/OUT Band Method**

Method used in isolation depth calculation for the estimate of the spectral spacing between in and out bands:

- ➤ **Bandwidth 1** (default): selects the out band reference points to be exactly a bandwidth away from the in-band point, using the result in **Notch Width 1** tool (see *Analyzing Notch Width Results* on page 182).
- ➤ **Set Distance**: enables you to set the spacing via the **In/Out Band Distance** parameter.



➤ **IN/OUT Band Distance** (only if **In/Out Band Method** is set to **Set Distance**)

Spectral spacing in nm/THz between the in-band reference point and the out-band reference points to be used for the isolation depth calculation.

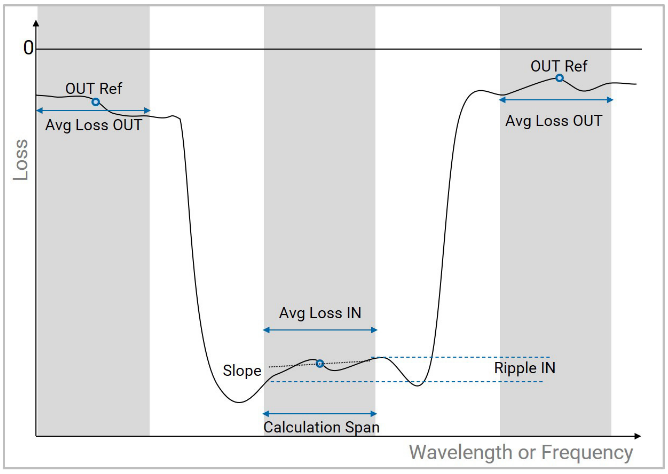
Default value: 1 nm

Average Loss & Ripple Settings

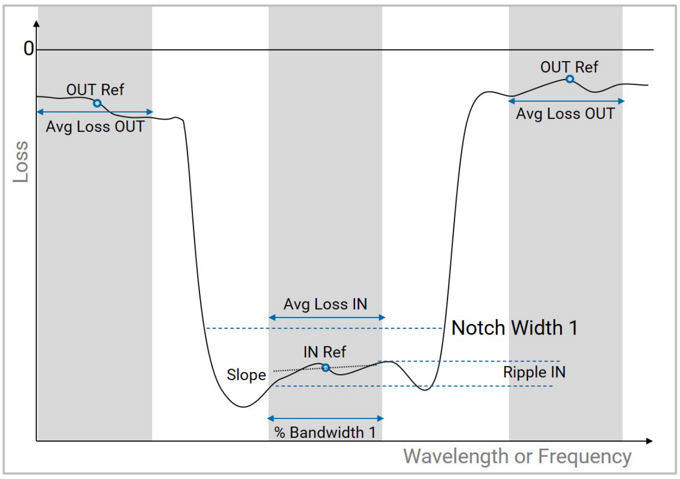
➤ **Averaging Range**

Spectral range used in the analysis of in-band and out-band average loss and ripple.

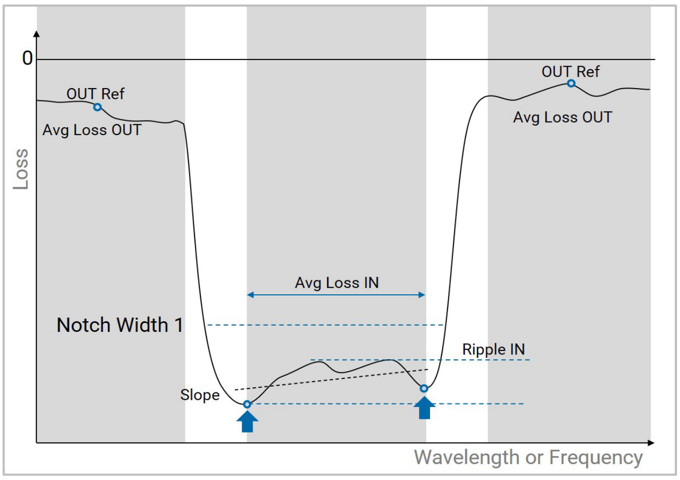
➤ **Fixed Range**: provides a fixed calculation span (see **Calculation Span *(only if Averaging Range is set to Fixed Range)* on page 186**).



➤ **% Bandwidth**: sets the range to a fraction of the bandwidth measured from the **Notch Width 1** tool (see *Analyzing Notch Width Results* on page 182).



➤ **PT Detection**: detects all peaks and troughs within the Bandwidth 1 using **Detection Threshold**, The span is then set to the distance between the first and last trough detected for a stop band filter.



In-band and out-band average loss and ripple/slope calculations are performed across a given calculation span centered on their respective reference points as defined in isolation depth settings.

➤ **Calculation Span** (only if **Averaging Range** is set to **Fixed Range**)

Fixed Range in nm/THz over which calculations are done. The range is centered on the reference points for in-band and out-band (set in isolation depth settings). A range of 0 takes a single point for the calculation.

Default value: 0.1 nm

➤ **% Bandwidth** (only if **Averaging Range** is set to **% 3dB Bandwidth**)

Fraction (in %) of the bandwidth calculated in **Notch Width 1** over which calculations are done. The range is centered on the reference points for in-band and out-band (set in isolation depth settings).

Default value: 50 %

➤ **Detection Threshold** (only if **Averaging Range** is set to **PT Detection**)

Threshold in dB for the detection of in-band extreme troughs over which calculations are done. The range is centered on the reference points for in-band (set in isolation depth settings).

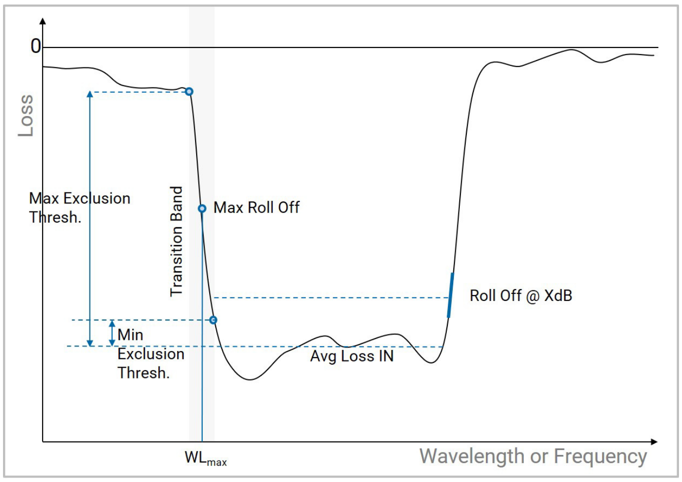
Default: 0.1 dB

Roll-Off & Transition Band Settings

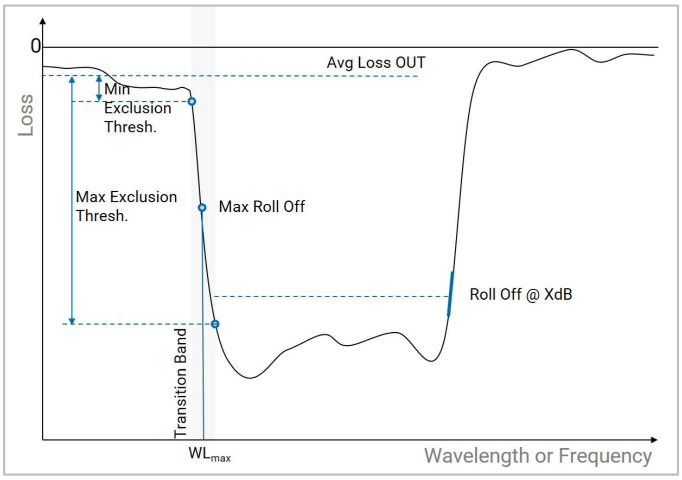
➤ **Transition Reference**

Reference to be used in the transition calculation:

- **In-Band** (default): the transition band is defined as the part of the trace between Level@ **Transition Reference + Min Exclusion Thresh**. and Level@ **Transition Reference + Max Exclusion Thresh**.



- **Out-Band**: the transition band is defined as the part of the trace between Level@ **Transition Reference - Min Exclusion Thresh**. and Level@ **Transition Reference - Max Exclusion Thresh**.



➤ **Min Exclusion Thresh.**

(in dB) Minimum threshold for the exclusion of data outside of the transition band.

Default value: 3 dB

➤ **Max Exclusion Thresh.**

(in dB) Maximum threshold for the exclusion of data outside of the transition band.

Default value: 20 dB.

Analyzing Stop Band Test Results

Analysis results are displayed below the graph, in the Analysis pane.

To analyze results displayed on graph:

If you have selected the **Display on Graph** check box, the following graphical items are displayed on graph:

-  are displayed on the reference points (in- and out-band).
-  are displayed on the maximum roll off wavelength within transition range.
-  are display on the transition range.

To analyze results displayed in the Analysis pane:

- **In-Band Results**

Result	Meaning
Avg Loss	Average loss in dB measured across **Averaging Range** around the in-band reference point.
Ripple	Uniformity in dB as the min/max level difference measured within **Averaging Range** around the **In-Band** reference point.
Slope	Linear fit slope calculated within **Averaging Range** around the **In-Band** reference point.

- **Out-Band Side 1 Results and Out-Band Side 2 Results**

Result	Meaning
Avg Loss	Average loss in dB measured across **Averaging Range** around the **Out-Band** reference point.
Ripple	Uniformity in dB as the min/max level difference measured within **Averaging Range** around the **Out-Band** reference point.
Isolation Depth	Isolation depth in dB measured between the **In-Band** Reference point and the **Out-Band** reference point. The isolation depth is given as difference between points, not between **Avg Losses**.
RollOff@XdB	Roll off in dB/nm (or dB/THz) measured at X dB (set by the **Notch Width 1** tool) from the **Transition Reference** point.
RollOffmax	Maximum roll off in dB/nm (or dB/THz), within the transition band.
λ@RollOffmax	Wavelength of maximum roll off in nm.
Transition Band	Wavelength region between **Transition Reference** -/+ **Minimum Threshold** and Reference point -/+ **Maximum Threshold**.

Setting Up WDM Filter Test Analysis

The **WDM Filter Test** tool is only available in PCT WDM analysis mode, for **Pass Band Filter** component type. It enables you to calculate the adjacent isolation, non-adjacent isolation, total crosstalk, ripple and slope of selected traces.

See the following sections for details:

➤ *Defining WDM Filter Test Parameters* on page 195

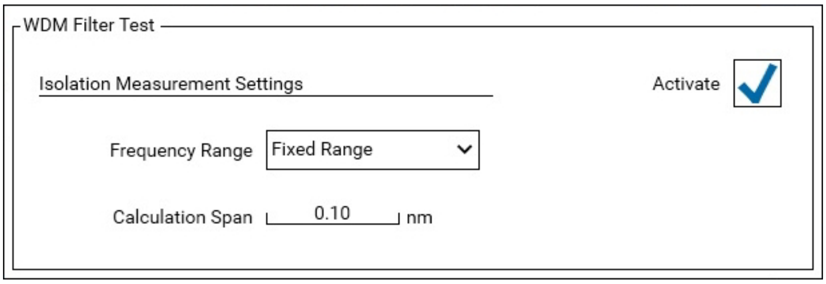
➤ *Analyzing WDM Filter Test Results* on page 196

Defining WDM Filter Test Parameters

The **WDM Filter Test** tool enables you to set the wanted channel window size for calculation of adjacent isolation, non-adjacent isolation, total crosstalk, ripple and slope.

To use the WDM Filter Test analysis tool:

1. In the **Analyze** menu, select the PCT WDM analysis mode.
2. In the **Analysis** pane, click the **WDM Filter Test** tool and modify the parameters using the instructions given in *To define the WDM Filter Test parameters:* on page 195 below.



3. Activate the analysis calculation for the next analysis run by selecting the **Activate** check box.

To define the WDM Filter Test parameters:

Calculation Settings

➤ **Frequency Range**

Method used to define the spectral range to use for the calculation of isolation, total crosstalk, ripple and slope of selected traces.

➤ **Fixed Range**

Sets the range to a fixed calculation span in nm or THz, depending on the unit setting. The range is centered on the grid wavelength/frequency defined by the **Channel Detection** tool (see *Analyzing Channel Detection Results* on page 171).

➤ **% Bandwidth 1**

Sets the range to a fraction of the bandwidth measured from the **Spectral Width 1** tool. The range is centered on the grid wavelength/frequency defined by the **Channel Detection** tool (see *Analyzing Channel Detection Results* on page 171).

- **% Channel spacing**

  Sets the range to a fraction of the grid channel spacing defined in the **Channel Detection** tool.

- **Calculation Span** (only if Frequency Range is set to **Fixed Range**)

  Fixed range centered on the central wavelength, (in nm or THz) over which calculations are done.

  Default value: 0.1 nm

- **% Bandwidth** (only if Frequency Range is set to **% Bandwidth 1**)

  Fraction (in %) of the bandwidth (measured from the **Spectral Width 1** tool) over which calculations are done.

  Default value: 50 %

- **% Channel** (only if Frequency Range is set to **% Channel spacing**)

  Fraction (in %) of the channel width over which calculations are done.

  Default value: 20 %

Analyzing WDM Filter Test Results

Analysis results are displayed below the graph, in the Analysis pane.

All WDM Filter Test results are calculated over the window defined using the *Frequency Range* parameter.

Result	Meaning
Slope (dB/nm or db/THz)	Linear fit slope calculated within the defined calculation range.
Ripple (dB)	Uniformity as the as the difference between IL min and IL max measured within the defined calculation range.
Adj. Iso. (dB)	Minimum (worst case) of the two isolation measurements performed on either side of the filter on the adjacent channels.
Non-adj. Iso. (dB)	Minimum (worst case) of the isolation measurements performed on either side of the filter on any channels except the adjacent channels
Total Xtalk (dB)	Cumulated isolation measurement performed on all channels on either side of the filter.

Setting Up Loss Measurement Analysis

The **Loss Measurement** analysis tool is only available in PCT analysis mode, for **Fiber** component type. The analysis settings cannot be modified.

The **Loss Measurement** tool allows you to get the average attenuation and the uniformity of a spectral trace obtained from a fiber-type passive component.

To use the Loss Measurement analysis tool:

1. In the **Analysis** pane, click the **Component Selector** tool and set the **Type** parameter to **Fiber**.
2. The **Loss Measurement** tool will automatically be calculated on the next analysis.

   The analysis settings cannot be modified.

   ➤ **Noise Suppression**: disabled

   ➤ **Offset**: 0 dB

   ➤ **Full Span**: activated

To analyze Loss Measurement results:

Analysis results are displayed below the graph, in the Analysis pane.

Result	Meaning
Average Loss	Measured fiber attenuation, in dB.
Uniformity	Difference between minimum and maximum loss within the analysis range, in dB.

Saving Analysis Results

You can save the analysis results in a *.csv file. You cannot load analysis results back to the system.

To save the analysis results:

1. In the **Subsystem** window, in the measurement control area, click the **Save** button.
2. Select the **Analysis Results (*.csv)** file type.
3. Select a location and type a name for the analysis result file.
4. Click the **Save** button.

11 Handling Files and User Data

The **File Explorer** window allows you to access the drives available from the CTP10:

➤ CTP10 internal drive (for details on data storage capacity, see *Technical Specifications* on page 3).

➤ USB drives connected to the CTP10 (for details on how to connected external storage devices, see *Connecting/Disconnecting USB Storage Devices* on page 199).

➤ Network drives connected to the CTP10 using the Ethernet port and added to the CTP10 file explorer (see *Adding/Removing a Network Drive* on page 200).

From this window, you can:

➤ Browse the available drives

➤ Display *.jpg and *.png images

➤ Open traces in *.tra format in a subsystem

➤ Open a subsystem (*.ctp10 file)

➤ Create, delete, copy/cut/paste and rename folders

➤ Copy/cut/paste, delete and rename files

➤ Connect/disconnect network drives

Connecting/Disconnecting USB Storage Devices

You can connect storage USB devices to the USB-A 2.0 and USB-A 3.0 ports located on the front and rear panels of the CTP10 (see *CTP10 Mainframe Overview* on page 7).

To connect USB storage devices:

Connect the USB storage device to one of the available USB ports (you do not need to restart the CTP10).

➤ The first time you connect a USB storage device, the driver is installed and can take some time (depending on the connected device).

➤ The icon appears at the left of the date and time and the device becomes available for loading or saving data.

To disconnect USB storage devices from the CTP10:

If you connect one or more USB storage device(s) to the CTP10, an icon appears in the task bar, at the left of the date and time.

This icon enables you to safely remove USB storage devices from the CTP10, as explained in the following procedure.

1. On the CTP10 screen, touch the icon located at the left of the date and time.

The list of all connected USB storage devices appears.

2. Click the **Safely remove...** menu corresponding to the device you want to disconnect.

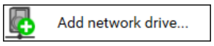
A confirmation message appears.

3. Remove the USB device from the CTP10.

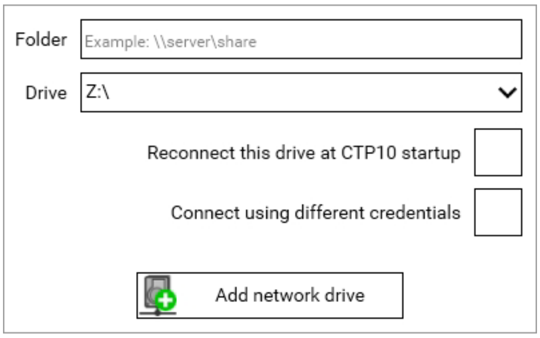
Adding/Removing a Network Drive

By default, the **File Explorer** window displays the content of the CTP10 internal drive. If the CTP10 is connected to a network through the Ethernet port, you can then map available network drives, as explained in this section.

To add a network drive:

1. Connect the Ethernet port of the CTP10 to the wanted network using an Ethernet cable.
2. In the task bar, click the button to open the **File Explorer** window.
3. Click the 

button to open the menu.



4. Enter the required values in the fields as described in the following table:

Parameter	Description
Folder	Click the field to enter the server folder pathname.
Drive	Select the wanted drive letter.
Reconnect this drive at CTP10 startup	➤ ☑: the mapped network drive will be available in the file explorer the next time you start the CTP10. ➤ ☐: the mapped network drive will not be available in the file explorer the next time you start the CTP10.
Connect using different credentials	➤ ☑: the previously entered credentials used for the connection to the folder (if any) won't be used. You will be prompted to enter login and password. ➤ ☐: the previously entered credentials used for the connection to the folder (if any) will be used to connect to the folder.

5. Click the **Add network drive** button.

   If the system requires credentials, a window prompts you to enter a login and password for the connection.

6. Enter your login (using the <*domain name*>\<*user name*> format), your password and click **OK**.

   When connected, the drive appears in the navigation pane.

To remove a network drive:

1. In the **File Explorer** window, click the Remove network drive... to open the menu.
2. In the **Network drive to remove** list, select the wanted network drive or **All network drives**.
3. Click the Remove selected network drive button.

   A confirmation window appears.
4. Click **Yes**.

To delete all saved credentials:

1. In the **File Explorer** window, click the Remove network drive... to open the menu.
2. In the **Network drive to remove** list, select the wanted network drive and click the Remove all saved credentials button.

   A confirmation window appears.
3. Click **Yes**.

   You will be prompted to enter credentials to connect to the mapped drives.

To retrieve a network drive:

If a previously mapped network drive is unavailable, the icon is displayed next to the drive name.

To try again to connect to the drive, click the drive name in the navigation pane.

Opening a File from the File Explorer

From the **File Explorer** window, you can see all files and folders of the connected network drives and you can open the following types of files:

➤ *.jpg and *.png images

➤ Traces in *.tra format

➤ Subsystem files (*.ctp10)

To open a file:

1. In the task bar, click the button to open the **File Explorer** window.
2. If you want to open a subsystem file (*.ctp10), stop the scanning process.
3. Double-click the file you want to open:

   ➤ *.jpg and *.png files are directly displayed in the **File Explorer** window.

   ➤ *.ctp10 files and trace files cannot be open outside a subsystem: they will be displayed in the subsystem.

Handling Folders and Files

The **File Explorer** windows enables you to copy/cut/paste, delete and rename folders and files from the available drives, and also to create new folders.

To handle files and folders:

1. In the task bar, click the button to open the **File Explorer** window.
2. Select the folder or file you want to handle and click the button corresponding to the action you want to perform, as explained in the following table.

   To select multiple files or folders simultaneously, you need to use a keyboard:

   - Ctrl + click on files/folders: to make multiple individual selections.
   - Shift + click on files/folders: to make a continuous selection.
   - Ctrl + a: to select all files/folders.

Button	Description
Up	Browses the folder one step up in the folder hierarchy.
New folder	Opens a window to enter the name of the new folder.
Rename	Opens a window to enter the new name of the selected folder or file.
Copy	Copies the selected folder or file.
Cut	Cuts the selected folder or file.
Paste	Pastes the selected folder or file.
Delete	Deletes the selected folder or file.
	Refreshes the content of the displayed folder.

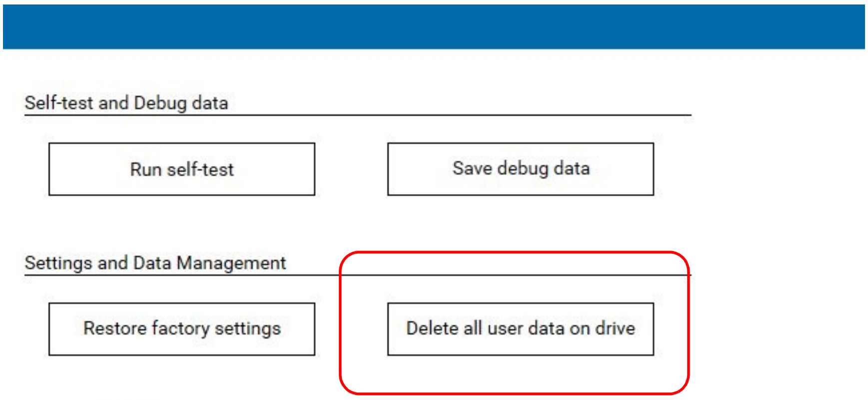
Deleting all User Data from the CTP10 Internal Drive

You can delete all data saved by a user on the internal CTP10 drive D:\. All user customized settings, parameters and traces displayed on screen will not be deleted.

To delete all user data from the CTP10 internal drive:

1. In the CTP10 task bar, click the  button to display the **Settings** window.

The **Settings and Data Management** area enables you to delete user data on drive.



2. Click the **Delete all user data on drive** button.

Restoring Factory Settings

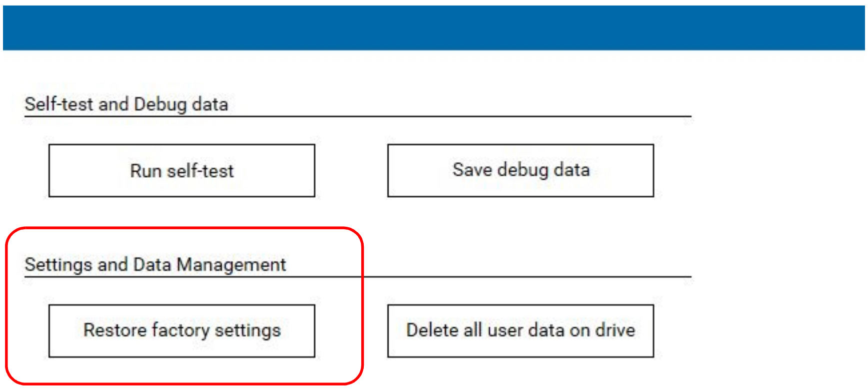
Restoring factory settings deletes all the user customized settings, lasers, subsystems and traces displayed on screen in the entire CTP10 system and restores the original default parameters.

This operation can take several minutes.

To restore factory settings:

1. In the CTP10 task bar, click the  button to display the **Settings** window.

The **Settings and Data Management** area enables you to restore the factory settings.



2. Click the **Restore factory settings** button and wait until the confirmation message appears. This operation takes several minutes.

12 Remotely Controlling the CTP10

You can remotely control the CTP10 by using the Ethernet port, the USB-B port or the GPIB port (optional) located on the rear panel (see *Rear panel* on page 9).

Maximum transfer rates are available in *Technical Specifications* on page 3.

This section explains how to connect the CTP10 to an external device such as PC for remote control and set the remote control parameters.

Setting the Communication Port

Setting the CTP10 Ethernet Port

You can remotely control the CTP10 in a private local area network (LAN) or through your company's network.

If you do not know how to configure this port or if the connection does not work, contact your company network administrator.

To directly control the CTP10 from a remote computer in a private LAN:

1. Make sure you have an Ethernet switch.
2. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Ethernet** area enables you to configure the Ethernet connection of the CTP10.
3. In the **Port** field, set the TCP destination port of the CTP10, to allow data transmission between the CTP10 and external equipments.

   Default value: 5025 (SCPI-RAW)
   In the **Settings** window, let the **Obtain an IP address automatically** check box selected.
4. Using two RJ45 cables, connect the Ethernet switch to your computer and to your CTP10 (this configuration defines your private LAN).
5. Click **Apply**.
6. Before starting to remotely control the CTP10 from your computer, wait for the IP address to refresh (the auto-IP process can take a few minutes).
   Once completed the IP address should start with 169.

To remotely control the CTP10 through your company network:

1. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Ethernet** area enables you to configure the Ethernet connection of the CTP10.
2. In the **Port** field, set the TCP destination port of the CTP10, to allow data transmission between the CTP10 and external equipments.

   Default value: 5025 (SCPI-RAW)

IMPORTANT

Make sure that the firewall of your computer allows communication on this port.

3. Connect an RJ45 cable from your company network to the CTP10 Ethernet port.

4. In the **Settings** window, set the IP address, subnet mask and gateway to identify your CTP10 (see *Connecting the CTP10 to your Company Network* on page 49).
5. Click **Apply** to validate the connection parameters.
6. On your computer, use the Ethernet parameters defined in the CTP10 Settings window to set the communication with your CTP10 in your application.

Setting the CTP10 USB-B Port

The USB-B port located on the rear panel enables you to directly control the CTP10 from a connected computer on which the appropriate USB driver is installed.

To remotely control the CTP10 through the USB-B port, you must install the EXFO USB driver on the computer from which you want to control the CTP10.

The EXFO USB driver is available on the USB key provided with the CTP10, or can be downloaded from the EXFO website. It runs on Windows 10 operating systems.

To install the EXFO USB driver on your computer:

1. Do one of the following:
   - Connect the CTP10 USB key to your computer.
   - From the EXFO website, download the CTP10 USB driver.
2. Unzip the CTP10 USB Driver to a temporary folder on your computer.
3. Connect your computer to the CTP10 by using a USB-A to USB-B cable.
4. On your computer, in the Windows Device Manager: under Other Devices, right-click **CTP10** and select **Update driver**.

   Windows prompts you to select a driver.
5. Browse you computer and select the CTP10 USB Driver folder; then follow the instructions displayed on screen to install the selected driver.

To set the USB parameters:

To be able to communicate via USB with the CTP10, configure the USB settings as follows:

- Baud rate: 115200
- Data bits: 8
- Stop bits: 1
- Parity: None

Setting the CTP10 GPIB Port

If you want to remotely control the CTP10 through the GPIB port (optional), you can modify the CTP10 GPIB address.

The default GPIB address is 10. You can set it between 0 and 30.

To set the CTP10 GPIB address:

1. In the CTP10 task bar, click the button to display the **Settings** window.

   The **GPIB** area enables you to configure the GPIB connection of the CTP10.
2. In the **Address** field, enter the wanted value to set the GPIB address of the CTP10.

Entering/Exiting the Remote Mode

The CTP10 enters the remote mode when it receives a command from an external controller. When the remote mode is activated, you cannot use the CTP10 GUI to control the CTP10.

EXFO provides a set of program examples in C#, LabVIEW and Python, to help you communicate with the CTP10. The examples are available on the USB key provided with the CTP10, or can be downloaded from the EXFO website.

In remote mode, the CTP10 GUI displays the **Local** mode button on the main screen.

To enter the remote mode:

1. Use the appropriate cable to connect the external controller to the CTP10:
   - Ethernet port: RJ45 cable
   - USB-B port: USB-A to USB-B cable.
   - GPIB port: IEEE 488 cable.
2. Make sure the port is properly configured for remote control:
   - For Ethernet: see *Setting the CTP10 Ethernet Port* on page 205.
   - For USB-B: see *Setting the CTP10 USB-B Port* on page 206.
   - For GPIB: see *Setting the CTP10 GPIB Port* on page 206.
3. Send a command from the remote controller. All available commands are described in *IEEE 488.2 and SCPI Command Reference* on page 247.

   When the CTP10 receives a command from an external controller, it enters the remote mode: the GUI is deactivated and the **Local** button appears on the main screen.

To exit the remote mode:

To get back to the local control of the CTP10, touch the **Local** button.

The GUI is now available and you can use it. The local operations performed will be taken into account when another remote command will be received by the CTP10.

Communication Principle

EXFO supplies commands that follow the guidelines determined by the SCPI consortium for your CTP10.

The present section gives you information to help you use the provided commands, to remotely control your instrument.

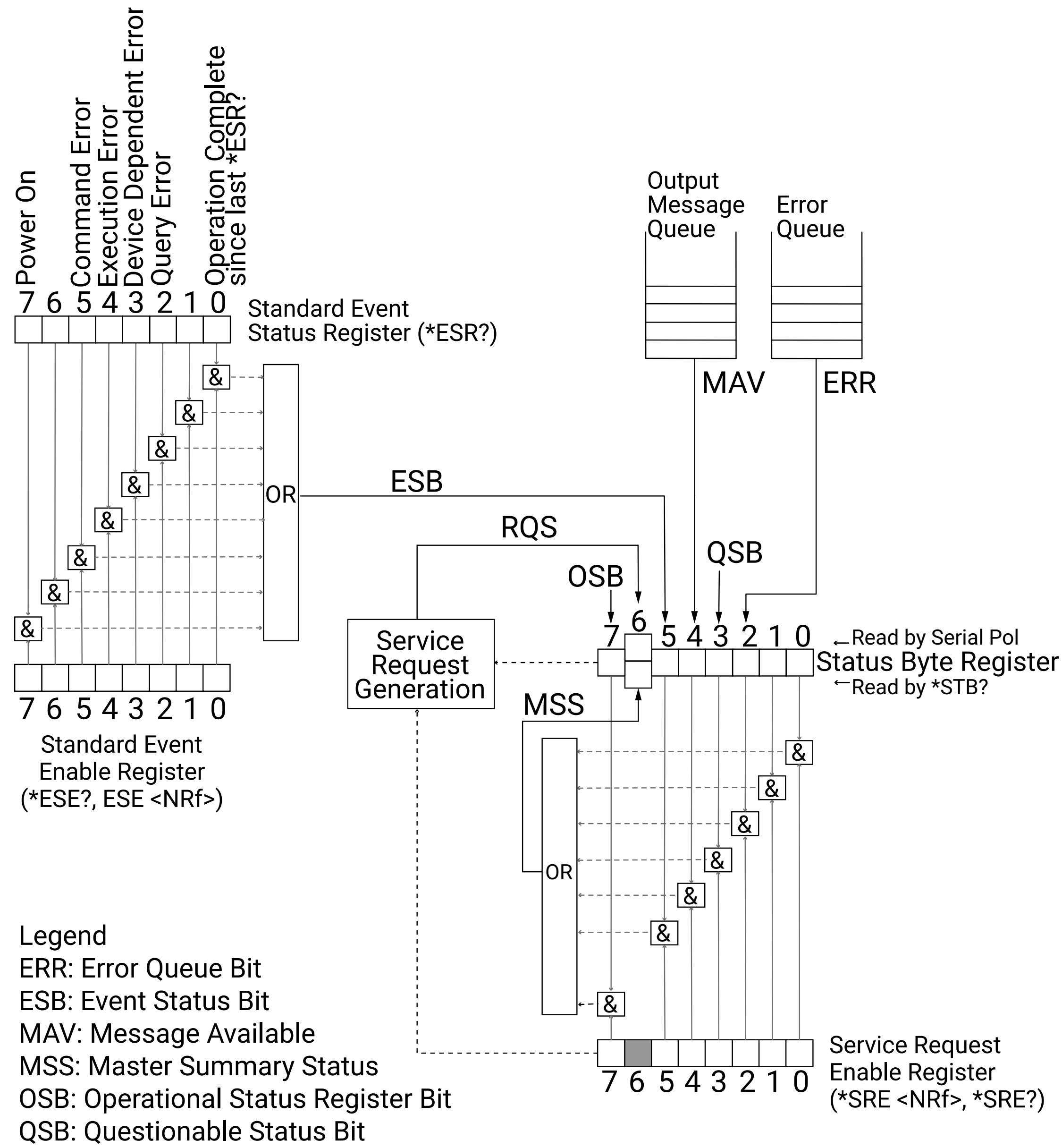
Standard Status Reporting

Each device has four status registers with a structure complying with the IEEE 488.2 standard. These registers allow the controller to monitor events and get useful information on the status of the devices it controls.

- Standard Event Status Register (ESR)
- Standard Event Status Enable Register (ESE)
- Status Byte Register (STB)
- Service Request Enable Register (SRE)

The following diagram is a useful aid in understanding the general commands and how a service request (SRQ) is generated.

Using a service request, a device notifies the controller that an event requiring special attention occurred. The controller will then find which device generated a SRQ (its RQS bit is set) and the causes of it.



Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)

The following table shows the content of the Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR):

Bit	Weight	Meaning
PON	128	Power ON Enable
N.U	64	Not used
CMD	32	CoMmanD Error Enable
EXE	16	Execution Error Enable

Bit	Weight	Meaning
DDE	8	Device Dependent Error Enable
QRY	4	QueRy Error Enable
N.U.	2	Not used
OPC	1	Operation Complete Enable

Service Request Enable Register (SRE)

The following table shows the content of the Service Request Enable Register (SRE):

Bit	Weight	Meaning
OSB	128	Operational Status Register Bit Enable
N.U.	64	Not used
ESB	32	Event Summary Bit Enable
MAV	16	Message AVailable Enable
QSB	8	Questionable Status Bit Enable
ERR	4	Error Message in Queue Enable
N.U.	2	Not used
N.U.	1	Not used

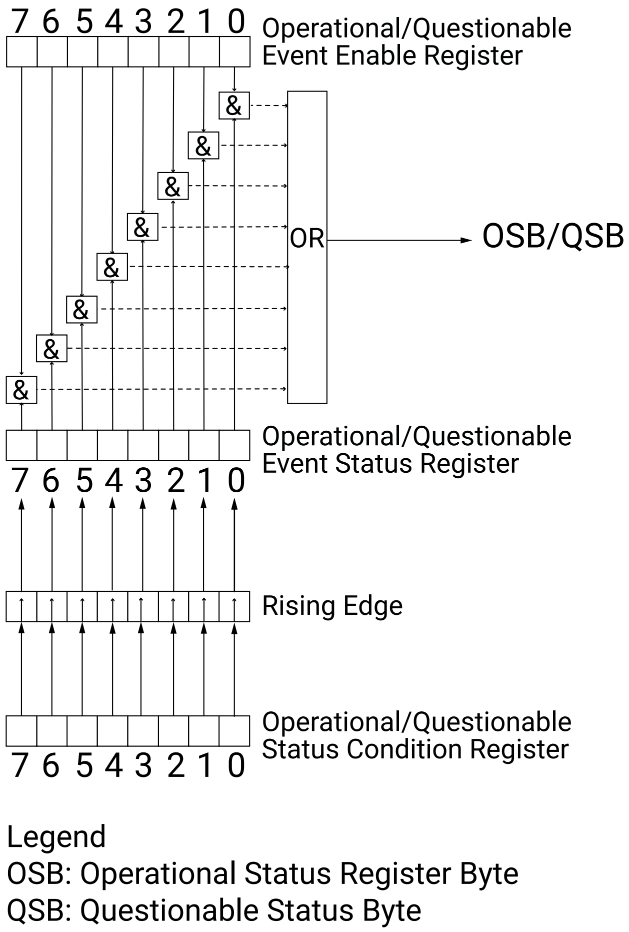
Status Byte Register (STB)

The following table shows the content of the Status Byte Register (STB):

Bit	Weight	Meaning
OSB	128	Not used
MSS	64	MaSter Summary Status
ESB	32	Event Status Byte Enable
MAV	16	Message AVailable Enable
QSB	8	Questionable Status Byte
ERR	4	Error Message in Queue
N.U.	2	Not used
N.U.	1	Not used

Operational / Questionable Status Reporting

The following diagram show the operational and questionable status reporting structure.



- A rising bit in the Operational/Questionable Status Condition Register is copied to the Operational/Questionable Event Status Register.
- A falling bit in the Operational/Questionable Status Condition Register has no effect.
- Read effects:
  - Reading the Operational/Questionable Status Condition Register has no effect on the registers.
  - Reading the Operational/Questionable Event Status Register clears the register.
- The summary of Operational/Questionable Event Status Register is available in STB.

The following table shows the content of the Operational Status Condition Register:

Bit	Weight	Meaning
15	32768	Not used.
14	16384	Not used.
13	8192	Not used.
12	4096	Loading/Saving.
11	2048	Laser referencing.
10	1024	Updating setup for Daisy chaining.
9	512	Updating setup from Controller CTP10.
8	256	Waiting for Controller CTP10.
7	128	Quick referencing.
6	64	Referencing.
5	32	Armed.
4	16	Aborting.
3	8	Analyzing.
2	4	Scanning.
1	2	Calibrating.
0 (LSB)	1	Zeroing.

The following table shows the content of the Questionable Status Condition Register:

Bit	Weight	Meaning
15	32768	Not used.
14	16384	Not used.
13	8192	Not used.
12	4096	Not used.
11	2048	Not used.
10	1024	Not used.
9	512	Not used.
8	256	Not used.
7	128	Not used.
6	64	Not used.
5	32	Not used.
4	16	Not used.
3	8	Not used.
2	4	Not used.
1	2	Not used.
0 (LSB)	1	Temperature error.

SCPI Command Structure and Syntax

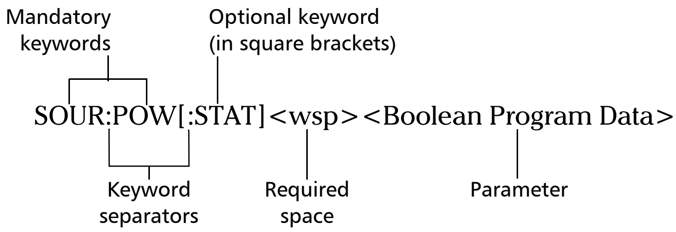
The information presented in this section provides an overview of SCPI programming. If you need detailed information, refer to:

- ➤ The International Institute of Electrical and Electronics Engineers. IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols and Common Commands For Use with ANSI/IEEE Std. 488.1-1987. New York, 1992.
- ➤ Standard Commands for Programmable Instruments (SCPI). Volume 1: Syntax and Style. Vers. 1999.0 May, U.S.A, 1999.

Syntax of Messages

The provided commands follow the guidelines determined by the Standard Commands for Programmable Instruments (SCPI) consortium. A program message consists of one or more commands (and/or queries) with their appropriate parameters.

For example, a program message could contain a command used to activate or deactivate a source. The corresponding command syntax would be:



When sending a message containing the previous command, you would actually type: SOUR:POW ON.

The following table shows elements that are commonly used in the commands or queries syntax.

Item	Meaning
[ ]	Enclose optional keywords or parameters. *Do not include square brackets in your program message.*
[1..n]	Indicates that the instrument provides multiple capabilities and that you have to specify which one you want to use. If you omit the value, the command will take effect on the first capability. Multiple capabilities can be found at any branch of the command tree (root, intermediate node or terminal node). Example: If the command is :SENSe*[1..n]*:CORRection:COLLect:ZERO and you want it to take effect on the second SENSe (sensor) capability of the instrument, you may send this: :SENSe*2*:CORRection:COLLect:ZERO. *Do not include square brackets in your program message; simply enter the number.*
<wsp>	Indicates that a space is required ("wsp" stands for "white space"). Corresponds to ASCII character codes (0 to 9 and 11 to 32, in decimal). *Do not include* "<wsp>" *in your program message; simply type a space.*

<table>
<tr><th>Item</th><th>Meaning</th></tr>
<tr><td>< ></td><td>Text appearing between angled brackets specifies the command parameter to be sent or the response you will receive from an instrument.
Do not include angled brackets in your program message.</td></tr>
<tr><td>|</td><td>Indicates that one, and only one, value must be selected from the available choices.
Example: If the list is 0|1, you can only select 0 or 1.
Do not include the pipe character in your program message.</td></tr>
<tr><td>{ }</td><td>Indicates that the enclosed parameters can appear 0 to n times when the command is used.
Do not include braces in your program message.</td></tr>
<tr><td>:</td><td>Mandatory to separate keywords. Can be omitted at the beginning of a program message. For example, you can use either :SYST:ERR or SYST:ERR.</td></tr>
<tr><td>;</td><td>➤ Mandatory to separate the different commands of a program message when more than one command is sent at a time.
If an error occurs in a command of a program message, the program does not stop: all the commands of the program message are still executed.
➤ Also used to separate responses when multiple queries were sent in a single program message.</td></tr>
<tr><td>,</td><td>➤ Mandatory to separate parameters in a command or a query.
➤ Also used to separate the various responses from a query.</td></tr>
</table>

There are also several conventions regarding command syntax:

- Spelling errors cancel the command or query.
- The unit of received numerical values is always the base unit.
- Numerical values are entered in decimal format.
  Result format for float is +1.12345678E-123.
- If a transmitted value has a higher precision than expected, the value is rounded off to the nearest accepted value.
- Commands and queries are not case-sensitive. You can type your program messages using either lower-case or upper-case letters.
- The command or query can be written using only the three- or four-letter shortcuts, only full words, or a combination of both.

  The example below shows the long and the short forms of a same query.

  :SYSTem:ERRor? — Long form

  :SYST:ERR?
  :syst:err?
  — Short form (small words represented by the capital letters of the long form)

- A message must end with the following characters: CR LF
- The CTP10 uses the ISO-8859-1:1998 (Latin-1, West Europe) character set. Make sure to configure your remote client with the same character set and to use supported characters while giving names to files or to other items.

Command Types

The CTP10 uses the following types of commands and queries:

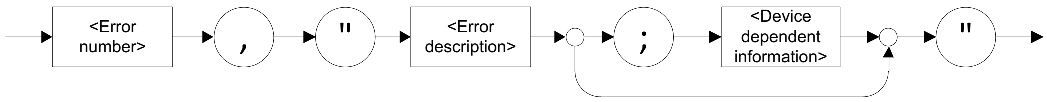
➤ Sequential: these commands are executed one after the other, in sequential order. A sequential command always finishes before the next command is implemented.

➤ Overlapped: these commands allow execution of overlapping commands while execution of the overlapped commands is still in progress.

➤ Overlapping: these commands can be executed during execution of an overlapped command.

Error Messages

System and device-specific errors are managed by your unit. The generic format for error messages is illustrated in the following figure.



As shown in the above figure, the message contains three parts:

➤ error number

➤ error description

➤ device-dependent information

Error messages ending in a negative number are SCPI-based errors. The list of possible error codes is available in *SCPI-Based Errors* on page 559.

IMPORTANT

If an error occurs in a command of a program message (several commands separated by ";"), the program does not stop: all the commands of the program message are executed. As a consequence, several errors may be present in the error queue. You need to check the error bit to make sure that the error queue is empty.

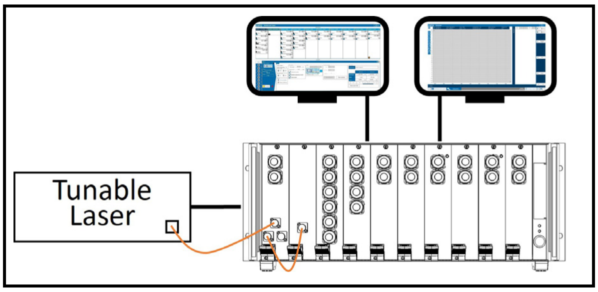
Writing Remote Control Code

Your unit offers a set of commands permitting remote control of the CTP10 You can find all the commands and queries supported by the CTP10 in *IEEE 488.2 and SCPI Command Reference* on page 247.

EXFO provides a set of program examples in C#, LabVIEW and Python, to help you communicate with the CTP10. The examples are available on the USB key provided with the CTP10, or can be downloaded from the EXFO website.

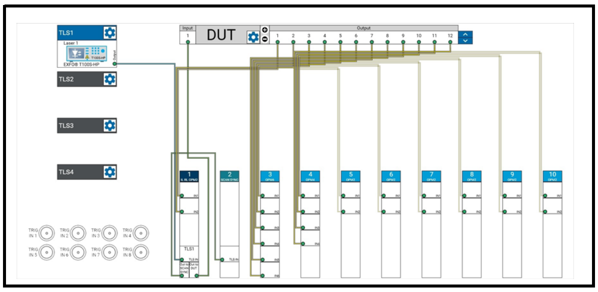
The following diagram gives an overview of the steps and necessary commands required to remotely perform a DUT characterization using the CTP10.

Create and connect your laser(s) to the CTP10



1. Connect laser(s) to CTP10:
   - *CTP:RLASer[1...10]:TYPE* on page 436.
   - *CTP:RLASer[1...10]:CPARameters* on page 429.
   - *CTP:RLASer[1...10]:LINK* on page 432.
2. Configure laser parameters with commands *:CTP:RLASer* (see *p. 426)*.

Configure your test setup

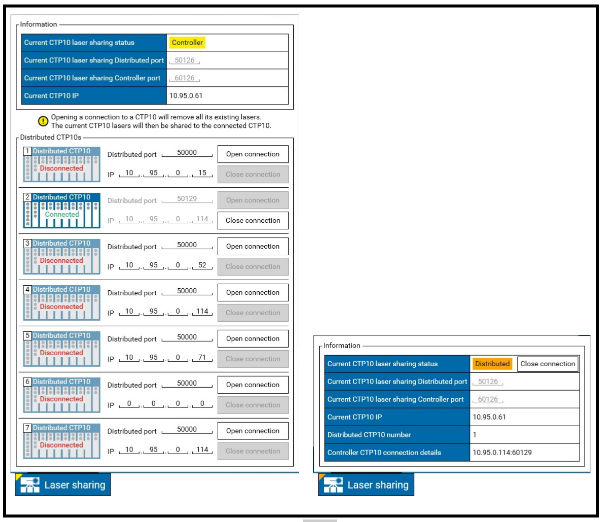


1. Define the location and connections of your modules and lasers in the subsystem, in the following order:
   - *:INITiate:TLS[1...4]:* (*see p. 458*).
   - *:INITiate:FBC:* (if any, *see p. 458*).
   - *INITiate:ILRL[:SENSe] (Deprecated)* (*see p. 465*).
   - *INITiate:ILRL:TLSin (Deprecated) (see p. 467)*.
   - *INITiate:SCANsync[:SENSe]* (*see p. 475*).
2. If needed, configure the Daisy chaining function and open the connection to another CTP10 for Daisy chaining:
   - *:CTP:DCHAINing commands* (see *p. 405*).
   - *CTP:DCHAINing:ID1:LINK* on page 407 (see *p. 407*).

   Once entered in the Daisy chaining mode, you must execute all commands and queries on the Primary CTP10. You cannot send any commands or queries to the Secondary CTP10, except: *STATus:OPERation[:EVENt]?* on page 516, *STATus:OPERation:CONDition?* on page 517, *SYSTem:ERRor[:NEXT]?* on page 525, *STATus:PRESet* on page 521, *CTP:DLOG* on page 411, *CTP:DCHAINing:STATus?* on page 411, *CTP:DCHAINing:CLOSe* on page 405, **RST* on page 253, **IDN?* on page 251.
3. Define the detectors connections to the DUT and the wanted traces:

   TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10] | [14...23]:ACTive on page 530.

Share the lasers with other CTP10s if needed (not compatible with Daisy chaining)



Before entering the laser sharing mode, make sure that the CTP10s that you want to set as Distributed are properly configured:

1. On CTP10s that you want to set as Distributed, define the location and connections of the modules:

➤ *INITiate:ILRL[:SENSe] (Deprecated)* on page 465

➤ *INITiate:SCANsync[:SENSe]* on page 475.

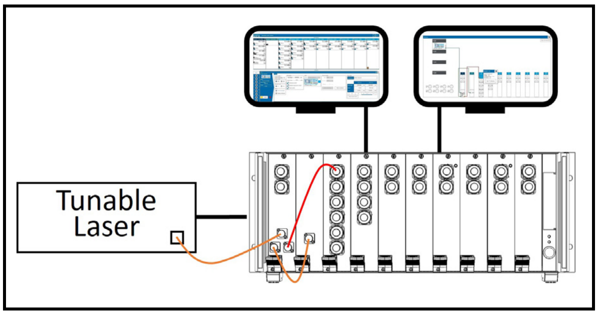
2. On CTP10s that you want to set as Distributed, define the detectors connections to the DUT and the wanted traces:

➤ *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]| [14...23]:ACTive* on page 530.

3. Enter the laser sharing mode by connecting the Controller CTP10 to Distributed CTP10s:

➤ :CTP:LSHARing (see *p. 420*).

Configure the scan parameters and reference the subsystem



1. Configure the scan parameters:

➤ *INITiate Commands and Queries* on page 458.

➤ *UNIT Commands and Queries* on page 556.

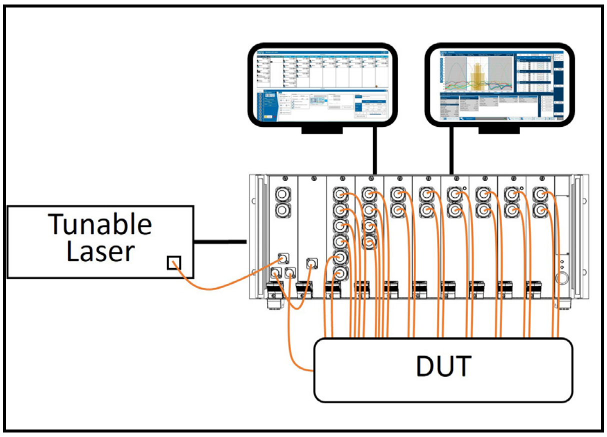
➤ *TRIGger Commands and Queries* on page 549.

2. Reference the subsystem:

➤ TF/BR or TF/PDL referencing (depending on the module used) on OPM detectors and wavelength referencing: *REFerence Commands and Queries* on page 509.

➤ Dark current referencing: *CTP:SENSe[1...20]:CHANnel[1...6]:ZEROing* on page 450.

Test your DUT



1. Perform scan:
   - ➤ *INITiate[:IMMediate]* on page 459.
2. Manage traces:
   - ➤ *TRACe Commands and Queries* on page 526.
3. Perform analysis:
   - ➤ *CALCulate Commands and Queries* on page 260.
   - ➤ *CALCulate:DATA Queries* on page 286.
4. Manage data files:
   - ➤ *MMEMory Commands and Queries* on page 500.

13 Maintenance

To help ensure long, trouble-free operation:

- Always keep the unit and its surroundings clean, free of dust and dirt, even if you are not using it.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store the unit at room temperature in a clean and dry area, free of dust and out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately, disconnect from any external power source and let the unit dry completely.

WARNING

The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

Updating the CTP10 System Version

The CTP10 embedded software package is a .pkg file available on the EXFO website. You can install it from a USB device or by directly copying it on the CTP10 internal drive (only available from software package version 2.1.x.x).

It contains the following components:

- The latest CTP10 GUI, mainframe FPGA and CTP10 application versions, which are automatically installed on your system during the updating process
- The CTP10 module version updates, that you can apply to your modules as explained in *Updating a Module System Version* on page 85

Updating the CTP10 system version does not affect referencing data nor user data. It takes less than 10 minutes.

IMPORTANT

- **If you want to update the CTP10 system version from your CTP10 internal drive, make sure your current version is version 2.1.x.x or above.**
- **Do not install a lower version of software that is not immediately preceding the version installed on your product.**

To update the CTP10 system version:

1. From the EXFO website (www.EXFO.com/en/exfo-apps), download the last CTP10 update package (compressed into a *.zip file).
2. Do one of the following:

➤ To install the update package from a USB device:

- Unzip the package to a USB device, so that the necessary *.pkg file is located at the USB device root.

- Connect the USB device to one of the available USB ports.

➤ To install the update package from the CTP10 internal drive (only available from software package version 2.1.x.x):

- Unzip the package to a network drive.

- From the CTP10 File Explorer, connect the CTP10 to the network drive where the package is located: see *Adding/Removing a Network Drive* on page 200.

- From the CTP10 File Explorer, copy the *.pkg file to root of the CTP10 internal drive D:\.

3. Turn off the CTP10 (see *Turning off the CTP10* on page 46).

4. On the front panel, press the ⏻ button to turn on the CTP10.

   The CTP10 automatically detects the *.pkg file on the USB device or on the CTP10 internal drive and starts the update wizard (if several *.pkg files are detected, the last copied on the USB device or on the internal drive is taken into account).

CAUTION

To avoid serious system problems:

➤ **Do not turn the CTP10 off during the update.**

➤ **Do not remove the USB device before the end of the upgrade process.**

5. Follow the instructions displayed on screen to update the system version.

   Once the update is finished, the CTP10 starts normally.

6. Open the **Modules and Lasers** window and if the icon appears on the module overview window, update the modules as explained in *Updating a Module System Version* on page 85.

7. If necessary, safely remove the USB device as explained in *Connecting/Disconnecting USB Storage Devices* on page 199.

Updating the Operating System Version

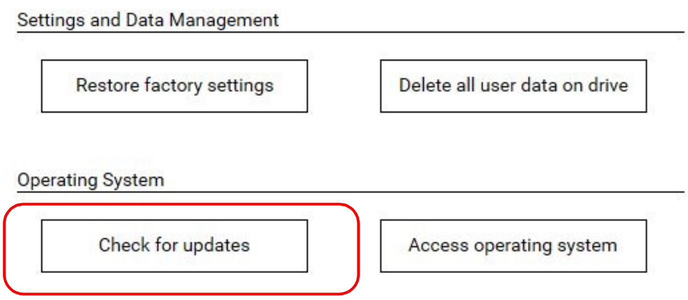
You should check for updates regularly to keep the CTP10 operating system version up to date for security reasons.

Updating the operating system may take a significant amount of time.

To update the operating system version:

1. Make sure that your CTP10 is connected to the Internet.
2. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
3. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Operating System** area enables you to update the operating system.



4. Click the **Check for updates** button.

   The CTP10 verifies if your system is up to date. This operation might take time. If updates are available, a message gives the list of available updates and prompts you to install them.
5. Click the **Download, install and restart** button to install the update(s).

   The CTP10 downloads and installs the updates, and then restarts automatically.
6. Once the CTP10 has restarted: in the **Settings** window, click the **Check for updates** button again to make sure that all updates have been installed.
   If all updates have not been installed, perform steps 1 to 5 again to install all the available updates.

Accessing the Operating System

You can access the CTP10 operating system with administrator's permissions to perform Windows-specific operations, such as installing an anti-virus program or activate the remote desktop (see *Activating Remote Desktop on the CTP10* on page 223).

CAUTION

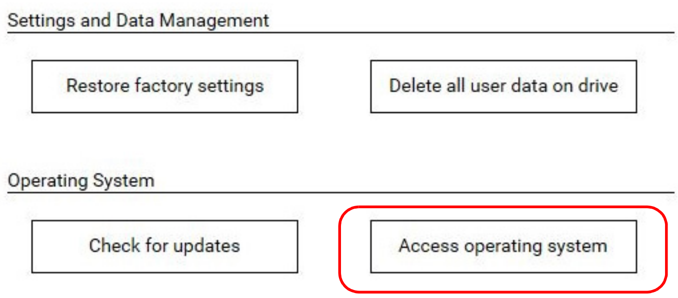
Do not perform modifications on the operating system that could affect the CTP10 performances or the proper functioning of the CTP10 application (such as partitioning, regional settings or application files).

Accessing the operating system closes the CTP10 application. To open it again, you must restart the system.

To access the operating system:

1. Turn on the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.
2. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Operating System** area enables you to update the operating system.



3. Click the **Access operating system** button.

   An information message appears.
4. Click the **OK** button to close the CTP10 application and access the operating system.

   The CTP10 application is closed and the operating system is available.
5. To open the CTP10 application again, restart the CTP10.

Activating Remote Desktop on the CTP10

To be able to remotely access the CTP10 using Remote Desktop, you must add a password to the CTP10 Windows session. As the CTP10 is configured to automatically logon, you must also add the password in the registry, as explained in the following procedure.

CAUTION

To be able to properly restart the CTP10 after password configuration, please carefully follow the procedure steps, especially concerning the configuration of password in the registry.

To activate the Remote Desktop on the CTP10 and set the automatic logon:

1. Access the operating system as explained in *Accessing the Operating System* on page 222.

2. Allow remote connections to the CTP10:

2a. In Windows **Control Panel\System and Security\System**, click **Remote Settings**.

2b. In the **Remote Desktop** area, select **Allow remote connections to this computer**. and click **OK**.

3. Add a password to the **CTP10**:

3a. Press **Ctrl+Alt+Del** and select **Change a password**.

3b. Leave the **Old password** field blank.

3c. Type the new password and confirm.

4. Configure the autologon with the new password (encrypted) in the registry:

4a. Download and open the Autologon.exe tool (https://docs.microsoft.com/en-us/sysinternals/downloads/autologon).

4b. In the Autologon window:
In the Username field, type CTP10.
In the Password field, type the password you have just added.
Click **Enable**.

The new password is updated in the registry and will be used for automatic logon.

5. Restart the CTP10.

The CTP10 starts and you are now able to access it via Remote Desktop.

Cleaning the CTP10

Cleaning the Cover of the CTP10

If the external cover of the CTP10 becomes dirty or dusty, clean it by following the instruction below.

CAUTION

Do not use chemically active or abrasive materials to clean the CTP10.

Material needed:

➤ Cleaning cloth

➤ Isopropyl alcohol

To clean the external cover of the CTP10:

1. Turn the CTP10 off (see *Turning off the CTP10* on page 46) and unplug the power supply cable from the wall socket.
2. Slightly damp the cloth with an isopropyl alcohol liquid and gently swipe dirt and dust on the external cover of the CTP10, without applying excessive force onto it.

Cleaning the Fan Grids

To ensure proper cooling of the CTP10 from the fan, the cooling fan grids located on the rear panel (see *Rear panel* on page 9) must not be dusty, you must clean it regularly.

CAUTION

Do not use a vacuum cleaner to clean the fan as this may apply excessive force to it and cause damage to the fan.

To clean the fan grids:

1. Turn the CTP10 off (see *Turning off the CTP10* on page 46) and unplug the power supply cable from the wall socket.
2. Using a duster or a slightly moist cloth, gently clean the external grid of the fan without pressing it.

Replacing the Air Filter

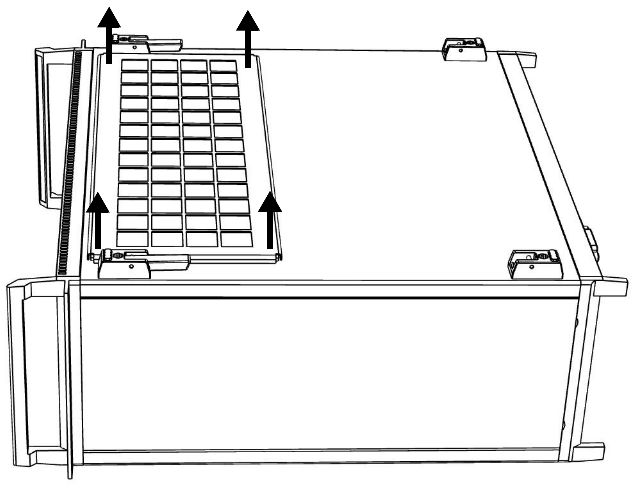
To ensure proper ventilation of the CTP10, the air input filter must not be too dusty, you must replace it as soon as you notice that dust accumulates on it.

The air filter is affixed with velcro tape to the bottom side of the instrument, you do not need to open the case to replace it.

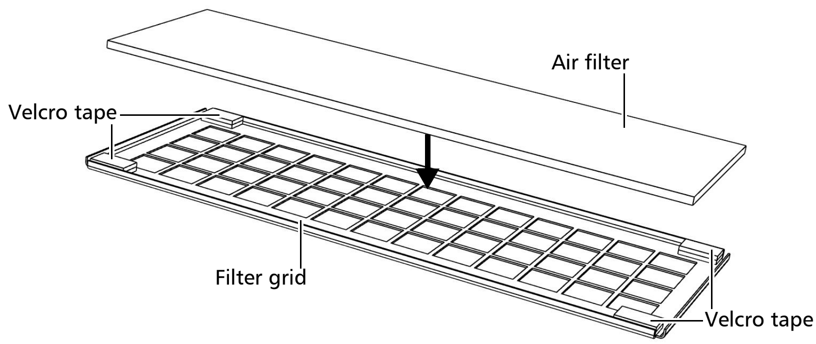
To replace the air filter:

1. Make sure you have a replacement filter: contact your EXFO sales representative.

2. Turn the CTP10 off (see *Turning off the CTP10* on page 46) and unplug the power supply cable from the wall socket.
3. Lift the instrument and flip it over gently on a stable soft surface to make visible the air filter.
4. Separate the filter grid from the instrument by pulling out each corner of the grid: it is fastened with velcro tape at the four corners of the filter grid.



5. Remove the dusty filter from the filter grid and replace it by the new one.



6. Fasten back the filter grid on the instrument.

Cleaning Optical Connectors

To ensure measurement accuracy and prevent loss of optical power, you must regularly verify that the optical connectors of the CTP10 modules are clean. Follow the cleaning instructions corresponding to the type of connector to clean:

➤ *Cleaning Detector Ports* on page 226

➤ *Cleaning TLS Input and Output Connectors* on page 228

Cleaning Detector Ports

To ensure measurement accuracy and prevent loss of optical power, you must regularly verify that the optical detectors located on the OPMx, IL RL OPM2 and IL PDL OPM2 modules are clean.

Handle optical fiber with appropriate care and preserve the integrity of optical connectors by keeping them free of contamination.

IMPORTANT

To reduce the need for cleaning, immediately replace protective caps on the optical connectors when not in use.

Before starting:

➤ Turn off all the laser sources connected to the CTP10 and make sure that no optical power is coming in or out the connector you want to clean.

➤ Make sure you have the following material:

IMPORTANT

Use only high quality cleaning supplies that are non-abrasive and leave no residue.

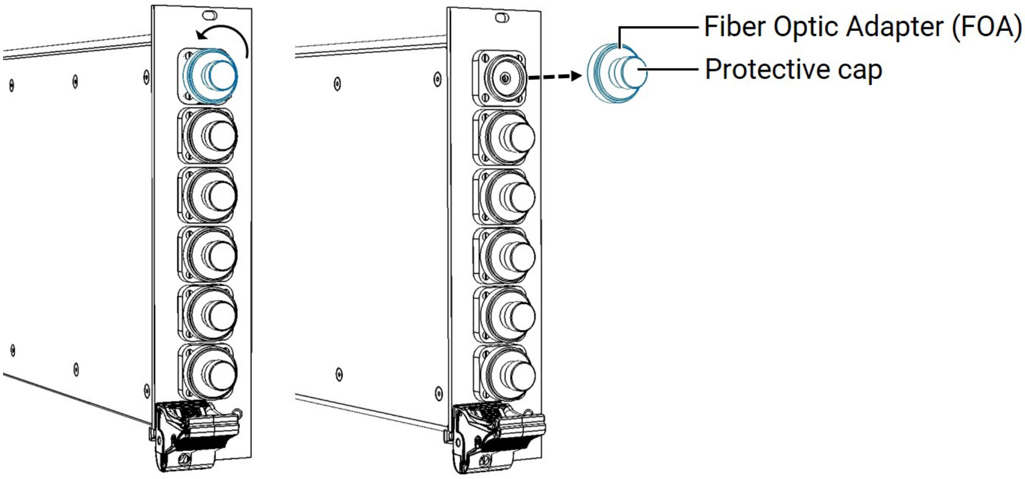
- ➤ Clean compressed air
- ➤ Fiberscope or similar

To clean the detector ports:

1. On the module front panel, use your fingers to unscrew the fiber optic adapter (FOA) with its protective cap from the connector.

CAUTION

Do not touch the black part inside the FOA.



2. Clean the connector as follows:

2a. Hold the can of compressed air upright and spray the can into the air to purge any propellant.

2b. Spray the clean compressed air on the detector to remove any loose particles or moisture.

3. Screw back the FOA on the connector.

Cleaning TLS Input and Output Connectors

To ensure measurement accuracy and prevent loss of optical power, you must regularly verify that the optical connectors located on the SCAN SYNC and IL RL OPM2 modules are clean.

Handle optical fiber with appropriate care and preserve the integrity of optical connectors by keeping them free of contamination.

IMPORTANT

To reduce the need for cleaning, immediately replace protective caps on the optical connectors when not in use.

Before starting:

- Turn off all the laser sources connected to the CTP10 and make sure that no optical power is coming in or out the connector you want to clean.
- Make sure you have the following material:

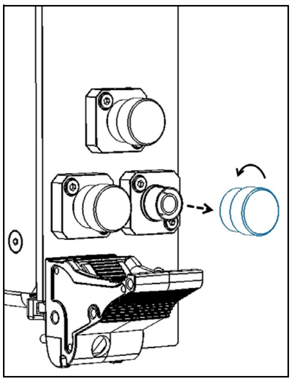
IMPORTANT

Use only high quality cleaning supplies that are non-abrasive and leave no residue.

  - Clean compressed air
  - Optical grade cleaning swabs
  - Connector cleaner pen
  - Fiberscope or similar if available

To clean the connectors:

1. On the module front panel, use your fingers to unscrew the metallic protective cap from the connector. Do not disassemble the bulkhead adapter.



2. Gently clean the connector end, with the following instructions:

   2a. Hold the can of compressed air upright and spray the can into the air to purge any propellant.

   2b. Spray the clean compressed air on the connector to remove any loose particles or moisture.

3. Clean the fiber end using your cleaning tool.

4. Spray the clean compressed air on the connector again to remove any loose particles or isopropyl alcohol.

5. Check that the connector is clean with a fiberscope (or similar).

Replacing Fuses

You must verify the power fuses in case you cannot turn on the CTP10.

WARNING

To avoid fire hazard, only use the correct fuse type, voltage and current ratings.

The unit contains two fuses (see *Technical Specifications* on page 3 for details). The fuse holder is located at the back of the unit, just above the power inlet.

Before starting:

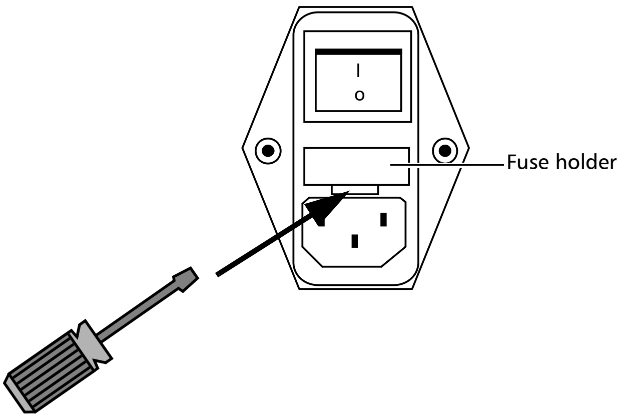
Make sure you have the following equipment:

➤ 1 small flat-head screwdriver.

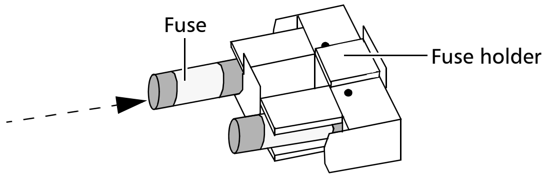
➤ 1 or 2 replacement fuses (for fuse type, see *Technical Specifications* on page 3).

To replace a fuse:

1. Turn off the unit and unplug the power cord.
2. Using a flat-head screwdriver as a lever, pull the fuse holder out of the unit.



3. Check and replace the fuses if necessary.
4. Insert the new fuse into the fuse holder.



5. Make sure the fuses are placed firmly in the holder prior to reinsertion.
6. Firmly push the fuse holder into place.

Carrying the CTP10

The two flexible handles located on both sides of the CTP10 allow you to carry it from one location to another, as explained in the following procedure.

The weight of the CTP10 mainframe and modules is detailed in *Technical Specifications* on page 3.

To carry the CTP10:

1. Turn the CTP10 off normally (see *Turning off the CTP10* on page 46).
2. Unplug the power cable from the wall socket outlet.
3. Disconnect all external devices, cables and patchcords connected to the CTP10 mainframe and modules.
4. Make sure that all the modules are secured in their slot by tightening the captive screws of all the modules
5. Carry the CTP10 with two hands using the two handles located on both side or the two rack-mounting handles.

Recalibrating the SCAN SYNC Module

EXFO manufacturing and service center calibrations are based on the ISO/IEC 17025 standard (*General Requirements for the Competence of Testing and Calibration Laboratories*). This standard states that calibration documents must not contain a calibration interval and that the user is responsible for determining the re-calibration date according to the actual use of the instrument.

The validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance, as well as the specific requirements for your application. All of these elements must be taken into consideration when determining the appropriate calibration validity period of this particular EXFO unit.

Until you collect the required empirical data to support your own calibration interval strategy, EXFO recommends that the next calibration (due) date of an instrument be established according to the following equation:

Next calibration date = Date of first usage + Recommended calibration period (1 year)

Note: You can use the date of first usage only if the product was stored in proper conditions (23 °C ± 5 °C (73,4 °F ± 9 °F)). If it is not the case or if you do not know the date of first usage, you can use the date at which you received the product, as long as the product was sourced from an official EXFO distribution channel.

Restriction:

Next calibration date ≤ calibration date on certificate + recommended calibration period (1 year) + maximum storage period (3 months)

Under normal use, the recommended calibration period for your CTP10 is: 1 year.

For newly delivered units, EXFO has determined that the maximum storage period for this product is up to 3 months.

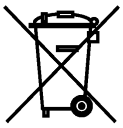
EXFO guarantees that proper storage at room temperature for up to the maximum storage period between calibration and shipment will not affect the performance of the test and measurement instruments and will not reduce the recommended validity period before requiring a new calibration.

To help you with calibration follow-up, EXFO provides a special calibration label that complies with the ISO/IEC 17025 standard and indicates the unit calibration date and provides space to indicate the due date.

To ensure that test and measurement instruments conform to the published specifications, calibration must be carried out at the relevant EXFO plant, or, depending on the product, at an EXFO service center, or at one of EXFO’s certified service centers. All calibrations are performed using standards traceable to national metrology institutes.

Note: You may have purchased a FlexCare plan that covers calibrations. See the Service and Repairs section of this user documentation for more information on how to contact the service centers and to see if your plan qualifies.

Recycling and Disposal



This symbol on the product means that you should recycle or dispose of your product (including electric and electronic accessories) properly, in accordance with local regulations. Do not dispose of it in ordinary garbage receptacles.

For complete recycling/disposal information, visit the EXFO Web site at www.exfo.com/recycle.

14 Troubleshooting

This section explains how to handle common problems that can occur with your instrument, and how to ask for support.

Solving Common Problems

The following table lists problems that can occur and their possible solution.

Trouble	Possible cause	Possible resolution
The CTP10 is stuck at "Initializing Hardware" or "Loading".	The CTP10 cannot load the user configuration.	See *Restoring Factory Settings at Startup* on page 235.
The GUI is frozen.	The system has encountered a problem.	See *Forcing the CTP10 to Shutdown & Restart* on page 236.
A part of the GUI window is not visible on screen.	Your screen resolution is too low for the CTP10 GUI.	See *Changing Your Screen Resolution* on page 236.
	The highest possible resolution of your screen is too low to display the CTP10 GUI.	Use a screen with a better resolution. The recommended screen resolution for the CTP10 GUI is given in *Technical Specifications* on page 3.
Temperature error on a module	Lack of ventilation in the CTP10 mainframe	➤ Make sure the location where the CTP10 is installed meets the environmental characteristics listed in *Electrical Safety Information* on page 27. ➤ Make sure the CTP10 is not located near a source of heat. ➤ Make sure there is sufficient clearance below and at the rear of the CTP10 in the place where it is installed.
	Dusty input or output air filters	➤ See *Replacing the Air Filter* on page 224. ➤ See *Cleaning the Fan Grids* on page 224.
	Defective fans	➤ CTP10 turned on: remove the module and verify by looking into the empty slot that the internal fan of the slot rotates properly. ➤ CTP10 turned on: verify that the two cooling fans located on the rear panel rotate properly. If one fan does not rotate properly, contact the EXFO support: see *Contacting the Technical Support Group* on page 241.

Trouble	Possible cause	Possible resolution
Impossible to open connection to a laser through GPIB.	The GPIB-USB adapter has been disconnected while a GPIB connection was open with a laser.	Connect the GPIB-USB adapter and restart the CTP10.
A module firmware update has been suddenly interrupted (power failure or abrupt shutdown of the CTP10); at startup, the module displays an error in the **Modules & Lasers** window.	The module has not been fully initialized at startup.	Remove the module from the CTP10 mainframe (see *Removing a Module From the CTP10 Mainframe* on page 37) and insert it again (see *Installing a Module Into the CTP10 Mainframe* on page 35).
After restart, the CTP10 displays a black screen.	A password has been added to the CTP10 session, but the autologon has not been properly configured, which prevents the CTP10 to autologon properly.	If you have allowed remote connections to the CTP10, connect to the CTP10 via Remote Desktop and follow step 4 of the following procedure: *Activating Remote Desktop on the CTP10* on page 223
A reference is required whereas only PCM module detectors are used.	A BR trace is activated in the **Trace setup** menu.	Remove all BR, TF traces from the **Trace setup** menu. Keep only I traces.
The CTP10 is scanning but the progress is stuck at x %, and the scan never ends.	➤ You are performing High res. sampling scan, and there is no BNC cable between the TLS and the CTP10. ➤ You are in Daisy chaining mode and the trigger link configured in the **Subsystem setup** menu is not similar to the BNC cable physically connected between the Primary CTP10 and the Secondary CTP10.	➤ Connect a BNC cable between the **Trig out** (or **Sync.**, depending on the laser model) port of the TLS to the **TRIG IN** port of the CTP10 that you have configured in the **Subsystem setup** menu. ➤ Connect a BNC cable between a **TRIG OUT** port of the Primary CTP10 to a **TRIG IN** port on the Secondary, and make sure the same ports are linked in the **Secondary CTP10** tab of the **Subsystem setup** menu.
In Laser Sharing, a Distributed CTP10 does not scan simultaneously with the Controller CTP10: it stops scanning to wait for the Controller in the middle of a scan (multi-lasers or 4-sweep scan).	You are using more detectors and/or traces on the Distributed than on the Controller CTP10: the Distributed takes more time to process the traces than the Controller so it is too late for the next sweep and cannot scan simultaneously with the Controller.	➤ Use more detectors and/or traces on the Controller CTP10 than on the Distributed CTP10. ➤ Disconnect the Distributed from the Controller and connect it again. ➤ Make sure that all CTP10 are part of a dedicated network, or a VLAN.

Restoring Factory Settings at Startup

If the CTP10 stays stuck at initialization time during startup, it may be due to the user configuration that cannot be retrieved. In this case, follow the instructions below to restore the factory settings at startup time (the system and module versions won't be modified).

To restore default settings at startup:

1. If the CTP10 is indefinitely "Initializing hardware" or "Loading" at startup time, stop the system by pressing the On/Off button during 4 seconds.
2. Connect a keyboard to one of the USB ports of the CTP10.
3. Press the On/Off button to turn on the CTP10 and wait for the white EXFO logo to appear on screen.
4. As soon as the white EXFO logo disappears from screen, press the **Delete** key on the keyboard and hold it down until the **Restore Factory Settings** window appears on screen.
5. Release the **Delete** key and click **Yes**.
6. Accept the license agreement and wait until the startup procedure is completed and the **Modules and Lasers** window appear on screen.

   The CTP10 is started with the default settings, the user customized settings has been deleted.

Forcing the CTP10 to Shutdown & Restart

In case of system crash and frozen screen, you can abruptly turn the CTP10 off as explained in the following procedure.

CAUTION

Do not stop the CTP10 with this procedure if you can turn it off normally as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.

To force the CTP10 to shutdown and restart:

1. If the touchscreen is frozen: connect a mouse to one of the USB ports and try to shutdown the CTP10 as explained in *Turning off the CTP10* on page 46.

   If this does not work, follow the rest of these instructions.

2. Press the On/Off button during 4 seconds.

   The system abruptly stops.

3. On the rear panel, set the power switch to **O**.

4. Wait 10 seconds and set the power switch back to **I**.

5. Restart the CTP10 as explained in *Turning on the CTP10 and Accessing the GUI* on page 44.

   After an abrupt shutdown and restart, the subsystem that was running when the system crashed is not retrieved. The loaded subsystem is the one that was up and running at the last proper shutdown (as explained in *Turning on the CTP10 and Accessing the GUI* on page 44).

Changing Your Screen Resolution

In case a part of the GUI window is not visible on screen, it may be due to the screen resolution setting, which is not adapted to the CTP10 GUI.

To modify the screen resolution:

1. In the CTP10 task bar, click the button to display the **Settings** window.

   The **Display** area enables you to set the screen resolution.

2. In the **Screen 1 resolution** or **Screen 2 resolution** list (depending on the affected screen), modify your screen resolution to a higher resolution setting.

Abruptly Turning off the CTP10 (Emergency Shutdown)

In case of emergency (presence of smoke flame or any immediate hazard), you can abruptly turn the CTP10 off as explained in the following procedure.

CAUTION

Do not stop the CTP10 with this procedure if you can turn it off normally as explained in *Turning off the CTP10* on page 46.

To abruptly turn off the CTP10:

Unplug the CTP10 by pulling the power cable off the CTP10 power cable connector on the rear panel (see *Rear panel* on page 9).

Using Assistance Tools

The CTP10 provides tools for remote or self assistance, as explained in the following sections:

➤ *Sending Debug Data to EXFO Support Service* on page 238

➤ *Performing a Self-test* on page 238

➤ *Displaying the List of Errors and Warnings* on page 239

Sending Debug Data to EXFO Support Service

Saving debug data and sending it to the EXFO customer support service can be useful for remote assistance.

To save and send debug data:

1. In the CTP10 task bar, click the ⚙ button to display the **Settings** window.
2. In the **Self-test and Debug data** area, click the **Save Debug Data** button.
3. Enter a name for the *.dbgexfo file and save it on the wanted location.
4. Send the saved file to the EXFO customer support service (for contact details, see *Contacting the Technical Support Group* on page 241).

Performing a Self-test

Performing a self-test enables you to detect possible errors on the system or on a CTP10 module, and may be used for remote assistance from the EXFO customer support service.

To perform a self-test on the CTP10 mainframe:

1. In the CTP10 task bar, click the ⚙ button to display the **Settings** window.
2. In the **Self-test and Debug data** area, click the **Run self-test** button and wait for its execution.

   The result of the test is displayed on screen.

To perform a self-test on a CTP10 module:

1. In the **Modules and Lasers** window, click the wanted module.
2. In the module **Information** area, click the **Run self-test** button.

   The result of the test is displayed on screen. If an error is detected, the module becomes unavailable and displays an error.

Displaying the List of Errors and Warnings

The following procedure explains how to display the last main errors and warnings that occurred on the CTP10. Only errors/warnings of the following types are displayed:

- File loading (excluding traces) and file saving errors/warnings
- Platform communication errors/warnings
- Module communication errors/warnings
- Auto-test errors/warnings
- Scanning errors/warnings
- Module configuration errors/warnings
- Module upgrade errors/warnings

To display the last error/warning messages:

In the CTP10 task bar, click the button.

The last 100 errors or warnings that occurred are displayed in order of appearance, with their corresponding date and time.

To clear the list of error/warning messages:

1. In the CTP10 task bar, click the button.
2. At the bottom of the list, click the **Clear error list** button.

   If the red Error LED was lit, it immediately turns off.

Viewing System Information

You can see information about your product, such as the serial number, options, version numbers, license agreement and contact information at all times.

To view product information:

1. In the task bar, click the ? button and select **About**.
2. Do one of the following:
   - To display contact information, click the **Technical Support** tab
   - To display product information, click the **System Information** tab
3. To see the license agreements, click the **View License Agreement** button.
4. To go back to the About window, click again the **View License Agreement** button.
5. Click the **OK** button to exit.

Displaying the User Documentation

You can access the user guide at all times from your unit. Multi-touch screen gestures are available to zoom in or out on the help pages. If a keyboard is connected, you can also use it to zoom in or out and browse the help pages.

The user guide is also available in PDF format on the USB key delivered with the instrument and from the EXFO website:
EXFO.com/en/resources/

To open the user documentation from the GUI:

In the task bar, click the ? button and select **Help**.

The user guide appears in the main window.

To zoom in/out:

➤ To zoom in/out using multi-touch screen gestures: pinch two fingers together or move them apart.

➤ To zoom in/out using a keyboard (and mouse):

Press **Ctrl** and use the mouse scroll wheel.

OR

Press **Ctrl + +** / **Ctrl + -**

➤ To reset page zoom, press **Ctrl + 0**

To browse the help pages using keyboard commands:

➤ To go back, press **Shift + Back** key.

➤ To go forward, press the **Back** key.

➤ To reload the help pages, press **F5**.

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 8:00 a.m. to 7:00 p.m. (Eastern Time in North America).

Technical Support Group
400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: 1 418 683-5498
Fax: 1 418 683-9224
support@exfo.com

For detailed information about technical support, and for a list of other worldwide locations, visit the EXFO Web site at www.exfo.com.

If you have comments or suggestions about this user documentation, you can send them to customer.feedback.manual@exfo.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.

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 unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

For instructions on returning the CTP10, please contact EXFO (see *Contacting the Technical Support Group* on page 241).

To package a CTP10 module for shipment:

1. On the module front panel, unscrew all the FOA with their protective cap from the connectors and pack them in a protective plastic bag.
2. Screw a dust cap (originally provided with the module) on all the connectors.
3. Make sure that the extractor handle is in upright position.
4. Place the module in its original packaging with all the FOA.
5. Close the box.

15 Warranty

General Information

EXFO Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of 1 year from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product, as well as verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.

IMPORTANT

The warranty can become null and void if:

- **unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**
- **warranty sticker has been removed.**
- **case screws, other than those specified in this guide, have been removed.**
- **case has been opened, other than as explained in this guide.**
- **unit serial number has been altered, erased, or removed.**
- **unit has been misused, neglected, or damaged by accident.**

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

Gray Market and Gray Market Products

Gray market is a market where products are traded through distribution channels that are legal but remain unofficial, unauthorized, or unintended by the original manufacturer. Intermediaries using such channels to distribute products are considered to be part of the gray market (hereafter unauthorized intermediary).

EXFO considers that a product originates from the gray market (hereafter gray market product) in the following situations:

A product is sold by an unauthorized intermediary.

A product is designed and destined for a particular market and sold on a second market.

A product is resold, despite being reported lost or stolen.

When products are purchased on the gray market, rather than through an authorized EXFO distribution channel, EXFO is unable to guarantee the source and quality of those products nor the local safety regulations and certifications (CE, UL, etc.).

EXFO will not honor warranty, install, maintain, repair, calibrate, provide technical support nor make any support contracts available for gray market products.

For complete information, refer to EXFO's policy regarding gray market products at www.exfo.com/en/how-to-buy/sales-terms-conditions/gray-market/

Liability

EXFO 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.

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

Exclusions

EXFO 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 EXFO 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 EXFO.

IMPORTANT

In the case of products equipped with optical connectors, EXFO will charge a fee for replacing connectors that were damaged due to misuse or bad cleaning.

Certification

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

Service and Repairs

EXFO commits to providing product service and repair for five years following the date of purchase.

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 246). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.
3. If possible, back up your data before sending the unit for repair.
4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

Note: A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications.

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, you will be invoiced for the cost appearing on this report. EXFO will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 246).

EXFO Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center

400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	support@exfo.com

EXFO Europe Service Center

Winchester House, School Lane	Tel.: +44 2380 246800
Chandlers Ford, Hampshire S053 4DG	Fax: +44 2380 246801
ENGLAND	support.europe@exfo.com

EXFO Telecom Equipment (Shenzhen) Ltd.

3rd Floor, Building C,	Tel: +86 (755) 2955 3100
FuNing Hi-Tech Industrial Park, No. 71-3,	Fax: +86 (755) 2955 3101
Xintian Avenue,	support.asia@exfo.com
Fuhai, Bao'An District,	
Shenzhen, China, 518103	

To view EXFO's network of partner-operated Certified Service Centers nearest you, please consult EXFO's corporate website for the complete list of service partners:
http://www.exfo.com/support/services/instrument-services/exfo-service-centers.

A IEEE 488.2 and SCPI Command Reference

This section presents detailed information about the command and queries supplied with your CTP10. For more details on CTP10 remote control parameters and procedures, see *Remotely Controlling the CTP10* on page 205.

IEEE 488.2 Commands

Quick Reference

The CTP10 recognizes the required commands identified in IEEE 488.2. The table below summarizes these commands. These commands are fully explained on the following pages.

Command	Function	Section
*CLS	Clear status command	**CLS* on page 248
*ESE	Standard event status enable command	**ESE* on page 248
*ESE?	Standard event status enable query	**ESE?* on page 249
*ESR?	Standard event status register query	**ESR?* on page 250
*IDN?	Identification query	**IDN?* on page 251
*OPC	Operation complete command	**OPC* on page 252
*OPC?	Operation complete query	**OPC?* on page 252
*RST	Reset command	**RST* on page 253
*SRE	Service request enable command	**SRE* on page 254
*SRE?	Service request enable query	**SRE?* on page 254
*STB?	Read status byte query	**STB?* on page 255
*TST?	Self-test query	**TST?* on page 256
*WAI	Wait for pending operations to be completed	**WAI* on page 256

IEEE 488.2 Required Commands

*CLS

Description	The *CLS command clears the Standard Event Status Register, the Status Byte Register and the Error Queue.
Type	Overlapping, no query.
Syntax	*CLS
Parameter(s)	None.

*ESE

Description	The *ESE command sets the Standard Event Status Enable Register bits, as defined in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209. This register contains a mask value for the bits to be enabled in the Standard Event Status Register.
Type	Overlapping.
Syntax	*ESE<wsp><register value>
Parameter(s)	*register value:* The <register value>, expressed in base 2 (binary), represents the bit values of the Standard Event Status Enable Register, in the range of 0 through 255. See the content of this register in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209. A value of 1 in the Enable Register enables the corresponding bit in the Status Register, a value of 0 disables the bit.
Example(s)	*ESE 25 where 25 = (bit EXE, bit DDE and bit OPC) *ESE 0 clears the content of the Standard Event Status Enable register
See Also	*ESE? *ESR?

*ESE?

Description	The *ESE? query returns the current contents of the Standard Event Status Enable Register, as defined in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209.
Type	Overlapping.
Syntax	*ESE?
Parameter(s)	None.
Response Syntax	<register value>
Response(s)	*register value:* The <register value> value expressed in base 2 (binary) represents the bit values of the Standard Event Status Enable register. The <register value> ranges from 0 through 255. See the content of this register in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209.
Example(s)	*ESE? returns 133 where 133 = (bit PON, bit QYE and bit OPC)
See Also	*ESE *ESR?

*ESR?

Description	The *ESR? query returns the current contents of the Standard Event Status Register, as defined in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209. Reading the Standard Event Status Register clears it.
Type	Overlapping, query only.
Syntax	*ESR?
Parameter(s)	None.
Response Syntax	<register value>
Response(s)	*register value:* The <register value> value expressed in base 2 (binary) represents the bit values of the Standard Event Status register. The <register value> ranges from 0 through 255. See the content of this register in *Standard Event Status Enable Register (ESE) and Standard Event Status Register (ESR)* on page 209.
Example(s)	*ESR? returns 33 where 33 = (bit CME and bit OPC)
See Also	*ESE *ESE?

*IDN?

Description	The *IDN? query returns the unique identification of the device over the system interface.
Type	Overlapping, query only.
Syntax	*IDN?
Parameter(s)	None.
Response Syntax	<Identification>
Response(s)	*Identification:* The response is organized into four fields separated by commas. The field definitions are as follows: Field 1 (Manufacturer): EXFO Field 2 (Model): Instrument model Field 3 (Serial number): ASCII character (0 if not available) Field 4 (Firmware level): ASCII character (0 if not available) ASCII character 0 represents a single ASCII-encoded byte with a value of 30 (48 decimal). The presence of data in all fields is mandatory. If either field 3 or 4 is not available, the ASCII character 0 shall be returned for that field. A field may contain any 7-bit ASCII-encoded bytes in the range of 20 through 7E (32 through 126 decimal) except commas (2C, 44 decimal) and semicolons (3B, 59 decimal).
Example(s)	*IDN? returns EXFO,CTP10,EO182110146,1.0.0
Notes	The overall length of the *IDN? response is less than or equal to 72 characters.

*OPC

Description	The *OPC command makes synchronization between the instrument and an external controller possible: it causes the instrument to set bit 0 (Operation Complete) in the Standard Event Status Register to the TRUE (logic 1) state when the instrument completes all pending operations. Detection of the Operation Complete message can be accomplished by continuous polling of the Standard Event Status Register using the *ESR? common query command. However, using a service request eliminates the need to poll the Standard Event Status Register thereby freeing the controller to do other useful work.
Type	Overlapping.
Syntax	*OPC
Parameter(s)	None.
See Also	*OPC? *WAI

*OPC?

Description	The *OPC? query makes possible the synchronization between the instrument and an external controller by reading the Output Queue or by waiting for a service request on the Message Available (MAV) bit in the Status Byte Register. The *OPC? query causes the instrument to place an ASCII character, 1, into its Output Queue when the device completes all pending operations. A consequence of this action is that the MAV bit in the Status Byte Register is set to state 1.
Type	Overlapping.
Syntax	*OPC?
Parameter(s)	None.
Response Syntax	<Acknowledge>
Response(s)	*Acknowledge:* The <Acknowledge> response is a single ASCII-encoded byte corresponding to 1. The receipt of an <Acknowledge> response indicates that all pending selected device operations have been completed.
Example(s)	*OPC? returns 1
See Also	*OPC *WAI

*RST

Description	The *RST command performs a reset of the instrument. The command sets the instrument settings to default values (user customized settings, lasers, subsystems and traces). It restores the original default parameters. It also clear the error queue, status byte and event register. This operation can take several minutes: to know if the reset operation is completed, use the *RST?* query (*RST?* on page 259). The command does not affect the following: ➤ the state and address of the communication interfaces of the device ➤ the calibration data ➤ the module settings
Type	Overlapping.
Syntax	*RST
Parameter(s)	None.

*SRE

Description

The *SRE command sets the Service Request Enable Register bits, as defined in *Service Request Enable Register (SRE)* on page 210

This register contains a mask value to enable the bits in the Status Byte Register.

Type

Overlapping.

Syntax

*SRE<wsp><register value>

Parameter(s)

register value:

The <register value>, expressed in base 2 (binary), represents the bit values of the Service Request Enable Register.

The <register value> value ranges from 0 through 255.

See the content of this register in *Service Request Enable Register (SRE)* on page 210.

A bit value of zero shall indicate a disabled condition.

Example(s)

*SRE 52
where 52 = (bit ESB, bit MAV and bit ERR)

See Also

*SRE?
*STB?

*SRE?

Description

The *SRE? query returns the current content of the Service Request Enable Register.

See the content of this register in *Service Request Enable Register (SRE)* on page 210.

Type

Overlapping.

Syntax

*SRE?

Parameter(s)

None.

Response Syntax

<register value>

Response(s)

register value:

The <register value> represents the current bit values of the Service Request Enable Register.

The <register value> ranges from 0 through 255.

Example(s)

*SRE returns 32 (bit ESB)

See Also

*SRE
*STB?

*STB?

Description	The *STB? query returns the status byte and Master Summary Status bit, as defined in *Status Byte Register (STB)* on page 210.
Type	Overlapping, query only.
Syntax	*STB?
Parameter(s)	None.
Response Syntax	<register value>
Response(s)	*register value:* The <register value> value, expressed in base 2 (binary) represents the bit values of the Status Byte Register. The <register value> ranges from 0 through 255. See the content of this register in *Status Byte Register (STB)* on page 210.
Example(s)	*STB? returns 68 where 68 = (bit MSS and bit ERR)
See Also	*SRE *SRE?

*TST?

Description	The *TST? query causes an internal system self-test and places a response into the output queue indicating whether or not the device completed the self-test without any detected errors. Upon successful completion of *TST?, the device settings is restored to their values prior to the *TST?.
Type	Sequential, query only.
Syntax	*TST?
Parameter(s)	None.
Response Syntax	<result>

Response(s)	*result:*
	The <result> value ranges from -32767 through +32767. Possible values are:
	➤ 0: no error was found on the system.
	➤ <error code>: the self-test was not completed or an error occurred. In this case, if the error appears again, contact the EXFO customer support. Possible error values are:
	  ➤ -1017: registry access error.
	  ➤ -1018: hard disk SMART status error.
	  ➤ -1019: internal GPIB error.

Example(s)	*TST? returns 0 (self-test was completed with success)

*WAI

Description	The *WAI command prevents the device from executing any further commands or queries until the no-operation-pending flag becomes TRUE.
Type	Overlapping, no query.
Syntax	*WAI
Parameter(s)	None.
Example(s)	*WAI
See Also	*OPC *OPC?

CTP10 Specific Commands

Quick Reference

The table below contains a summary of the CTP10 specific commands. These commands are fully explained on the following pages.

Command/Query category	Corresponding section
ABORt	*Root Layer Commands and Queries* on page 258
CALCulate	*CALCulate Commands and Queries* on page 260
CALCulate:DATA?	*CALCulate:DATA Queries* on page 286
CALCulate:PARameters	*CALCulate:PARameters Commands and Queries* on page 308
CLEar	*Root Layer Commands and Queries* on page 258
CTP	*CTP Commands and Queries* on page 402
DISPlay	*DISPlay Commands and Queries* on page 456
INITiate	*INITiate Commands and Queries* on page 458
MMEMory	*MMEMory Commands and Queries* on page 500
REFerence	*REFerence Commands and Queries* on page 509
RST?	*Root Layer Commands and Queries* on page 258
STATus	*STATus Commands and Queries* on page 516
SYSTem	*SYSTem Commands and Queries* on page 522
TRACe	*TRACe Commands and Queries* on page 526
TRIGger	*TRIGger Commands and Queries* on page 549
UNIT	*UNIT Commands and Queries* on page 556

Root Layer Commands and Queries

Quick Reference

Command Overview	Parameter(s)	Section
ABORt		see *p. 258*
CLEar		see *p. 258*
RST?		see *p. 259*

Commands and Queries

ABORt

Description	This command immediately aborts a scan or analysis that is currently in progress. When the system is aborting a scan or analysis, the bit 4 "Aborting" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211). If a High res. sampling value is selected for the scan, the Abort operation can take a significant amount of time.
Type	Overlapping, no query.
Syntax	ABORt
Parameter(s)	None.
Example(s)	ABOR

CLEar

Description	This command definitively clears all trace content and analysis results (except Store traces).
Type	Sequential, no query.
Syntax	CLEar
Parameter(s)	None.
Example(s)	CLE

RST?

Description	This query returns the system resetting state: it enables you to know if the reset operation set with the *RST command (see **RST* on page 253) is in progress.
Type	Overlapping, query only.
Syntax	RST?
Parameter(s)	None.
Response Syntax	<state>
Response	*state:* State of the reset (see **RST* on page 253) operation: 0: the system is not resetting. 1: the system is resetting.
Example(s)	RST? returns 0

CALCulate Commands and Queries

Quick Reference

<table>
<tr><th colspan="4">Command Overview</th><th>Parameter(s)</th><th>Section</th></tr>
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<tr><td></td><td></td><td>AUTO?</td><td></td><td></td><td>see *p. 262*</td></tr>
<tr><td></td><td>DATA?</td><td></td><td></td><td></td><td>see *p. 286*</td></tr>
<tr><td></td><td>MARKers</td><td>A</td><td>CENTer</td><td></td><td>see *p. 262*</td></tr>
<tr><td></td><td></td><td></td><td>X</td><td><value>[<unit>] | MIN | MAX</td><td>see *p. 263*</td></tr>
<tr><td></td><td></td><td></td><td>X?</td><td>[MIN|MAX]</td><td>see *p. 263*</td></tr>
<tr><td></td><td></td><td></td><td>Y?</td><td></td><td>see *p. 264*</td></tr>
<tr><td></td><td></td><td>ARANge</td><td></td><td><state></td><td>see *p. 265*</td></tr>
<tr><td></td><td></td><td>ARANge?</td><td></td><td></td><td>see *p. 265*</td></tr>
<tr><td></td><td></td><td></td><td>STARt</td><td><value>[<unit>] | MIN | MAX</td><td>see *p. 266*</td></tr>
<tr><td></td><td></td><td></td><td>STARt?</td><td>[MIN|MAX]</td><td>see *p. 266*</td></tr>
<tr><td></td><td></td><td></td><td>STOP</td><td><value>[<unit>] | MIN | MAX</td><td>see *p. 267*</td></tr>
<tr><td></td><td></td><td></td><td>STOP?</td><td>[MIN|MAX]</td><td>see *p. 267*</td></tr>
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<tr><td></td><td></td><td></td><td>X</td><td><value>[<unit>] | MIN | MAX</td><td>see *p. 269*</td></tr>
<tr><td></td><td></td><td></td><td>X?</td><td>[MIN|MAX]</td><td>see *p. 269*</td></tr>
<tr><td></td><td></td><td></td><td>Y?</td><td></td><td>see *p. 270*</td></tr>
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<tr><td></td><td></td><td></td><td>X</td><td><value>| MIN | MAX</td><td>see *p. 271*</td></tr>
<tr><td></td><td></td><td></td><td>X?</td><td>[MIN|MAX]</td><td>see *p. 271*</td></tr>
<tr><td></td><td></td><td></td><td>Y?</td><td></td><td>see *p. 272*</td></tr>
<tr><td></td><td></td><td>C</td><td>CENTer</td><td></td><td>see *p. 272*</td></tr>
<tr><td></td><td></td><td></td><td>Y</td><td><value>[<unit>]| MIN | MAX</td><td>see *p. 273*</td></tr>
<tr><td></td><td></td><td></td><td>Y?</td><td>[MIN|MAX]</td><td>see *p. 273*</td></tr>
<tr><td></td><td></td><td>D</td><td>CENTer</td><td></td><td>see *p. 274*</td></tr>
<tr><td></td><td></td><td></td><td>Y</td><td><value>[<unit>]| MIN | MAX</td><td>see *p. 275*</td></tr>
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<tr><td></td><td></td><td></td><td>Y</td><td><value>| MIN | MAX</td><td>see *p. 277*</td></tr>
<tr><td></td><td></td><td></td><td>Y?</td><td>[MIN|MAX]</td><td>see *p. 277*</td></tr>
<tr><td></td><td></td><td>STATe</td><td></td><td><state></td><td>see *p. 278*</td></tr>
<tr><td></td><td></td><td>STATe?</td><td></td><td></td><td>see *p. 278*</td></tr>
<tr><td></td><td>MODe</td><td></td><td></td><td><mode></td><td>see *p. 279*</td></tr>
</table>

Command Overview				Parameter(s)	Section
	MODe?				see *p. 279*
	NFLOor	[LVL]		<value>[<unit>] | MIN | MAX	see *p. 280*
		[LVL]?		[MIN|MAX]	see *p. 280*
		STATe		<state>	see *p. 281*
		STATe?			see *p. 281*
	PARameters				see *p. 308*
	SOURce			<category>[,<trace>[,<channel>,<type>]]	see *p. 282*
		MULTitraces		<category>[,<trace>[,<channel>,<type>]]	see *p. 284*
		MULTitraces?			see *p. 285*
	SOURce?				see *p. 283*

Commands and Queries

CALCulate[:IMMediate]

Description This command performs an analysis on the trace(s) selected for analysis (to set the trace to analyze, see *CALCulate:SOURce* on page 282 or *CALCulate:SOURce:MULTitraces* on page 284).

Type Sequential, no query.

When the system performs an analysis, the bit 3 "Analyzing" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).

If the analysis takes more than 30 seconds, you will get a timeout error (code -302, see *SCPI-Based Errors* on page 559 for more details) in the error queue: this does not mean that the analysis did not complete, you should not take this error into account.

Syntax CALCulate[:IMMediate]

Parameter(s) None.

Example(s) CALC

CALCulate[:IMMediate]:AUTO

Description

This command sets the **Auto analyze** function.

The corresponding GUI parameter is **Auto analyze on page 161**.

Type

Sequential.

Syntax

CALCulate[:IMMediate]:AUTO<wsp><state>

Parameter(s)

state:

State of the auto analysis. The allowed values are:

0|OFF: disables the **Auto analyze** function.

1|ON: enables the **Auto analyze** function and performs an analysis as described in *CALCulate[:IMMediate]* on page 261.

Example(s)

CALC:AUTO ON

CALCulate[:IMMediate]:AUTO?

Description

This query returns the state of the **Auto analyze** function.

Type

Overlapping.

Syntax

CALCulate[:IMMediate]:AUTO?

Parameter(s)

None.

Response Syntax

<state>

Response(s)

state:

State of the auto analysis function:

0: the **Auto analyze** function is disabled.

1: the **Auto analyze** function is enabled.

Example(s)

CALC:AUTO ON

CALC:AUTO? returns 1

CALCulate:MARKers:A:CENTer

Description

This command places the A marker at the center of the X axis of the graph zoom area.

Corresponding command buttons on the GUI:  .

Type

Overlapping, no query.

Syntax

CALCulate:MARKers:A:CENTer

Parameter(s)

None.

Example(s)

CALC:MARK:A:CENT

CALCulate:MARKers:A:X

Description	This command defines the A marker position on graph.
Type	Overlapping.
Syntax	CALCulate:MARKers:A:X<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency corresponding to the position of the A marker, followed by the wanted unit. ➤ *unit:* Unit of the position value. The allowed units are PM|NM|M|HZ| GHZ|THZ. The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 1240 nm or 178.44789 THz. ➤ *MAX:* Maximum value: 1680 nm or 241.76811 THz.
Example(s)	CALC:MARK:A:X 1300NM

CALCulate:MARKers:A:X?

Description	This query returns the position of the A marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:A:X? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency corresponding to the A marker ’s position as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:MARK:A:X 1300NM CALC:MARK:A:X? returns +1.30000000E-006

CALCulate:MARKers:A:Y?

Description	This query returns the power/ratio value corresponding to the position of the A marker on the selected trace. To select the trace to which the marker applies, use the command *DISPlay:FOCUS* on page 456.
Type	Overlapping, query only.
Syntax	CALCulate:MARKers:A:Y?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Power level or ratio as float value corresponding to the position of the A marker on the selected trace The unit depends on the unit setting (see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:A:Y? returns -7.350000000E+001

CALCulate:MARKers:ARANge

Description	This command defines if the analysis should be performed on the part of the trace located between the two analysis markers. The corresponding GUI setting is **Between markers only on page 162**.
Type	Sequential.
Syntax	CALCulate:MARKers:ARANge<wsp><state>
Parameter(s)	*state:* State of the **Between markers only** analysis function. The allowed values are: 0|OFF: disables the **Between markers only** function. 1|ON: enables the **Between markers only** function.
Example(s)	CALC:MARKers:ARAN ON

CALCulate:MARKers:ARANge?

Description	This query returns the state of the **Between markers only** analysis function
Type	Overlapping.
Syntax	CALCulate:MARKers:ARANge?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the **Between markers only** analysis function: 0: the analysis is not performed between analysis markers. 1: the analysis is performed between analysis markers.
Example(s)	CALC:MARKers:ARAN ON CALC:MARKers:ARAN? returns 1

CALCulate:MARKers:ARANge:STARt

Description	This command defines the wavelength or frequency of the start analysis marker.
Type	Sequential.
Syntax	CALCulate:MARKers:ARANge:STARt<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency of the start analysis marker. ➤ *unit:* Unit of the start value. The allowed units are PM|NM|M|HZ| GHZ|THZ. The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 1240 nm or 178.44789 THz. ➤ *MAX:* Maximum value: 1680 nm or 241.76811 THz.
Example(s)	CALC:MARK:ARAN:STAR 1300NM

CALCulate:MARKers:ARANge:STARt?

Description	This query returns the wavelength or frequency of the start analysis marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:ARANge:STARt? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency of the start analysis marker as a float value in meters or Hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	CALC:MARK:ARAN:START 1300NM CALC:MARK:ARAN:START? returns +1.30000000E-006

CALCulate:MARKers:ARANge:STOP

Description	This command defines the wavelength or frequency of the stop analysis marker.
Type	Sequential.
Syntax	CALCulate:MARKers:ARANge:STOP<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency of the stop analysis marker. ➤ *unit:* Unit of the stop value. The allowed units are PM|NM|M|HZ| GHZ|THZ. The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 1240 nm or 178.44789 THz. ➤ *MAX:* Maximum value: 1680 nm or 241.76811 THz.
Example(s)	CALC:MARK:ARAN:STOP 1300NM

CALCulate:MARKers:ARANge:STOP?

Description	This query returns the wavelength or frequency of the stop analysis marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:ARANge:STOP? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency of the stop analysis marker as a float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:MARK:ARAN:STOP 1300NM CALC:MARK:ARAN:STOP? returns +1.30000000E-006

CALCulate:MARKers:B:CENTer

Description	This command places the B marker at the center of the X axis of the graph zoom area. Corresponding command buttons on the GUI:  .
Type	Overlapping, no query.
Syntax	CALCulate:MARKers:B:CENTer
Parameter(s)	None.
Example(s)	CALC:MARK:B:CENT

CALCulate:MARKers:B:X

Description	This command defines the B marker position on graph.
Type	Overlapping.
Syntax	CALCulate:MARKers:B:X<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency corresponding to the position of the B marker, followed by the wanted unit. ➤ *unit:* Unit of the position value. The allowed units are PM|NM|M|HZ|GHZ|THZ. The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 1240 nm or 178.44789 THz. ➤ *MAX:* Maximum value: 1680 nm or 241.76811 THz.
Example(s)	CALC:MARK:B:X 1400.520NM

CALCulate:MARKers:B:X?

Description	This query returns the position of the B marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:B:X? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency corresponding to the B marker 's position as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:MARK:B:X 1400.520NM CALC:MARK:B:X? returns +1.40052000E-006

CALCulate:MARKers:B:Y?

Description	This query returns the power/ratio value corresponding to the position of the B marker on the selected trace. To select the trace to which the marker applies, use the command *DISPlay:FOCUS* on page 456.
Type	Overlapping, query only.
Syntax	CALCulate:MARKers:B:Y?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Power level or ratio as float value corresponding to the position of the B marker on the selected trace The unit depends on the unit setting (see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:B:Y? returns -6.230000000E+001

CALCulate:MARKers:BADiff:CENTer

Description	This command places the center of the distance between the A and B markers at the center of the X axis of the graph zoom area, without modifying the B-A value (difference between the B marker and the A marker). Corresponding command buttons on the GUI: .
Type	Overlapping, no query.
Syntax	CALCulate:MARKers:BADiff:CENTer
Parameter(s)	None.
Example(s)	CALC:MARK:BAD:CENT

CALCulate:MARKers:BADiff:X

Description	This command defines the B-A (difference between the B marker and the A marker) wavelength or frequency value.
Type	Overlapping.
Syntax	CALCulate:MARKers:BADiff:X<wsp><value>| MIN | MAX
Parameter(s)	➤ *value:* Difference between the B marker and the A marker, in nm or THz depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: -440 nm or -63.32022 THz. ➤ *MAX:* Maximum value: 440 nm or 63.32022 THz.
Example(s)	CALC:MARK:BAD:X 100.52

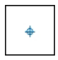
CALCulate:MARKers:BADiff:X?

Description	This query returns the B-A (difference between the B marker and the A marker) wavelength or frequency value.
Type	Overlapping.
Syntax	CALCulate:MARKers:BADiff:X? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency value corresponding to difference between the B marker and the A marker as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:MARK:BAD:X 100.52 CALC:MARK:BAD:X? returns +1.00520000E-007

CALCulate:MARKers:BADiff:Y?

Description	This query returns the power/ratio value corresponding to the B-A (difference between the B marker and the A marker) on the selected trace. To select the trace to which the markers apply, use the command *DISPlay:FOCUS* on page 456.
Type	Overlapping, query only.
Syntax	CALCulate:MARKers:BADiff:Y?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Power level or ratio as float value corresponding to the difference between the B marker and the A marker on the selected trace The unit depends on the unit setting (see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:BAD:Y? returns -7.350000000E+001

CALCulate:MARKers:C:CENTer

Description	This command places the C marker at the center of the Y axis of the graph zoom area. Corresponding command buttons on the GUI:  .
Type	Overlapping, no query.
Syntax	CALCulate:MARKers:C:CENTer
Parameter(s)	None.
Example(s)	CALC:MARK:C:CENT

CALCulate:MARKers:C:Y

Description	This command defines the C marker position on graph.
Type	Overlapping.
Syntax	CALCulate:MARKers:C:Y<wsp><value>[<unit>]|MIN|MAX
Parameter(s)	➤ *value:* Power level or ratio as float value corresponding to the position of the C marker ➤ *unit:* Unit of the position value. The allowed units are DB (dB) or RATIO (ratio). The default unit is dB. ➤ *MIN:* Minimum value: -110 dB or 0 ratio. ➤ *MAX:* Maximum value: 20 dB or 100 ratio.
Example(s)	CALC:MARK:C:Y -35DB

CALCulate:MARKers:C:Y?

Description	This query returns the position of the C marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:C:Y? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Power level or ratio as float value corresponding to the position of the C marker in dB or ratio depending on the unit setting (see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:C:Y -35DB CALC:MARK:C:Y? returns -3.50000000E+001

CALCulate:MARKers:D:CENTer

Description	This command places the D marker at the center of the Y axis of the graph zoom area. Corresponding command buttons on the GUI:  .
Type	Overlapping, no query.
Syntax	CALCulate:MARKers:D:CENTer
Parameter(s)	None.
Example(s)	CALC:MARK:D:CENT

CALCulate:MARKers:D:Y

Description	This command defines the D marker position on graph.
Type	Overlapping.
Syntax	CALCulate:MARKers:D:Y<wsp><value>[<unit>]|MIN|MAX
Parameter(s)	➤ *value:* Power level or ratio as float value corresponding to the position of the D marker ➤ *unit:* Unit of the position value. The allowed units are DB (dB) or RATIO (ratio). The default unit is dB. ➤ *MIN:* Minimum value: -110 dB or 0 ratio. ➤ *MAX:* Maximum value: 20 dB or 100 ratio.
Example(s)	CALC:MARK:D:Y 3.5DB

CALCulate:MARKers:D:Y?

Description	This query returns the position of the D marker.
Type	Overlapping.
Syntax	CALCulate:MARKers:D:Y? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Power level or ratio as float value corresponding to the position of the D marker in dB or ratio depending on the unit setting (see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:D:Y 3.5DB CALC:MARK:D:Y? returns +3.50000000E+000

CALCulate:MARKers:DCDiff:CENTer

Description	This command places the center of the distance between the C and D markers at the center of the Y axis of the graph zoom area, without modifying the D-C value (difference between the B marker and the A marker). Corresponding command buttons on the GUI:  .
Type	Overlapping, no query.
Syntax	CALCulate:MARKers:DCDiff:CENTer
Parameter(s)	None.
Example(s)	CALC:MARK:DCD:CENT

CALCulate:MARKers:DCDiff:Y

Description	This command defines the D-C (difference between the D marker and the C marker) power/ratio value.
Type	Overlapping.
Syntax	CALCulate:MARKers:DCDiff:Y<wsp><value>|MIN|MAX
Parameter(s)	➤ *value:* Difference between the D marker and the C marker, in dB or Ratio depending on the unit setting (set with command *UNIT:Y* on page 557). ➤ *MIN:* Minimum value: -130 dB or -100 ratio. ➤ *MAX:* Maximum value: 130 dB or 100 ratio.
Example(s)	CALC:MARK:DCD:Y -38.5

CALCulate:MARKers:DCDiff:Y?

Description	This query returns the D-C (difference between the D marker and the C marker) wavelength or frequency value.
Type	Overlapping.
Syntax	CALCulate:MARKers:DCDiff:Y? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Power or ratio value corresponding to the difference between the D marker and the C marker as float value (depending on the unit setting: see *UNIT:Y* on page 557).
Example(s)	CALC:MARK:DCD:Y -38.5 CALC:MARK:DCD:Y? returns -3.85000000E+001

CALCulate:MARKers:STATe

Description	This command makes the makers visible/invisible on graph. Corresponding command buttons on the GUI:  .
Type	Overlapping.
Syntax	CALCulate:MARKers:STATe<wsp><state>
Parameter(s)	*state:* State of the makers visibility. The allowed values are: 0|OFF: makes the markers invisible on graph. 1|ON: displays the markers on graph.
Example(s)	CALC:MARK:STAT ON

CALCulate:MARKers:STATe?

Description	This query returns the markers visibility state on graph.
Type	Overlapping.
Syntax	CALCulate:MARKers:STATe?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the markers visibility: 0: the markers are not displayed on graph. 1: the markers are displayed on graph.
Example(s)	CALC:MARK:STAT ON CALC:MARK:STAT? returns 1

CALCulate:MODe

Description	This command sets the analysis mode. The corresponding GUI setting is **Mode on page 161**.
Type	Sequential.
Syntax	CALCulate:MODe<wsp><mode>
Parameter(s)	*mode:* Analysis mode. The allowed values are: PCT: enables the **PCT** analysis mode. WPCT: enables the **PCT WDM** analysis mode.
Example(s)	CALC:MODe PCT

CALCulate:MODe?

Description	This query returns the state of the analysis mode.
Type	Sequential.
Syntax	CALCulate:MODe?
Parameter(s)	None.
Response Syntax	<mode>
Response(s)	*mode:* Selected analysis mode: PCT: the **PCT** mode is enabled. WPCT: the **PCT WDM** analysis mode is enabled.
Example(s)	CALC:MODe WPCT CALCulate:MODe? returns WPCT

CALCulate:NFLOor[:LVL]

Description	This command sets the noise floor for the analysis. The corresponding GUI setting is **Noise level @ 1575 nm on page 161**.
Type	Sequential.
Syntax	CALCulate:NFLOor[:LVL]<wsp><value>[<unit>]|MIN|MAX
Parameter(s)	➤ *value:* Noise detection threshold of the analysis tools, in the range -110 to 20 dB or 0.00000000001 to 100 ratio. ➤ *unit:* Unit of the noise detection threshold. The allowed units are DB (dB) or RATIO (Ratio). The default unit is dB. ➤ *MIN:* Minimum value: -110 dB or 0.00000000001 ratio. ➤ *MAX:* Maximum value: 20 dB or 100 ratio.
Example(s)	CALC:NFLO -55.0 DB

CALCulate:NFLOor[:LVL]?

Description	This query returns noise floor defined for the analysis.
Type	Overlapping.
Syntax	CALCulate:NFLOor[:LVL]? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Noise detection threshold of the analysis tools.
Example(s)	CALC:NFLO -55.0 DB CALC:NFLO? returns -5.500000000E+001

CALCulate:NFLOor:STATe

Description	This command makes the noise level visible/invisible on graph. The corresponding GUI setting is **Noise level visible on page 161**.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Sequential.
Syntax	CALCulate:NFLOor:STATe<wsp><state>
Parameter(s)	*state:* State of the noise level visibility. The allowed values are: 0|OFF: makes the noise level invisible on graph. 1|ON: makes the noise level visible on graph.
Example(s)	CALC:NFLO:STAT ON

CALCulate:NFLOor:STATe?

Description	This query returns the analysis noise floor visibility.
Type	Overlapping.
Syntax	CALCulate:NFLOor:STATe?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the noise level visibility: 0: the noise level is not visible on graph. 1: the noise level is visible on graph.
Example(s)	CALC:NFLO:STAT ON CALC:NFLO:STAT? returns 1

CALCulate:SOURce

Description	This command selects the trace to analyze in PCT analysis mode.
Type	Sequential.
Syntax	CALCulate:SOURce<wsp><category>[,<trace>[,<channel>,<type>]]
Parameter(s)	➤ *category:* Category of the trace to analyze: 0|NONE: no trace is selected for analysis. 1|SENse: trace linked to a measuring connector. 2|STORe: stored trace. ➤ *trace:* For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right, in the range 1 to 10. For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529. ➤ *channel:* For SENse traces only: integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6. This number is not taken into account for BR traces. ➤ *type:* For SENse traces only: integer corresponding to the trace type, in the range 1 to 10 and 14 to 23. For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526. For STORe traces: 0.
Example(s)	CALC:SOUR 1,2,5,3

CALCulate:SOURce?

Description This query returns the trace selected for PCT analysis.

Type Overlapping.

Syntax CALCulate:SOURce?

Parameter(s) None.

Response Syntax <state>~~{~~,<trace>,<channel>,<type>~~}~~

Response(s)

- *category:*
  Category of the trace to analyze:
  0|NONE: no trace is selected for analysis.
  1|SENse: trace linked to a measuring connector.
  2|STORe: stored trace.
- *trace:*
  For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right.
  For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. The store trace name corresponding to the identifier is available with the command *TRACe:LIST:STORe?* on page 529.
- *channel:*
  Integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6.
  On BR traces, this number is not significant (empty).
  For STORe traces, this number is 0.
- *type:*
  For SENSe traces: Integer corresponding to the trace type, in the range 1 to 10 and 14 to 23. For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526.
  For STORe traces: 0.

Example(s) CALC:SOUR 2,15
CALC:SOUR? returns 2,15,0,0

CALCulate:SOURce:MULTitraces

Description	This command enables you to select the trace(s) you want to analyze in PCT WDM analysis mode.
Applicability	This command is only available on TF, I and BR trace types; PDL traces cannot be selected for analysis in PCT WDM mode.
Type	Sequential.
Syntax	CALCulate:SOURce:MULTitraces<wsp><category>[,<trace>[, <channel>,<type>]]
Parameter(s)	➤ *category:* Category of the trace to analyze: 0|NONE: clears all traces selected for analysis. 1|SENse: trace linked to a measuring connector. 2|STORe: stored trace. ➤ *trace:* For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right, in the range 1 to 20. For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529. ➤ *channel:* For SENse traces only: integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6. This number is not taken into account for BR traces. ➤ *type:* For SENse traces only: integer corresponding to the trace type, in the range 1 to 10 and 19 to 23 (TF, I and BR traces only). For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526. For STORe traces: 0.
Example(s)	CALC:SOUR:MULT 1,2,5,2 CALC:SOUR:MULT 1,2,5,3 CALC:SOUR:MULT 1,2,3,4 CALC:SOUR:MULT 2,42

CALCulate:SOURce:MULTitraces?

Description	This query returns the trace selected for the PCT WDM analysis.
Type	Overlapping.
Syntax	CALCulate:SOURce:MULTitraces?
Parameter(s)	None.
Response Syntax	<category>,<trace>,<channel>,<type>
Response(s)	➤ *category:* Category of the trace to analyze: 0|NONE: no trace is selected for analysis. 1|SENse: trace linked to a measuring connector. 2|STORe: stored trace. ➤ *trace:* For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right. For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. The store trace name corresponding to the identifier is available with the command *TRACe:LIST:STORe?* on page 529. ➤ *channel:* For SENse traces: integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6. On BR traces, this number is not significant (empty). For STORe traces, this number is 0. ➤ *type:* For SENse traces: integer corresponding to the trace type, in the range 1 to 10 and 19 to 23 (TF, I and BR traces only). For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526. For STORe traces: 0.
Example(s)	CALC:SOUR:MULT 1,2,5,2 CALC:SOUR:MULT 1,2,5,3 CALC:SOUR:MULT 1,2,3,4 CALC:SOUR:MULT 2,42 CALC:SOUR:MULT? returns 1,2,5,2<lf>1,2,5,3<lf>1,2,3,4<lf>2,42,0,0<cr><lf>

CALCulate:DATA Queries

Quick Reference

Command Overview					Parameter(s)	Section
CALCulate	DATA	[ALL]?				see *p. 287*
		LOSS?				see *p. 288*
		NW1?				see *p. 289*
		NW2?				see *p. 290*
		NW3?				see *p. 290*
		PBAND?				see *p. 291*
		PTSearch	[LIST]?			see *p. 292*
			MAIN	PEAK?		see *p. 293*
				TROugh?		see *p. 293*
		SBAND?				see *p. 294*
		SW1?				see *p. 295*
		SW2?				see *p. 296*
		SW3?				see *p. 297*
		WDM	[:ALL]	CHANnel?		see *p. 298*
				IMEASurement?		see *p. 303*
				PDL?		see *p. 300*
				SW?		see *p. 301*
			CH	CHANnel?	<channel>	see *p. 302*
				IMEASurement?	<channel>	see *p. 303*
				PDL?		see *p. 304*
				SW?		see *p. 305*
			NCHannels?			see *p. 306*
			SLOPe?			see *p. 307*
			UNIFormity?			see *p. 307*

The unit returned depends on the unit settings (see *UNIT Commands and Queries* on page 556). The results headers WL (in meter) becomes FREQ when in Hertz.

All results are expressed in base unit (e.g. M|HZ)

Commands and Queries

CALCulate:DATA[:ALL]?

Description	This query collects all analysis results available in PCT or PCT WDM analysis mode, grouped by analysis tools.
Type	Overlapping, query only.
Syntax	CALCulate:DATA[:ALL]?
Parameter(s)	None.
Response Syntax	<results from PTSearch tool>,<results from activated tools>
Response(s)	➤ *results from PTSearch tool:* Result of the CALC:DATA:PTS? query. See *CALCulate:DATA:PTSearch[:LIST]?* on page 292 for more details. ➤ *results from activated analysis tools:* Result from all analysis tools corresponding to the component under test that have been activated using the command *CALCulate:PARameters:CSELector:TYPE* on page 314.
Example(s)	CALC:DATA? returns 2, 3, PEAKWAVELENGTH, M, PEAKPOWER, DBM, TROUGHWAVELENGTH, M, TROUGHPOWER, DBM, +1.53033000E-006, +1.52950600E-006, -1.14000000E+001, -1.15200000E+001, +1.53386800E-006, +1.53007200E-006, +1.52774400E-006, -6.40100000E+001, -6.42600000E+001, -6.45200000E+001, NBROFCHANNELS, 2, , SLOPE, +1.55800000E+008, DB/M, UNIFORMITY, +1.30000000E-001, DB, CH, NBR, WL_GRID, M, WL_MEAS, M, LVL_MEAS, DBM, DWLTOGRID, M, NOISE, DBM, OSNR, DB, 196, 197, +1.52995150E-006, +1.52917110E-006, +1.53033120E-006, +1.52950700E-006, -1.14200000E+001, -1.15500000E+001, +3.79700000E-010, +3.35900000E-010, -7.00700000E+001, -6.97500000E+001, +5.25400000E+001, +5.23400000E+001

CALCulate:DATA:LOSS?

Description	This query returns the results of the Loss Measurement analysis tool (for more details, see *Setting Up Loss Measurement Analysis* on page 197).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:LOSS?
Parameter(s)	None.
Response Syntax	LOSS MEASUREMENT RESULTS, AVERAGELOSSDB<Value>,<Unit>,UNIFORMITY,<Value>, <Unit>
Response(s)	The analysis results are described in *Setting Up Loss Measurement Analysis* on page 197.
Example(s)	CALC:DATA:LOSS? returns LOSS MEASUREMENT RESULTS , AVERAGELOSSDB , -7.00000000E-001 , DBM , UNIFORMITY , +1.10000000E-001, DB

CALCulate:DATA:NW1?

Description	This query returns the results of the Notch Width 1 analysis tool (for more details, see *Analyzing Notch Width Results* on page 182).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:NW1?
Parameter(s)	None.
Response Syntax	NOTCH WIDTH 1 RESULTS, WL_TROUGH,<value>,<unit>,LEVEL_THOUGH,<value>, <unit>,WL_NOTCH,<value>,<unit>,LEVEL_NOTCH,<value>, <unit>DWL_NOTCH,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Notch Width Results* on page 182.
Example(s)	CALC:DATA:NW1? returns NOTCH WIDTH 1 RESULTS, WL_TROUGH,+1.54667800E-006,M,LEVEL_TROUGH,-3.65700000E+001,DBM,WL_NOTCH,+1.54669440E-006,M,LEVEL_NOTCH,-3.65600000E+001,DBM,DWL_NOTCH_3dB,+5.93161000E-008,M

CALCulate:DATA:NW2?

Description	This query returns the results of the Notch Width 2 analysis tool (for more details, see *Analyzing Notch Width Results* on page 182).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:NW2?
Parameter(s)	None.
Response Syntax	NOTCH WIDTH 2 RESULTS, WL_NOTCH,<value>,<unit>,LEVEL_NOTCH,<value>,<unit>D WL_NOTCH,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Notch Width Results* on page 182.
Example(s)	CALC:DATA:NW2? returns NOTCH WIDTH 2 RESULTS,WL_NOTCH,+1.54669440E-006,M,LEVEL_NOTCH,-3.65600000E+001,DBM,DWL_NOTCH_1dB,+5.93161000E-008,M

CALCulate:DATA:NW3?

Description	This query returns the results of the Notch Width 3 analysis tool (for more details, see *Analyzing Notch Width Results* on page 182).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:NW3?
Parameter(s)	None.
Response Syntax	NOTCH WIDTH 3 RESULTS, WL_NOTCH,<value>,<unit>,LEVEL_NOTCH,<value>,<unit>D WL_NOTCH,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Notch Width Results* on page 182.
Example(s)	CALC:DATA:NW3? returns NOTCH WIDTH 3 RESULTS,WL_NOTCH,+1.54669440E-006,M,LEVEL_NOTCH,-3.65600000E+001,DBM,DWL_NOTCH_20dB,+5.93161000E-008,M

CALCulate:DATA:PBANd?

Description
This query returns the results of the Pass Band analysis tool (for more details, see *Analyzing Pass Band Test Results* on page 188).

Applicability
This query is only available if *CALCulate:MODe* on page 279 is set to PCT.

Type
Overlapping, query only.

Syntax
CALCulate:DATA:PBANd?

Parameter(s)
None.

Response Syntax
PASSBANDTESTRESULTS(NOISELIMITED), IN-BANDRESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, SLOPE, <Value>, <Unit>, OUT-BANDSIDE1RESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, CROSSTALK, <Value>, <Unit>, ROLLOFF@X.XDB<Value>, <Unit>, ROLLOFF_MAX_, <Value>, <Unit>, WL@ROLLOFF_MAX_, <Value>, <Unit>, TRANSITIONBAND, <Value>, <Unit>, OUT-BANDSIDE2RESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, CROSSTALK, <Value>, <Unit>, ROLLOFF@X.XDB, <Value>, <Unit>, ROLLOFF_MAX_, <Value>, <Unit>, WL@ROLLOFF_MAX_, <Value>, <Unit>, TRANSITIONBAND, <Value>, <Unit>

NOISELIMITED only appears if the measurement is limited by noise.

Response(s)
The analysis results are described in *Analyzing Pass Band Test Results* on page 188.

Example(s)
CALC:DATA:PBANd? returns

PASSBANDTESTRESULTS, IN-BANDRESULTS, , , AVGLOSS, 1.92000000E+000, DB, RIPPLE, 0.00000000E+000, DB, SLOPE, 1.95000000E-002, DB/NM, OUT-BANDSIDE1RESULTS, , , AVGLOSS, 6.50900000E+001, DB, RIPPLE, 4.19000000E+000, DB, CROSSTALK, 6.31100000E+001, DB, ROLLOFF@3.00DB, 8.46260000E+000, DB/NM, ROLLOFF_MAX_, 1.14789000E+001, DB/NM, WL@ROLLOFF_MAX_, 1.56004200E-006, M, TRANSITIONBAND, 1.54600000E-009, M, OUT-BANDSIDE2RESULTS, , , AVGLOSS, 6.31000000E+001, DB, RIPPLE, 1.99000000E+000, DB, CROSSTALK, 6.07400000E+001, DB, ROLLOFF@3.00DB, -8.77800000E+000, DB/NM, ROLLOFF_MAX_, -1.17777000E+001, DB/NM, WL@ROLLOFF_MAX_, 1.57951910E-006, M, TRANSITIONBAND, 1.54400000E-009, M, , -,

CALCulate:DATA:PTSearch[:LIST]?

Description	This query returns the wavelength/frequency and power level of all found peaks and troughs.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:PTSearch[:LIST]?
Parameter(s)	None.
Response Syntax	<number of peaks>, <number of troughs>, PEAKWAVELENGTH,<unit>,PEAKPOWER,<unit>,TROUGHWAVELENGTH,<unit>,TROUGHPOWER,<unit>,{<peak wavelength>},{<peak power level>}, {<trough wavelength>},{<trough power level>} OR (depending on the unit setting *UNIT:X* on page 556): <number of peaks>, <number of troughs>, PEAKFREQ,<unit>,PEAKPOWER,<unit>,TROUGHFREQ, <unit>,TROUGHPOWER,<unit>,{<peak frequency>},{<peak power level>}, {<trough frequency>},{<trough power level>}
Response(s)	➤ *number of peaks/troughs:* Number of detected peaks/troughs, according to the parameters set for the PT Search tool. ➤ *unit:* Unit set (see *UNIT Commands and Queries* on page 556). ➤ *peak/trough wavelength/frequency:* Measured wavelength or frequency for each detected peak and trough. ➤ *peak/trough power level:* Measured power level for each detected peak and trough.
Example(s)	CALC:DATA:PTS? returns 2,3,PEAKWAVELENGTH,M,PEAKPOWER,DBM,TROUGHWAVELENGTH,M,TROUGHPOWER,DBM,+1.53033000E-006,+1.52950600E-006,-1.14000000E+001,-1.15200000E+001,+1.53386800E-006,+1.53007200E-006,+1.52774400E-006,-6.40100000E+001,-6.42600000E+001,-6.45200000E+001

CALCulate:DATA:PTSearch:MAIN:PEAK?

Description	This query returns the wavelength/frequency and power level of the peak with the highest power.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:PTSearch:MAIN:PEAK?
Parameter(s)	None.
Response Syntax	<peak wavelength or frequency>, <peak power level>
Response(s)	➤ *peak wavelength or frequency:* Wavelength (in meters) or frequency (in Hertz) of the peak with the highest power. ➤ *peak power level:* Power level of the peak with the highest power in dB or Ratio, depending on the unit setting (set with command *UNIT:Y* on page 557).
Example(s)	CALC:DATA:PTS:MAIN:PEAK? returns +1.52950600E-006,-1.15200000E+001

CALCulate:DATA:PTSearch:MAIN:TROugh?

Description	This query returns the wavelength/frequency and power level of the trough with the lower power.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:PTSearch:MAIN:TROugh?
Parameter(s)	None.
Response Syntax	<trough wavelength or frequency>, <trough power level>
Response(s)	➤ *peak wavelength or frequency:* Wavelength (in meters) or frequency (in Hertz) of the trough with the lowest power. ➤ *peak power level:* Power level of the trough with the lowest power in dB or Ratio, depending on the unit setting (set with command *UNIT:Y* on page 557).
Example(s)	CALC:DATA:PTS:MAIN:TRO? returns +1.52774400E-006,-6.45200000E+001

CALCulate:DATA:SBANd?

Description	This query returns the results of the Stop Band analysis tool (for more details, see *Analyzing Stop Band Test Results* on page 194).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:SBANd?
Parameter(s)	None.
Response Syntax	STOPBANDTESTRESULTS(NOISELIMITED), IN-BANDRESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, SLOPE, <Value>, <Unit>, OUT-BANDSIDE1RESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, ISOLATIONDEPTH, <Value>,<Unit>, ROLLOFF@X.XDB<Value>, <Unit>, ROLLOFF_MAX_, <Value>, <Unit>, WL@ROLLOFF_MAX_, <Value>, <Unit>, TRANSITIONBAND, <Value>, <Unit>, OUT-BANDSIDE2RESULTS, , , AVGLOSS, <Value>, <Unit>, RIPPLE, <Value>, <Unit>, ISOLATIONDEPTH, <Value>, <Unit>, ROLLOFF@X.XDB, <Value>, <Unit>, ROLLOFF_MAX_, <Value>, <Unit>, WL@ROLLOFF_MAX_, <Value>, <Unit>, TRANSITIONBAND, <Value>, <Unit> NOISELIMITED only appears if the measurement is limited by noise.
Response(s)	The analysis results are described in *Analyzing Stop Band Test Results* on page 194.
Example(s)	CALC:DATA:SBANd? returns STOPBANDTESTRESULTS, IN-BANDRESULTS, , , AVGLOSS, 5.24300000E+001, DB, RIPPLE, 2.15000000E+000, DB, SLOPE, -2.58390000E+000, DB/NM, OUT-BANDSIDE1RESULTS, , , AVGLOSS, 3.17800000E+001, DB, RIPPLE, 0.00000000E+000, DB, ISOLATIONDEPTH, 6.63900000E+001, DB, ROLLOFF@3.00DB, -9.03320000E+000, DB/NM, ROLLOFF_MAX_, -1.94365000E+001, DB/NM, WL@ROLLOFF_MAX_, 1.53869150E-006, M, TRANSITIONBAND, 1.30300000E-009, M, OUT-BANDSIDE2RESULTS, , , AVGLOSS, 1.90600000E+001, DB, RIPPLE, 1.60000000E-001, DB, ISOLATIONDEPTH, 3.45400000E+001, DB, ROLLOFF@3.00DB, 1.37286000E+001, DB/NM, ROLLOFF_MAX_, 2.49708000E+001, DB/NM, WL@ROLLOFF_MAX_, 1.54124660E-006, M, TRANSITIONBAND, 8.45000000E-010, M, , -,

CALCulate:DATA:SW1?

Description	This query returns the results of the Spectral Width 1 analysis toolused in PCT analysis mode (for more details, see *Analyzing Spectral Width Results* on page 179).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:SW1?
Parameter(s)	None.
Response Syntax	For Threshold, Envelope, Gaussian Fit and Lorentzian Fit Algorithm: SPECTRAL WIDTH 1 RESULTS,WL_PEAK,<value>,<unit>, LEVEL_PEAK,<value>,<unit>,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>,DWL,<value>,<unit> For RMS and RMS Peak Algorithm: SPECTRAL WIDTH 1 RESULTS,WL_PEAK,<value>,<unit>, LEVEL_PEAK,<value>,<unit>,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>SIGMA,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Spectral Width Results* on page 179.
Example(s)	CALC:DATA:SW1? returns SPECTRAL WIDTH 1 RESULTS, WL_PEAK,+1.54547800E-006,M,LEVEL_PEAK,-9.12000000E-001,DBM,WL_MEAN,+1.54547100E-006,M,LEVEL_MEAN,-9.10000000E-001,DBM,DWL@3.00DB,+1.02800000E-010,M

CALCulate:DATA:SW2?

Description	This query returns the results of the Spectral Width 2 analysis tool used in PCT analysis mode (for more details, see *Analyzing Spectral Width Results* on page 179).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:SW2?
Parameter(s)	None.
Response Syntax	For Threshold, Envelope, Gaussian Fit and Lorentzian Fit Algorithm: SPECTRAL WIDTH 2 RESULTS,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>,DWL,<value>,<unit> For RMS and RMS Peak Algorithm: SPECTRAL WIDTH 2 RESULTS,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>SIGMA,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Spectral Width Results* on page 179.
Example(s)	CALC:DATA:SW2? returns SPECTRAL WIDTH 2 RESULTS,WL_MEAN,+1.54547100E-006,M,LEVEL_MEAN,-9.10000000E-001,DBM,DWL@1.00DB,+1.02800000E-010,M

CALCulate:DATA:SW3?

Description	This query returns the results of the Spectral Width 3 analysis tool used in PCT analysis mode (for more details, see *Analyzing Spectral Width Results* on page 179).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to PCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:SW3?
Parameter(s)	None.
Response Syntax	For Threshold, Envelope, Gaussian Fit and Lorentzian Fit Algorithm: SPECTRAL WIDTH 2 RESULTS,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>,DWL,<value>,<unit> For RMS and RMS Peak Algorithm: SPECTRAL WIDTH 2 RESULTS,WL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>SIGMA,<value>,<unit>
Response(s)	The analysis results are described in *Analyzing Spectral Width Results* on page 179.
Example(s)	CALC:DATA:SW3? returns SPECTRAL WIDTH 3 RESULTS,WL_MEAN,+1.54547100E-006,M,LEVEL_MEAN,-9.10000000E-001,DBM,DWL@20.00DB,+1.02800000E-010,M

CALCulate:DATA:WDM[:ALL]:CHANnel?

Description

This query returns the results of the Channel Detection analysis tool (for more details, see *Analyzing Channel Detection Results* on page 171) for all analyzed traces.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM[:ALL]:CHANnel?

Parameter(s)

None.

Response Syntax

CH,NBR,TRACE#,ID,WL_GRID,<Unit>,WL_CHAN,<Unit>,DWL,<Unit>,IL_GRID,<Unit>,IL_CHAN,<Unit>,{<WDM Channel Number>},{<Trace ID value>},{<WL Grid Value>},{<WL chan value>},{<DWL value>},{<IL Grid value>},{<IL Chan value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing Channel Detection Results* on page 171.

Example(s)

CALC:DATA:WDM:CHAN? returns

CH,NBR,TRACE#,ID,WL_GRID,M,WL_CHAN,M,DWL,M,IL_GRID,DB,IL_CHAN,DB,2,3,1;3;2;1,1;5;1;1,+1.29100000E-006,+1.31100000E-006,+1.28977000E-006,+1.30990380E-006,-1.23000000E-009,-1.09620000E-009,-6.50000000E-001,-6.80000000E-001,-6.50000000E-001,-6.50000000E-001

This response corresponds to the following table:

CH	TRACE#	WL_GRID	WL_CHAN	DWL	IL_GRID	IL_CHAN
NBR	ID	M	M	M	M	DB
2	1;3;2;1	+1.29100000E-006	+1.28977000E-006	-1.23000000E-009	-6.50000000E-001	-6.50000000E-001
3	1;5;1;1	+1.31100000E-006	+1.30990380E-006	-1.09620000E-009	-6.80000000E-001	-6.50000000E-001

CALCulate:DATA:WDM[:ALL]:IMEASurement?

Description This query returns the results of the WDM Filter Test analysis tool (for more details, see *Analyzing WDM Filter Test Results* on page 196) for all analyzed traces.

Applicability This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type Overlapping, query only.

Syntax CALCulate:DATA:WDM[:ALL]:IMEASurement?

Parameter(s) None.

Response Syntax CH,NBR,TRACE#,ID,SLOPE,<Slope unit>,RIPPLE,<Ripple unit>,ADJ.ISO.,<Adjacent Isolation unit>,NON-ADJ.ISO.,<Non Adjacent Isolation unit>,TOTALXTALK,<Total Crosstalk unit>,{<WDM Channel Number >},{<Trace ID value>},{<Slope value>},{<Ripple value>},{<Adjacent Isolation value>},{<Non Adjacent Isolation value>},{<Total Crosstalk value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s) The analysis results are described in *Analyzing WDM Filter Test Results* on page 196.

Example(s) CALC:DATA:WDM:IMEAS? returns

CH, NBR, TRACE#, ID, SLOPE, DB/NM, RIPPLE, DB, ADJ.ISO., DB, NON-ADJ.ISO., DB, TOTALXTALK, DB, 2, 3, 1;3;2;1, 1;5;1;1, +1.21000000E-002, -1.04800000E-001, +0.00000000E+000, +1.00000000E-002, +6.28900000E+001, +6.46000000E+001, +6.29700000E+001, +6.49700000E+001, +5.69500000E+001, +5.91600000E+001

This response corresponds to the following table:

CH	TRACE#	SLOPE	RIPPLE	ADJ.ISO.	NON-ADJ.ISO.	TOTALXTALK
NBR	ID	DB/NM	DB/NM	DB	DB	DB
2	1;3;2;1	+1.21000000E-002	+0.00000000E+000	+6.28900000E+001	+6.29700000E+001	+5.69500000E+001
3	1;5;1;1	-1.04800000E-001	+1.00000000E-002	+6.46000000E+001	+6.49700000E+001	+5.91600000E+001

CALCulate:DATA:WDM[:ALL]:PDL?

Description

This query returns the results of the **PDL Analysis** analysis tool (for more details, see *Analyzing PDL Analysis Results* on page 173) for all analyzed traces.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM[:ALL]:PDL?

Parameter(s)

None.

Response Syntax

CH,NBR,TRACE#,ID,PDL_GRID,<PDL unit>,PDL_CHAN,<PDL unit>,PDL_MAX.,<PDL unit>,{<WDM Channel Number >},{<Trace ID value>},{<PDLGrid value>},{<PDLChan value>},{<PDLMax value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing PDL Analysis Results* on page 173.

Example(s)

CALC:DATA:WDM:PDL? returns

CH,NBR,TRACE#,ID,PDL_GRID,DB,PDL_CHAN,DB,PDL_MAX,DB,13,14,1;5;1;1,1;5;1;2,+8.00000000E-002,+8.00000000E-002,+3.80000000E-001,+7.00000000E-002,+8.00000000E-002,+8.00000000E-002

This response corresponds to the following table:

CH	TRACE#	PDL_GRID	PDL_CHAN	PDL_MAX
NBR	ID	DB	DB	DB
13	1;5;1;1	+8.00000000E-002	+3.80000000E-001	+8.00000000E-002
14	1;5;1;2	+8.00000000E-002	+7.00000000E-002	+8.00000000E-002

CALCulate:DATA:WDM[:ALL]:SW?

Description

This query returns the results of the Spectral Width 1; Spectral Width 2 and Spectral Width 3 analysis tools used in PCT WDM analysis mode (for more details, see *To define the Spectral Width parameters in PCT WDM Analysis mode:* on page 178) for all analyzed traces.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM[:ALL]:SW?

Parameter(s)

None.

Response Syntax

CH,NBR,TRACE#,ID,DWL1@xx.xxdB,<Unit>,DWL2@yy.yydB,<Unit>,DWL2@zz.zzdB,<Unit>,{<WDM Channel Number Value>},{<Trace ID Value>},{<WL1@xx.xxdB value>},{<WL2@yy.yydB value>},{<WL3@zz.zzdB value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing WDM Filter Test Results* on page 196.

Example(s)

CALC:DATA:WDM:SW? returns

CH,NBR,TRACE#,ID,DWL1@1.00DB,M,DWL2@3.00DB,M,DWL3@20.00DB,M,2,3,1;3;2;1,1;5;1;1,+1.69607000E-008,+1.70329000E-008,+1.75082000E-008,+1.76346000E-008,+2.00912000E-008,+2.04797000E-008

This response corresponds to the following table:

CH	TRACE#	DWL1@1.00DB	DWL2@3.00DB	DWL3@20.00DB
NBR	ID	M	M	M
2	1;3;2;1	+1.69607000E-008	+1.75082000E-008	+2.00912000E-008
3	1;5;1;1	+1.70329000E-008	+1.76346000E-008	+2.04797000E-008

CALCulate:DATA:WDM:CH:CHANnel?

Description

This query returns the results of the Channel Detection analysis tool (for more details, see *Analyzing Channel Detection Results* on page 171) for the given grid channel.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM:CH:CHANnel?<wsp><channel>

Parameter(s)

channel

Integer corresponding to the grid channel number from which you want to get the results.

Response Syntax

CH,NBR,TRACE#,ID,WL_GRID,<Unit>,WL_CHAN,<Unit>,DWL,<Unit>,IL_GRID,<Unit>,IL_CHAN,<Unit>,{<WDM Channel number>},{<Trace ID value>},{<WL Grid value>},{<WL chan value>},{<DWL value>},{<IL Grid value>},{<IL Chan value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing Channel Detection Results* on page 171.

Example(s)

CALC:DATA:WDM:CH:CHAN? 194 returns

CH,NBR,TRACE#,ID,WL_GRID,M,WL_CHAN,M,DWL,M,IL_GRID,DB,IL_CHAN,DB,2,1;3;2;1,+1.29100000E-006,+1.28977000E-006,-1.23000000E-009,-6.50000000E-001,-6.50000000E-001

This response corresponds to the following table:

CH	TRACE#	WL_GRID	WL_CHAN	DWL	IL_GRID	IL_CHAN
NBR	ID	M	M	M	DB	DB
2	1;3;2;1	+1.29100000E-006	+1.28977000E-006	-1.23000000E-009	-6.50000000E-001	-6.50000000E-001

CALCulate:DATA:WDM:CH:IMEASurement?

Description

This query returns the results of the WDM Filter Test analysis tool (for more details, see *Analyzing WDM Filter Test Results* on page 196) for the given grid channel.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM:CH:IMEASurement?<wsp><channel>

Parameter(s)

channel

Integer corresponding to the grid channel number from which you want to get the results.

Response Syntax

TRACE#,ID,SLOPE,<Slope Unit>,RIPPLE,<Ripple unit>,ADJ.ISO.,<Adjacent Isolation unit>,NON-ADJ.ISO.,<Non Adjacent Isolation unit>,TOTALXTALK,<Total Crosstalk unit>,{<WDM Channel Number>},{<Trace ID value>,{<Slope value>},{<Ripple value>},{<Adjacent Isolation value>},{<Non Adjacent Isolation value>},{<Total Crosstalk value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing WDM Filter Test Results* on page 196.

Example(s)

CALC:DATA:WDM:CH:IMEAS? 2 returns

TRACE#,ID,SLOPE,DB/NM,RIPPLE,DB,ADJ.ISO.,DB,NON-ADJ.ISO.,DB,TOTALXTALK,DB,1;3;2;1,+1.21000000E-002,+0.00000000E+000,+6.28900000E+001,+6.29700000E+001,+5.69500000E+001

This response corresponds to the following table:

CH	TRACE#	SLOPE	RIPPLE	ADJ.ISO.	NON-ADJ.ISO	TOTALXTALK
NBR	ID	DB/NM	DB/NM	DB	DB	DB
2	1;3;2;1	+1.21000000E-002	+0.00000000E+000	+6.28900000E+001	+6.29700000E+001	+5.69500000E+001

CALCulate:DATA:WDM:CH:PDL?

Description

This query returns the results of the **PDL Analysis** analysis tool (for more details, see *Analyzing PDL Analysis Results* on page 173) for the given grid channel.

Applicability

This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type

Overlapping, query only.

Syntax

CALCulate:DATA:WDM:CH:PDL?<wsp><channel>

Parameter(s)

channel

Integer corresponding to the grid channel number from which you want to get the results.

Response Syntax

TRACE#,ID,PDL_GRID,<PDL unit>,PDL_CHAN,<PDL unit>,PDL_MAX.,<PDL unit>,<Trace ID value>,<PDLGrid value>,<PDLChan value>,<PDLMax value>

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s)

The analysis results are described in *Analyzing PDL Analysis Results* on page 173.

Example(s)

CALC:DATA:WDM:CH:PDL? 14 returns

TRACE#,ID,PDL_GRID,DB,PDL_CHAN,DB,PDL_MAX,DB,1;5;1;1,+8.00000000E-002,+7.00000000E-002,+8.00000000E-002

This response corresponds to the following table:

CH	TRACE#	PDL_GRID	PDL_CHAN	PDL_MAX
NBR	ID	DB	DB	DB
14	1;5;1;2	+8.00000000E-002	+7.00000000E-002	+8.00000000E-002

CALCulate:DATA:WDM:CH:SW?

Description This query returns the results of the Spectral Width 1; Spectral Width 2 and Spectral Width 3 analysis tools used in PCT WDM analysis mode (for more details, see *To define the Spectral Width parameters in PCT WDM Analysis mode:* on page 178) for the given grid channel.

Applicability This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.

Type Overlapping, query only.

Syntax CALCulate:DATA:WDM:CH:SW?<wsp><channel>

Parameter(s) *channel*

Integer corresponding to the grid channel number from which you want to get the results.

Response Syntax TRACE#,ID,DWL1@xx.xxdB,<Unit>,DWL2@yy.yydB,<Unit>,DWL2@zz.zzdB,<Unit>,{<WDM Channel Number>},{<Trace ID value>},{<WL1@xx.xxdB value>},{<WL2@yy.yydB value>},{<WL3@zz.zzdB value>}

where

<Trace ID value> consists of 4 digits separated by semicolons:

- First digit: 1 for measured trace, 2 for Store type trace.
- Second digit: module identification number, which is the position of the module in the mainframe from left to right (if first digit is 1) or Store trace number (if first digit is 2). To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.
- Third digit: detector identification number, which is the detector position on the module from top to bottom (if first digit is 1) or 0 (if first digit is 2).
- Fourth digit: trace type (if first digit is 1) or 0 (if first digit is 2).

Response(s) The analysis results are described in *Analyzing WDM Filter Test Results* on page 196.

Example(s) CALC:DATA:WDM:CH:SW? 16 returns

TRACE#,ID,DWL1@1.00DB,M,DWL2@3.00DB,M,DWL3@20.00DB,M,1;3;2;1,+1.69607000E-008,+1.75082000E-008,+2.00912000E-008

This response corresponds to the following table:

CH	TRACE#	DWL1@1.00DB	DWL2@3.00DB	DWL3@20.00DB
NBR	ID	M	M	M
2	1;3;2;1	+1.69607000E-008	+1.75082000E-008	+2.00912000E-008

CALCulate:DATA:WDM:NCHannels?

Description	This query returns the number of channels that have been detected (for more details, see *Analyzing Channel Detection Results* on page 171).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:WDM:NCHannels?
Parameter(s)	None.
Response Syntax	NBROFCHANNELS,<Value>,
Response(s)	The analysis result is described in **Table header on page 171**.
Example(s)	CALC:DATA:WDM:NCHannels? returns NBROFCHANNELS,6,

CALCulate:DATA:WDM:SLOPe?

Description	This query returns the slope of all detected peaks on all analyzed traces (for more details, see *Analyzing Channel Detection Results* on page 171).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:WDM:SLOPe?
Parameter(s)	None.
Response Syntax	SLOPE,<Value>,<Unit>
Response(s)	The analysis result is described in **Table header on page 171**.
Example(s)	CALC:DATA:WDM:SLOPe? returns SLOPE,+3.95000000E+008,DB/M

CALCulate:DATA:WDM:UNIFormity?

Description	This query returns the uniformity of all detected peaks (for more details, see *Analyzing Channel Detection Results* on page 171).
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Overlapping, query only.
Syntax	CALCulate:DATA:WDM:UNIFormity?
Parameter(s)	None.
Response Syntax	UNIFORMITY,<Value>,<Unit>
Response(s)	The analysis result is described in **Table header on page 171**.
Example(s)	CALC:DATA:WDM:UNIFormity? returns UNIFORMITY,+2.17000000E+000,DB

CALCulate:PARameters Commands and Queries

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			TYPE?			see *p. 314*
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			ALGorithm?			see *p. 323*
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			MULTiplier		<value>|MIN|MAX	see *p. 325*
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			NSELection		<method>	see *p. 326*
			NSELection?			see *p. 326*
			WREFerence		<method>	see *p. 327*
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CALCulate	PARameters	NW2	[:ACTivate]		<state>	see *p. 329*
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			ALGorithm?			see *p. 323*
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Commands and Queries

CALCulate:PARameters:CSELector:TYPE

Description	This command selects the component under test and activates the corresponding analysis tools (for more details, see *Selecting the Component Under Test (Component Selector)* on page 166).
Type	Sequential.
Syntax	CALCulate:PARameters:CSELector:TYPE<wsp><type>
Parameter(s)	*type:* Type of component under test. The allowed values are: 0|PASS: selects the pass band filter as component under test. 1|STOP: selects the stop band filter as component under test (only available if *CALCulate:MODe* on page 279 is set to PCT). 2|ISOLator: selects the isolator or circulator as component under test (only available if *CALCulate:MODe* on page 279 is set to PCT). 3|FIBer: selects the fiber component as component under test (only available if *CALCulate:MODe* on page 279 is set to PCT).
Example(s)	CALC:PAR:CSEL:TYPE ISOL

CALCulate:PARameters:CSELector:TYPE?

Description	This query returns the selected component under test.
Type	Sequential.
Syntax	CALCulate:PARameters:CSELector:TYPE?
Parameter(s)	None.
Response Syntax	<type>
Response(s)	*type:* Integer corresponding to the selected component under test: 0: the pass band filter is selected as component under test. 1: the stop band filter is selected as component under test. 2: the isolator or circulator is selected as component under test. 3: the fiber component is selected as component under test.
Example(s)	CALC:PAR:CSEL:TYPE ISOL CALC:PAR:CSEL:TYPE? returns 2

CALCulate:PARameters:IMEASurement[:ACTivate]

Description	This command enables/disables the WDM Filter test analysis tool.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement[:ACTivate]<wsp><state>
Parameter(s)	*state:* Activation state of the WDM Filter test tool. The allowed values are: 0|OFF: disables the tool. 1|ON: enables the tool.
Example(s)	CALC:PAR:IMEAS:ACT ON

CALCulate:PARameters:IMEASurement[:ACTivate]?

Description	This query returns the activation state of the WDM Filter test analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement[:ACTivate]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the WDM Filter test tool: 0: the tool is disabled. 1: the tool is enabled.
Example(s)	CALC:PAR:IMEAS:ACT OFF CALC:PAR:IMEAS:ACT? returns 0

CALCulate:PARameters:IMEASurement:BPERCentage

Description	This command defines the **% Bandwidth 1** parameter of the WDM Filter test analysis tool. The corresponding GUI setting is **% Bandwidth *(only if Frequency Range is set to % Bandwidth 1)* on page 196**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to PBWidt
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:BPERCentage<wsp><percentage>| MIN | MAX
Parameter(s)	➤ *percentage:* Percentage of bandwidth calculated from Spectral Width 1 (centered on the grid wavelength/frequency) to use for calculations, in the range 0.1 to 100. ➤ *MIN* Minimum programmable value: 0.1 % ➤ *MAX:* Maximum programmable value: 100 %
Example(s)	CALC:PAR:IMEAS:BPERC 25.5

CALCulate:PARameters:IMEASurement:BPERCentage?

Description	This query returns the **% Bandwidth 1** parameter set for the WDM Filter test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to PBWidth
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:BPERCentage? [MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	*<percentage>*
Response(s)	*percentage:* Percentage of bandwidth calculated from Spectral Width 1 (centered on the grid wavelength/frequency) used for calculations.
Example(s)	CALC:PAR:IMEAS:BPERCentage 25.5 CALC:PAR:IMEAS:BPERCentage? returns +2.55000000E+001

CALCulate:PARameters:IMEASurement:CPERCentage

Description	This command defines the **% Channel spacing** parameter of the WDM Filter test analysis tool. The corresponding GUI setting is **% Channel *(only if Frequency Range is set to % Channel spacing)* on page 196**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to PCWidth
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:CPERCentage<wsp><percentage>| MIN | MAX
Parameter(s)	➤ *percentage:* Percentage of the channel width to use for calculations, in the range 0.1 to 100. ➤ *MIN* Minimum programmable value: 0.1 % ➤ *MAX:* Maximum programmable value: 100 %
Example(s)	CALC:PAR:IMEAS:CPERC 30

CALCulate:PARameters:IMEASurement:CPERCentage?

Description	This query returns the **% Channel spacing** parameter set for the WDM Filter test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to PCWidth
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:CPERCentage? [MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	*<percentage>*
Response(s)	*percentage:* Percentage of the channel width used for calculations.
Example(s)	CALC:PAR:IMEAS:CPERCentage 50 CALC:PAR:IMEAS:CPERCentage? returns +5.00000000E+001

CALCulate:PARameters:IMEASurement:RANGe

Description	This command defines the **Frequency Range** parameter for the WDM Filter test analysis tool. The corresponding GUI setting is **Frequency Range on page 195**.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:RANGe<wsp><method>
Parameter(s)	*method:* Method used to define the spectral range used for the calculation of isolation, total crosstalk, ripple and slope of selected traces. The allowed values are: 0|FIXed: a fixed span is used to define the spectral range. It is set using the command *CALCulate:PARameters:IMEASurement:SPAN* on page 321. 1|PBWidth: a percentage of bandwidth is used to define the spectral range, calculated using Spectral Width 1. It is set using the command *CALCulate:PARameters:IMEASurement:BPERCentage* on page 316. 2|PCWidth: a percentage of the channel bandwidth is used to define the spectral range. It is set using the command *CALCulate:PARameters:IMEASurement:CPERCentage* on page 318.
Example(s)	CALC:PAR:IMEAS:RANG PBW

CALCulate:PARameters:IMEASurement:RANGe?

Description	This query returns the **Frequency Range** parameter set for the WDM Filter test analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:RANGe?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Integer representing the method used to define the spectral range used for the calculation of isolation, total crosstalk, ripple and slope.
Example(s)	CALC:PAR:IMEAS:RANG PBW CALC:PAR:IMEAS:RANG? returns 1

CALCulate:PARameters:IMEASurement:SPAN

Description	This command defines the **Calculation Span** parameter of the WDM Filter test analysis tool. The corresponding GUI setting is **Calculation Span *(only if Frequency Range is set to Fixed Range)* on page 196**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:SPAN<wsp><span>[<unit>] | MIN | MAX
Parameter(s)	➤ *span:* Wavelength or frequency distance (centered on the grid wavelength/frequency) to use for calculation, as float value in the range 0.01 to 100 nm or 0.001 to 12.085 THz. ➤ *unit* Unit of the set value. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or Hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN* Minimum programmable value: 0.01 nm or 0.001 THz ➤ *MAX:* Maximum programmable value: 100 nm or 12.085 THZ
Example(s)	CALC:PAR:IMEAS:SPAN 200PM

CALCulate:PARameters:IMEASurement:SPAN?

Description	This query returns the **Calculation span** parameter set for the WDM Filter test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:IMEASurement:SPAN?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<span>
Response(s)	*span:* Wavelength or frequency distance in meters or Hertz depending on the unit setting (set with command *UNIT:X* on page 556)..
Example(s)	CALC:PAR:IMEAS:SPAN 200PM CALC:PAR:IMEAS:SPAN? returns +2.00000000E-010

CALCulate:PARameters:NW[1...3]:ALGorithm

Description	This command sets the **Algorithm** setting for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool (for more details, see **Notch Width Detection Settings on page 181**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:ALGorithm<wsp> <algorithm>
Parameter(s)	*algorithm:* Algorithm to use for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool. The allowed values are: 0|THReshold: sets the **Threshold** algorithm. 1|GFIT: sets the **Gaussian Fit** algorithm 2|LFIT: sets the **Lorentzian Fit** algorithm.
Example(s)	CALC:PAR:NW1:ALG LFIT

CALCulate:PARameters:NW[1...3]:ALGorithm?

Description	This query returns the algorithm used for the calculation of the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:ALGorithm?
Parameter(s)	None.
Response Syntax	<algorithm>
Response(s)	*algorithm:* Integer corresponding to the algorithm used for calculation of the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool: 0: the **Threshold** algorithm is used. 1: the **Gaussian Fit** algorithm is used. 2: the **Lorentzian Fit** algorithm is used.
Example(s)	CALC:PAR:NW1:ALG LFIT CALC:PAR:NW1:ALG? returns 2

CALCulate:PARameters:NW[1...3]:DISPlay

Description	This command sets the **Display on Graph** setting for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:DISPlay<wsp><state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:NW1:DISP ON CALC:PAR:NW2:DISP ON CALC:PAR:NW3:DISP OFF

CALCulate:PARameters:NW[1...3]:DISPlay?

Description	This query returns the **Display on Graph** setting for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:DISPlay?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:NW2:DISP ON CALC:PAR:NW2:DISP? returns 1

CALCulate:PARameters:NW[1...3]:MULTiplier

Description This command sets the **Multiplier** value for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool (for more details, see **Notch Width Detection Settings on page 181**).

Applicability This command is only available if:

- *CALCulate:MODe* on page 279 is set to PCT.
- *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.

Type Sequential.

Syntax CALCulate:PARameters:NW[1...3]:MULTiplier<wsp><value>| MIN | MAX

Parameter(s)

- *value:*
  Multiplier factor as float value, in the range 1 to 10.
- *MIN:*
  Minimum value: 1 dB.
- *MAX:*
  Maximum value: 10 dB.

Example(s) CALC:PAR:NW1:MULT 3

CALCulate:PARameters:NW[1...3]:MULTiplier?

Description This query returns the **Multiplier** value set for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.

Applicability This query is only available if:

- *CALCulate:MODe* on page 279 is set to PCT.
- *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.

Type Sequential.

Syntax CALCulate:PARameters:NW[1...3]:MULTiplier? [MIN|MAX]

Parameter(s)

- *MIN:*
  The query returns the minimum programmable value.
- *MAX:*
  The query returns the maximum programmable value.

Response Syntax <value>

Response(s) *value:*

Value set for the Multiplier parameter.

Example(s) CALC:PAR:NW1:MULT 3

CALC:PAR:NW1:MULT? returns +3.00000000E+000

CALCulate:PARameters:NW[1...3]:NSELection

Description	This command sets the **Notch Selection** method for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool (for more details, see **Notch Selection Options on page 181**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:NSELection<wsp> <method>
Parameter(s)	*method:* Method to use for the **Notch Selection** parameter. The allowed values are: 0|MTRough: enables the **Minimum Trough** method. 1|DNOTch: enables the **Deepest Notch** method.
Example(s)	CALC:PAR:NW1:NSEL LNOT

CALCulate:PARameters:NW[1...3]:NSELection?

Description	This query returns the **Notch Selection** method set for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:NSELection?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method selected for the notch selection: 0: the **Minimum Trough** method is selected. 1: the **Deepest Notch** method is selected.
Example(s)	CALC:PAR:NW1:NSEL LNOT CALC:PAR:NW1:NSEL? returns 1

CALCulate:PARameters:NW[1...3]:WREFerence

Description	This command sets the **Width Reference** parameter for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool (for more details, see **Notch Selection Options on page 181**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:WREFerence<wsp> <method>
Parameter(s)	*method:* Method to use for the **Width Reference**. The allowed values are: 0|BOTTom: enables the **Bottom** method. 1|TOP: enables the **Top** method.
Example(s)	CALC:PAR:NW1:WREF TOP

CALCulate:PARameters:NW[1...3]:WREFerence?

Description	This query returns the **Width Reference** method set for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:NSELection?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method selected for the measurement of the width: 0: the **Bottom** method is selected. 1: the **Top** method is selected.
Example(s)	CALC:PAR:NW1:WREF TOP CALC:PAR:NW1:WREF? returns 1

CALCulate:PARameters:NW[1...3]:WTHReshold

Description	This command sets the **Width Threshold** value for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool (for more details, see **Notch Width Detection Settings on page 181**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:WTHReshold<wsp><value>|MIN | MAX
Parameter(s)	➤ *value:* Detection threshold for the measurement of width as float value in dB, in the range 0.01 to 50. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:NW1:WTHR 3

CALCulate:PARameters:NW[1...3]:WTHReshold?

Description	This query returns the **Width Threshold** value for the Notch Width 1, Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW[1...3]:WTHReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the Width threshold parameter in dB.
Example(s)	CALC:PAR:NW1:WTHR 3 CALC:PAR:NW1:WTHR? returns +3.00000000E+000

CALCulate:PARameters:NW2|NW3:[:ACTivate]

Description	This command enables/disables the Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW2|3:[:ACTivate]<wsp><state>
Parameter(s)	*state:* Activation state of the Notch Width 2 or Notch Width 3 tool. The allowed values are: 0|OFF: disables the tool. 1|ON: enables the tool.
Example(s)	CALC:PAR:NW2:ACT ON

CALCulate:PARameters:NW2|NW3:[:ACTivate]?

Description	This query returns the activation state of the Notch Width 2 or Notch Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP or ISOL.
Type	Sequential.
Syntax	CALCulate:PARameters:NW2|3:[:ACTivate]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the Notch Width 2 or Notch Width 3 tool: 0: the tool is disabled. 1: the tool is enabled.
Example(s)	CALC:PAR:NW3:ACT OFF CALC:PAR:NW3:ACT? returns 0

CALCulate:PARameters:PBand[:ACTivate]

Description	This command enables/disables the Pass Band analysis tool.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBand[:ACTivate]<wsp><state>
Parameter(s)	*state:* Activation state of the Pass Band tool. The allowed values are: 0|OFF: disables the tool. 1|ON: enables the tool.
Example(s)	CALC:PAR:PBAN:ACT ON

CALCulate:PARameters:PBand[:ACTivate]?

Description	This query returns the activation state of the Pass Band analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBand[:ACTivate]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the Pass Band tool: 0: the tool is disabled. 1: the tool is enabled.
Example(s)	CALC:PAR:PBAN:ACT OFF CALC:PAR:PBAN:ACT? returns 0

CALCulate:PARameters:PBANd:ARANge

Description	This command sets the **Averaging Range** parameter for the Pass Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 185**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:ARANge<wsp><method>
Parameter(s)	*method:* Parameter set as **Averaging Range**, spectral range over which the average loss and ripple are calculated. The allowed values are: 0|FIXed: sets the averaging range to **Fixed Range**. The corresponding fixed span value is defined with the following command *CALCulate:PARameters:PBANd:SPAN* on page 342 1|PBWidth: sets the averaging range to **% Bandwidth 1**. The corresponding percentage is defined with the following command *CALCulate:PARameters:PBANd:PERCentage* on page 339. 2|PTDetection: sets the averaging range to **PT Detection**. The corresponding value is defined with the following command *CALCulate:PARameters:PBANd:THReshold* on page 344.
Example(s)	CALC:PAR:PBAN:ARAN PBW

CALCulate:PARameters:PBANd:ARANge?

Description	This query returns the **Averaging Range** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:ARANge?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method used as **Averaging Range**: 0: the **Fixed Range** parameter is set as averaging range. 1: the **% Bandwidth 1** parameter is set as averaging range. 2: the **PT Detection** parameter is set as averaging range.
Example(s)	CALC:PAR:PBAN:ARAN PBW CALC:PAR:PBAN:ARAN? returns 1

CALCulate:PARameters:PBANd:BDIStance

Description	This command defines the **IN/OUT Band Distance** parameter for the Pass Band Test analysis tool (for more details, see **CrossTalk Settings on page 184**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:PBANd:BMEThod* on page 335 is set to SET.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:BDIStance<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency as float value corresponding to the distance between the in-band reference point and the out-band reference point. ➤ *unit:* Unit of the distance. The allowed values are PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 0.05 nm or 0.006 THz. ➤ *MAX:* Maximum value: 450 nm or 54.384 THz.
Example(s)	CALC:PAR:PBAN:BDIS 5NM

CALCulate:PARameters:PBANd:BDIStance?

Description	This query returns the **IN/OUT Band Distance** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:PBANd:BMEThod* on page 335 is set to SET.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:BDIStance? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency value corresponding to the distance between the in-band reference point and the out-band reference point, as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:PAR:PBAN:BDIS 5NM CALC:PAR:PBAN:BDIS? returns +5.00000000E-009

CALCulate:PARameters:PBANd:BMEThod

Description	This command sets the **IN/OUT Band Method** parameter for the Pass Band Test analysis tool (for more details, see **CrossTalk Settings on page 184**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:BMEThod<wsp><method>
Parameter(s)	*method:* Parameter set as **IN/OUT Band Method**. The allowed values are: 0|BWIDth: sets the **Bandwidth 1** method as in/out band method. The out-band reference points are calculated using the **Spectral Width 1** tool results (see *CALCulate:DATA:SW1?* on page 295). 1|SET: sets the **Set Distance** method as in/out band method. The spacing value is the value defined using *CALCulate:PARameters:PBANd:BDIStance* on page 333.
Example(s)	CALC:PAR:PBAN:BMET BWID

CALCulate:PARameters:PBANd:BMEThod?

Description	This query returns the **IN/OUT Band Method** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:BMEThod?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method used as **IN/OUT Band Method**: 0: **Bandwidth 1** is set as in/out band method. 1: **Set Distance** is set as in/out band method.
Example(s)	CALC:PAR:PBAN:BMET BWID CALC:PAR:PBAN:BMET? returns 0

CALCulate:PARameters:PBANd:DISPlay

Description	This command sets the **Display on Graph** setting for the Pass Band Test analysis tool.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:DISPlay<wsp><state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:PBAN:DISP ON

CALCulate:PARameters:PBANd:DISPlay?

Description	This query returns the **Display on Graph** setting for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:DISPlay?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:PBAN:DISP ON CALC:PAR:PBAN:DISP? returns 1

CALCulate:PARameters:PBANd:EXCLusion:MINimum

Description	This command defines the **Min Exclusion Thresh.** parameter for the Pass Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 187**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:EXCLusion:MINimum<wsp> <value> | MIN | MAX
Parameter(s)	➤ *value:* Minimum threshold in dB above which you want the roll-off to be calculated. ➤ *MIN:* Minimum value: 0 dB. ➤ *MAX:* Maximum value: 19.99 dB.
Example(s)	CALC:PAR:PBAN:EXCL:MIN 3

CALCulate:PARameters:PBANd:EXCLusion:MINimum?

Description	This query returns the **Min Exclusion Thresh.** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:EXCLusion:MINimum? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Minimum threshold in dB above which the roll-off is calculated.
Example(s)	CALC:PAR:PBAN:EXCL:MIN 3 CALC:PAR:PBAN:EXCL:MIN? returns +3.00000000E+000

CALCulate:PARameters:PBANd:EXCLusion:MAXimum

Description	This command defines the **Max Exclusion Thresh.** parameter for the Pass Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 187**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:EXCLusion:MAXimum<wsp><value> | MIN | MAX
Parameter(s)	➤ *value:* Maximum threshold in dB under which you want the roll-off to be calculated. ➤ *MIN:* Minimum value: 3.01 dB. ➤ *MAX:* Maximum value: 100 dB.
Example(s)	CALC:PAR:PBAN:EXCL:MAX 20

CALCulate:PARameters:PBANd:EXCLusion:MAXimum?

Description	This query returns the **Max Exclusion Thresh.** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:EXCLusion:MAXimum? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Maximum threshold in dB under which the roll-off is calculated.
Example(s)	CALC:PAR:PBAN:EXCL:MAX 20 CALC:PAR:PBAN:EXCL:MAX? returns +2.00000000E+001

CALCulate:PARameters:PBANd:PERCentage

Description	This command defines the **% Bandwidth** parameter for the Pass Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 185**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to PBWidth.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:PERCentage<wsp> <percentage> | MIN | MAX
Parameter(s)	➤ *percentage:* Fraction in percent of **Bandwidth 1** calculated from Spectral Width 1 tool (see *CALCulate:DATA:SW1?* on page 295) to be used as a range for average loss and ripple calculation. ➤ *MIN:* Minimum value: 0 %. ➤ *MAX:* Maximum value: 100 %.
Example(s)	CALC:PAR:PBAN:PERC 25.5

CALCulate:PARameters:PBANd:PERCentage?

Description	This query returns the **% Bandwidth** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to PBWidth.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:PERCentage? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<percentage>
Response(s)	*percentage:* Percentage of **Bandwidth 1** calculated from Spectral Width 1 tool used as a range for average loss and ripple calculation.
Example(s)	CALC:PAR:PBAN:PERC 25.5 CALC:PAR:PBAN:PERC? returns +2.55000000E+001

CALCulate:PARameters:PBANd:REFerence

Description	This command sets the **Reference** parameter for the Pass Band Test analysis tool (for more details, see **CrossTalk Settings on page 184**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:REFerence<wsp><point>
Parameter(s)	*point:* In-band point to use as **Reference** point, calculated from the **Spectral Width 1** tool results (see *CALCulate:DATA:SW1?* on page 295). The allowed values are: 0|PEAK: sets the **Peak wavelength** as reference point. 1|CENTer: sets the **Center wavelength** as reference point.
Example(s)	CALC:PAR:PBAN:REF CENT

CALCulate:PARameters:PBANd:REFerence?

Description	This query returns the **Reference** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:REFerence?
Parameter(s)	None.
Response Syntax	<point>
Response(s)	*point:* Integer corresponding to the point used as **Reference** point: 0: the **Peak wavelength** is set as reference point. 1: the **Center wavelength** is set as reference point.
Example(s)	CALC:PAR:PBAN:REF CENT CALC:PAR:PBAN:REF? returns 1

CALCulate:PARameters:PBANd:SPAN

Description	This command defines the **Calculation Span** parameter for the Pass Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 185**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to FIXed.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:SPAN<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency as float value corresponding to the span over which average loss and ripple will be calculated. ➤ *unit:* Unit of the span. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 0 nm or 0 THz. ➤ *MAX:* Maximum value: 100 nm or 12.085 THz.
Example(s)	CALC:PAR:PBAN:SPAN 200PM

CALCulate:PARameters:PBANd:SPAN?

Description	This query returns the **Calculation Span** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to FIXed.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:SPAN? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency value corresponding to the span over which average loss and ripple will be calculated, as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:PAR:PBAN:SPAN 200PM CALC:PAR:PBAN:SPAN? returns +2.00000000E-010

CALCulate:PARameters:PBANd:THReshold

Description	This command defines the **Detection Threshold** parameter for the Pass Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 185**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to PTDetection.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:THReshold<wsp> <value> | MIN | MAX
Parameter(s)	➤ *value:* Threshold in dB for the detection of in-band extreme peaks to be used as averaging range for loss and ripple calculation. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:PBAN:THR 0.2

CALCulate:PARameters:PBANd:THReshold?

Description	This query returns the **Detection Threshold** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS. ➤ *CALCulate:PARameters:PBANd:ARANge* on page 331 is set to PTDetection.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:THReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Detection threshold in dB used as averaging range for loss and ripple calculation.
Example(s)	CALC:PAR:PBAN:THR 0.2 CALC:PAR:PBAN:THR? returns +2.00000000E-001

CALCulate:PARameters:PBANd:TRANsition

Description	This command sets the **Transition Reference** parameter for the Pass Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 187**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:TRANsition<wsp><point>
Parameter(s)	*point:* Parameter set as **Transition Reference**, the reference point used to determine the spectral range over which the roll-off is calculated. The allowed values are: 0|INBand: sets the reference point to **In-Band**. 1|OUTBand: sets the reference point to **Out-Band**.
Example(s)	CALC:PAR:PBAN:TRAN INB

CALCulate:PARameters:PBANd:TRANsition?

Description	This query returns the **Transition Reference** parameter set for the Pass Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:PBANd:TRANsition?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the parameter used as **Transition Reference**: 0: the **In-Band** parameter is set. 1: the **Out-Band** parameter is set.
Example(s)	CALC:PAR:PBAN:TRAN INB CALC:PAR:PBAN:TRAN? returns 0

CALCulate:PARameters:PDL[:ACTivate]

Description	This command enables/disables the PDL Analysis analysis tool.
Applicability	This command is only available if: *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:PDL[:ACTivate]<wsp><state>
Parameter(s)	*state:* Activation state of the PDL Analysis tool. The allowed values are: 0|OFF: disables the tool. 1|ON: enables the tool.
Example(s)	CALC:PAR:PDL:ACT ON

CALCulate:PARameters:PDL[:ACTivate]?

Description	This query returns the activation state of the PDL Analysis analysis tool.
Applicability	This query is only available if: *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:PDL[:ACTivate]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the PDL Analysis tool: 0: the tool is disabled. 1: the tool is enabled.
Example(s)	CALC:PAR:PDL:ACT OFF CALC:PAR:PDL:ACT? returns 0

CALCulate:PARameters:PDL:BPERCentage

Description	This command defines the **% Bandwidth 1** parameter of the **PDL Analysis** analysis tool. The corresponding GUI setting is **% Bandwidth *(only if Frequency Range is set to % Bandwidth 1)* on page 173**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to PBWidt
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:BPERCentage<wsp> <percentage>| MIN | MAX
Parameter(s)	➤ *percentage:* Percentage of bandwidth calculated from Spectral Width 1 (centered on the grid wavelength/frequency) to use for calculation, in the range 0.1 to 100. ➤ *MIN* Minimum programmable value: 0.1 % ➤ *MAX:* Maximum programmable value: 100 %
Example(s)	CALC:PAR:PDL:BPERC 25.5

CALCulate:PARameters:PDL:BPERCentage?

Description	This query returns the **% Bandwidth 1** parameter set for the **PDL Analysis** analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to PBWidth
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:BPERCentage? [MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	*<percentage>*
Response(s)	*percentage:* Percentage of bandwidth calculated from Spectral Width 1 (centered on the grid wavelength/frequency) used for calculation.
Example(s)	CALC:PAR:PDL:BPERCentage 25.5 CALC:PAR:PDL:BPERCentage? returns +2.55000000E+001

CALCulate:PARameters:PDL:CPERCentage

Description	This command defines the **% Channel spacing** parameter of the **PDL Analysis** analysis tool. The corresponding GUI setting is **% Channel *(only if Frequency Range is set to % Channel spacing)* on page 173**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to PCWidth
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:CPERCentage<wsp><percentage>| MIN | MAX
Parameter(s)	➤ *percentage:* Percentage of the channel width to use for calculation, in the range 0.1 to 100. ➤ *MIN* Minimum programmable value: 0.1 % ➤ *MAX:* Maximum programmable value: 100 %
Example(s)	CALC:PAR:PDL:CPERC 30

CALCulate:PARameters:PDL:CPERCentage?

Description	This query returns the **% Channel spacing** parameter set for the **PDL Analysis** analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to PCWidth
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:CPERCentage?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	*<percentage>*
Response(s)	*percentage:* Percentage of the channel width used for calculations.
Example(s)	CALC:PAR:PDL:CPERCentage 50 CALC:PAR:PDL:CPERCentage? returns +5.00000000E+001

CALCulate:PARameters:PDL:RANGe

Description	This command defines the **Frequency Range** parameter for the **PDL Analysis** analysis tool. The corresponding GUI setting is **Frequency Range on page 172**.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:RANGe<wsp><method>
Parameter(s)	*method:* Method used to define the spectral range from which the maximum PDL level is measured. The allowed values are: 0|FIXed: a fixed span is used to define the spectral range. It is set using the command *CALCulate:PARameters:PDL:SPAN* on page 353. 1|PBWidth: a percentage of bandwidth is used to define the spectral range, calculated using Spectral Width 1. It is set using the command *CALCulate:PARameters:PDL:BPERCentage* on page 348. 2|PCWidth: a percentage of the channel bandwidth is used to define the spectral range. It is set using the command *CALCulate:PARameters:PDL:CPERCentage* on page 350.
Example(s)	CALC:PAR:PDL:RANG PBW

CALCulate:PARameters:PDL:RANGe?

Description	This query returns the **Frequency Range** parameter set for the **PDL Analysis** analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:RANGe?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Integer representing the method used to define the spectral range from which the maximum PDL level is measured.
Example(s)	CALC:PAR:PDL:RANG PBW CALC:PAR:PDL:RANG? returns 1

CALCulate:PARameters:PDL:SPAN

Description	This command defines the **Calculation Span** parameter of the **PDL Analysis** analysis tool. The corresponding GUI setting is **Calculation Span *(only if Frequency Range is set to Fixed Range)* on page 173**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:SPAN<wsp><span>[<unit>] | MIN | MAX
Parameter(s)	➤ *span:* Wavelength or frequency distance (centered on the grid wavelength/frequency) to use for calculation, as float value in the range 0.01 to 100 nm or 0.001 to 12.085 THz. ➤ *unit* Unit of the set value. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or Hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN* Minimum programmable value: 0.01 nm or 0.001 THz ➤ *MAX:* Maximum programmable value: 100 nm or 12.085 THZ
Example(s)	CALC:PAR:PDL:SPAN 200PM

CALCulate:PARameters:PDL:SPAN?

Description	This query returns the **Calculation span** parameter set for the **PDL Analysis** analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:PDL:RANGe* on page 352 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:PDL:SPAN?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<span>
Response(s)	*span:* Wavelength or frequency distance in meters or Hertz depending on the unit setting (set with command *UNIT:X* on page 556)..
Example(s)	CALC:PAR:PDL:SPAN 200PM CALC:PAR:PDL:SPAN? returns +2.00000000E-010

CALCulate:PARameters:PTSearch:ANTHreshold

Description	This command enable/disables the **Auto Noise Threshold** function for the Peak Trough Search analysis tool (see **Auto Noise Threshold on page 165**).
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:ANTHreshold<wsp><state>
Parameter(s)	*state:* Activation state of the **Auto Noise Threshold** function. The allowed values are: 0|OFF: disables the function. 1|ON: enables the function.
Example(s)	CALC:PAR:PTS:ANTH ON

CALCulate:PARameters:PTSearch:ANTHreshold?

Description	This query returns the activation state of the **Auto Noise Threshold** function for the Peak Trough Search analysis tool.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:ANTHreshold?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the **Auto Noise Threshold** function: 0: the function is disabled. 1: the function is enabled.
Example(s)	CALC:PAR:PTS:ANTH ON CALC:PAR:PTS:ANTH? returns 1

CALCulate:PARameters:PTSearch:DISPlay[:STATe]

Description	This command sets the **Display on Graph** setting for the Peak Trough Search analysis tool. The corresponding GUI setting is **Display on Graph on page 165**.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:DISPlay[:STATe]<wsp> <state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:PTS:DISP[:STAT] ON

CALCulate:PARameters:PTSearch:DISPlay[:STATe]?

Description	This query returns the **Display on Graph** setting for the Peak Trough Search analysis tool.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:DISPlay[:STATe]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:PTS:DISP[:STAT] ON CALC:PAR:PTS:DISP[:STAT]? returns 1

CALCulate:PARameters:PTSearch:DISPlay:SHOW

Description	This command sets the **Show** setting for the Peak Trough Search analysis tool (see **Display on Graph on page 165**).
Applicability	This command is only available if *CALCulate:PARameters:PTSearch:DISPlay[:STATe]* on page 356 is set to ON.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:DISPlay:SHOW<wsp><type>
Parameter(s)	*type:* Type of graphical item to display on graph. The allowed values are: 0|PEAKs: displays graphical items on peaks. 1|TROughs: displays graphical items on troughs. 2|BOTH: displays graphical items on peaks and troughs.
Example(s)	CALC:PAR:PTS:DISP:SHOW TRO

CALCulate:PARameters:PTSearch:DISPlay:SHOW?

Description	This query returns the setting of the **Show** parameter for the Peak Trough Search analysis tool.
Applicability	This query is only available if *CALCulate:PARameters:PTSearch:DISPlay[:STATe]* on page 356 is set to ON.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:DISPlay:SHOW?
Parameter(s)	None.
Response Syntax	<type>
Response(s)	*type:* Integer corresponding to the type of graphical item that is displayed on graph for the Peak Trough Search analysis tool: 0: graphical items are displayed on peaks. 1: graphical items are displayed on troughs. 2: graphical items are displayed on peaks and troughs.
Example(s)	CALC:PAR:PTS:DISP:SHOW TRO CALC:PAR:PTS:DISP:SHOW? returns 1

CALCulate:PARameters:PTSearch:MTHReshold

Description	This command sets the **Mode Treshold** value for the Peak Trough Search analysis tool (see **Mode Threshold on page 164**).
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:MTHReshold<wsp><value>| MIN | MAX
Parameter(s)	➤ *value:* Mode threshold as float value in dB, in the range 0.01 to 100. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 100 dB.
Example(s)	CALC:PAR:PTS:MTHR 20

CALCulate:PARameters:PTSearch:MTHReshold?

Description	This query returns the **Mode Threshold** value for the Peak Trough Search analysis tool.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:MTHReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the Mode threshold parameter in dB.
Example(s)	CALC:PAR:PTS:MTHR 20 CALC:PAR:PTS:MTHR? returns +2.00000000E+001

CALCulate:PARameters:PTSearch:PTTHreshold

Description	This command sets the **PT Threshold** value for the Peak Trough Search analysis tool (see **PT Threshold on page 164**).
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:PTTHreshold<wsp><value>| MIN | MAX
Parameter(s)	➤ *value:* PT threshold as float value in dB, in the range 0.01 to 50. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:PTS:PTTH 3

CALCulate:PARameters:PTSearch:PTTHreshold?

Description	This query returns the **PT Threshold** value for the Peak Trough Search analysis tool.
Type	Sequential.
Syntax	CALCulate:PARameters:PTSearch:PTTHreshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the PT threshold parameter in dB.
Example(s)	CALC:PAR:PTS:PTTH 3 CALC:PAR:PTS:PTTH? returns +3.00000000E+000

CALCulate:PARameters:SBand[:ACTivate]

Description
This command enables/disables the Stop Band analysis tool.

Applicability
This command is only available if:

- *CALCulate:MODe* on page 279 is set to PCT.
- *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.

Type
Sequential.

Syntax
CALCulate:PARameters:SBand[:ACTivate]<wsp><state>

Parameter(s)
state:

Activation state of the Stop Band tool. The allowed values are:

0|OFF: disables the tool.

1|ON: enables the tool.

Example(s)
CALC:PAR:SBAN:ACT ON

CALCulate:PARameters:SBand[:ACTivate]?

Description
This query returns the activation state of the Stop Band analysis tool.

Applicability
This query is only available if:

- *CALCulate:MODe* on page 279 is set to PCT.
- *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.

Type
Sequential.

Syntax
CALCulate:PARameters:SBand[:ACTivate]?

Parameter(s)
None.

Response Syntax
<state>

Response(s)
state:

Integer corresponding to the activation state set for the Stop Band tool:

0: the tool is disabled.

1: the tool is enabled.

Example(s)
CALC:PAR:SBAN:ACT OFF

CALC:PAR:SBAN:ACT? returns 0

CALCulate:PARameters:SBANd:ARANge

Description	This command sets the **Averaging Range** parameter for the Stop Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 191**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:ARANge<wsp><method>
Parameter(s)	*method:* Parameter set as **Averaging Range**, spectral range over which the average loss and ripple are calculated. The allowed values are: 0|FIXed: sets the averaging range to **Fixed Range**. The corresponding fixed span value is defined with the following command *CALCulate:PARameters:SBANd:SPAN* on page 373 1|PBWidth: sets the averaging range to **% Bandwidth 1**. The corresponding percentage is defined with the following command *CALCulate:PARameters:SBANd:PERCentage* on page 370. 2|PTDetection: sets the averaging range to **PT Detection**. The corresponding value is defined with the following command *CALCulate:PARameters:SBANd:THReshold* on page 375.
Example(s)	CALC:PAR:SBAN:ARAN PBW

CALCulate:PARameters:SBANd:ARANge?

Description	This query returns the **Averaging Range** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:ARANge?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method used as **Averaging Range**: 0: the **Fixed Range** parameter is set as averaging range. 1: the **% Bandwidth 1** parameter is set as averaging range. 2: the **PT Detection** parameter is set as averaging range.
Example(s)	CALC:PAR:SBAN:ARAN PBW CALC:PAR:SBAN:ARAN? returns 1

CALCulate:PARameters:SBANd:BDIStance

Description	This command defines the **IN/OUT Band Distance** parameter for the Stop Band Test analysis tool (for more details, see **Isolation Depth Settings on page 190**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:BMETHod* on page 365 is set to SET.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:BDIStance<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency as float value corresponding to the distance between the in-band reference point and the out-band reference point. ➤ *unit:* Unit of the distance. The allowed values are PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 0.05 nm or 0.006 THz. ➤ *MAX:* Maximum value: 450 nm or 54.384 THz.
Example(s)	CALC:PAR:SBAN:BDIS 5NM

CALCulate:PARameters:SBANd:BDIStance?

Description	This query returns the **IN/OUT Band Distance** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:BMEThod* on page 365 is set to SET.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:BDIStance? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency value corresponding to the distance between the in-band reference point and the out-band reference point, as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:PAR:SBAN:BDIS 5NM CALC:PAR:SBAN:BDIS? returns +5.00000000E-009

CALCulate:PARameters:SBANd:BMETHod

Description	This command sets the **IN/OUT Band Method** parameter for the Stop Band Test analysis tool (for more details, see **Isolation Depth Settings on page 190**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:BMETHod<wsp><method>
Parameter(s)	*method:* Parameter set as **IN/OUT Band Method**. The allowed values are: 0|BWIDth: sets the **Bandwidth 1** method as in/out band method. The out-band reference points are calculated using the **Notch Width 1** tool results (see *CALCulate:DATA:NW1?* on page 289). 1|SET: sets the **Set Distance** method as in/out band method. The spacing value is the value defined using *CALCulate:PARameters:SBANd:BDIStance* on page 363.
Example(s)	CALC:PAR:SBAN:BMET BWID

CALCulate:PARameters:SBANd:BMETHod?

Description	This query returns the **IN/OUT Band Method** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:BMETHod?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method used as **IN/OUT Band Method**: 0: **Bandwidth 1** is set as in/out band method. 1: **Set Distance** is set as in/out band method.
Example(s)	CALC:PAR:SBAN:BMET BWID CALC:PAR:SBAN:BMET? returns 0

CALCulate:PARameters:SBANd:DISPlay

Description	This command sets the **Display on Graph** setting for the Stop Band Test analysis tool.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:DISPlay<wsp><state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:SBAN:DISP ON

CALCulate:PARameters:SBANd:DISPlay?

Description	This query returns the **Display on Graph** setting for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:DISPlay?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:SBAN:DISP ON CALC:PAR:SBAN:DISP? returns 1

CALCulate:PARameters:SBANd:EXCLusion:MAXimum

Description	This command defines the **Max Exclusion Thresh.** parameter for the Stop Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 193**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:EXCLusion:MAXimum<wsp><value> | MIN | MAX
Parameter(s)	➤ *value:* Maximum threshold in dB under which you want the roll-off to be calculated. ➤ *MIN:* Minimum value: 3.01 dB. ➤ *MAX:* Maximum value: 100 dB.
Example(s)	CALC:PAR:SBAN:EXCL:MAX 20

CALCulate:PARameters:SBANd:EXCLusion:MAXimum?

Description	This query returns the **Max Exclusion Thresh.** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:EXCLusion:MAXimum? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Maximum threshold in dB under which the roll-off is calculated.
Example(s)	CALC:PAR:SBAN:EXCL:MAX 20 CALC:PAR:SBAN:EXCL:MAX? returns +2.00000000E+001

CALCulate:PARameters:SBANd:EXCLusion:MINimum

Description	This command defines the **Min Exclusion Thresh.** parameter for the Stop Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 193**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:EXCLusion:MINimum<wsp><value> | MIN | MAX
Parameter(s)	➤ *value:* Minimum threshold in dB above which you want the roll-off to be calculated. ➤ *MIN:* Minimum value: 0 dB. ➤ *MAX:* Maximum value: 19.99 dB.
Example(s)	CALC:PAR:SBAN:EXCL:MIN 3

CALCulate:PARameters:SBANd:EXCLusion:MINimum?

Description	This query returns the **Min Exclusion Thresh.** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:EXCLusion:MINimum?[MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Minimum threshold in dB above which the roll-off is calculated.
Example(s)	CALC:PAR:SBAN:EXCL:MIN 3 CALC:PAR:SBAN:EXCL:MIN? returns +3.00000000E+000

CALCulate:PARameters:SBANd:PERCentage

Description	This command defines the **% Bandwidth** parameter for the Stop Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 191**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to PBWidth.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:PERCentage<wsp> <percentage> | MIN | MAX
Parameter(s)	➤ *percentage:* Fraction in percent of **Bandwidth 1** calculated from Notch Width 1 tool (see *CALCulate:DATA:NW1?* on page 289) to be used as a range for average loss and ripple calculation. ➤ *MIN:* Minimum value: 0 %. ➤ *MAX:* Maximum value: 100 %.
Example(s)	CALC:PAR:SBAN:PERC 25.5

CALCulate:PARameters:SBANd:PERCentage?

Description	This query returns the **% Bandwidth** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to PBWidth.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:PERCentage? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<percentage>
Response(s)	*percentage:* Percentage of **Bandwidth 1** calculated from Notch Width 1 tool used as a range for average loss and ripple calculation.
Example(s)	CALC:PAR:SBAN:PERC 25.5 CALC:PAR:SBAN:PERC? returns +2.55000000E+001

CALCulate:PARameters:SBANd:REFerence

Description	This command sets the **Reference** parameter for the Stop Band Test analysis tool (for more details, see **Isolation Depth Settings on page 190**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:REFerence<wsp><point>
Parameter(s)	*point:* In-band point to use as **Reference** point, calculated from the **Notch Width 1** tool results (see *CALCulate:DATA:NW1?* on page 289). The allowed values are: 0|TROUgh: sets the **Trough wavelength** as reference point. 1|CENTer: sets the **Center wavelength** as reference point.
Example(s)	CALC:PAR:SBAN:REF TROU

CALCulate:PARameters:SBANd:REFerence?

Description	This query returns the **Reference** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:REFerence?
Parameter(s)	None.
Response Syntax	<point>
Response(s)	*point:* Integer corresponding to the point used as **Reference** point: 0: the **Trough wavelength** is set as reference point. 1: the **Center wavelength** is set as reference point.
Example(s)	CALC:PAR:SBAN:REF CENT CALC:PAR:SBAN:REF? returns 1

CALCulate:PARameters:SBANd:SPAN

Description	This command defines the **Calculation Span** parameter for the Stop Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 191**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to FIXed.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:SPAN<wsp><value>[<unit>] | MIN | MAX
Parameter(s)	➤ *value:* Wavelength or frequency as float value corresponding to the span over which average loss and ripple will be calculated, followed by the wanted unit. ➤ *unit:* Unit of the span value. The allowed values are PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN:* Minimum value: 0 nm or 0 THz. ➤ *MAX:* Maximum value: 100 nm or 12.085 THz.
Example(s)	CALC:PAR:SBAN:SPAN 200PM

CALCulate:PARameters:SBANd:SPAN?

Description	This query returns the **Calculation Span** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to FIXed.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:SPAN? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency value corresponding to the span over which average loss and ripple will be calculated, as float value in meters or Hertz depending on the unit setting (see *UNIT:X* on page 556).
Example(s)	CALC:PAR:SBAN:SPAN 200PM CALC:PAR:SBAN:SPAN? returns +2.00000000E-010

CALCulate:PARameters:SBANd:THReshold

Description	This command defines the **Detection Threshold** parameter for the Stop Band Test analysis tool (for more details, see **Average Loss & Ripple Settings on page 191**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to PTDetection.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:THReshold<wsp> <value> | MIN | MAX
Parameter(s)	➤ *value:* Threshold in dB for the detection of in-band extreme peaks to be used as averaging range for loss and ripple calculation. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:SBAN:THR 0.2

CALCulate:PARameters:PBANd:THReshold?

Description	This query returns the **Detection Threshold** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP. ➤ *CALCulate:PARameters:SBANd:ARANge* on page 361 is set to PTDetection.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:THReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Detection threshold in dB used as averaging range for loss and ripple calculation.
Example(s)	CALC:PAR:SBAN:THR 0.2 CALC:PAR:SBAN:THR? returns +2.00000000E-001

CALCulate:PARameters:SBANd:TRANsition

Description	This command sets the **Transition Reference** parameter for the Stop Band Test analysis tool (for more details, see **Roll-Off & Transition Band Settings on page 193**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:TRANsition<wsp><point>
Parameter(s)	*point:* Parameter set as **Transition Reference**, the reference point used to determine the spectral range over which the roll-off is calculated. The allowed values are: 0|INBand: sets the reference point to **In-Band**. 1|OUTBand: sets the reference point to **Out-Band**.
Example(s)	CALC:PAR:SBAN:TRAN INB

CALCulate:PARameters:SBANd:TRANsition?

Description	This query returns the **Transition Reference** parameter set for the Stop Band Test analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to STOP.
Type	Sequential.
Syntax	CALCulate:PARameters:SBANd:TRANsition?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the parameter used as **Transition Reference**: 0: the **In-Band** parameter is set. 1: the **Out-Band** parameter is set.
Example(s)	CALC:PAR:SBAN:TRAN INB CALC:PAR:SBAN:TRAN? returns 0

CALCulate:PARameters:SW[1...3]:ALGorithm

Description	This command sets the **Algorithm** setting for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Spectral Width Detection Settings *(PCT analysis mode)* on page 175**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:ALGorithm<wsp><algorithm>
Parameter(s)	*algorithm:* Algorithm to use for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool. The allowed values are: 0|THReshold: sets the **Threshold** algorithm. 1|ENVelope: sets the **Envelope** algorithm. 2|RMS: sets the **RMS** algorithm. 3|RMSPeak: sets the **RMS Peak** algorithm. 4|GFIT: sets the **Gaussian Fit** algorithm. 5|LFIT: sets the **Lorentzian Fit** algorithm.
Example(s)	CALC:PAR:SW1:ALG GFIT

CALCulate:PARameters:SW[1...3]:ALGorithm?

Description	This query returns the algorithm used for the calculation of the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:ALGorithm?
Parameter(s)	None.
Response Syntax	<algorithm>
Response(s)	*algorithm:* Integer corresponding to the algorithm used for calculation of the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool: 0: the **Threshold** algorithm is used. 1: the **Envelope** algorithm is used. 2: the **RMS** algorithm is used. 3: the **RMS Peak** algorithm is used. 4: the **Gaussian Fit** algorithm is used. 5: the **Lorentzian Fit** algorithm is used.
Example(s)	CALC:PAR:SW1:ALG GFIT CALC:PAR:SW1:ALG? returns 4

CALCulate:PARameters:SW[1...3]:DISPlay

Description	This command sets the **Display on Graph** setting for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This command is only available if *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:DISPlay<wsp><state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:SW1:DISP ON CALC:PAR:SW2:DISP ON CALC:PAR:SW3:DISP OFF

CALCulate:PARameters:SW[1...3]:DISPlay?

Description	This query returns the **Display on Graph** setting for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:DISPlay?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:SW2:DISP ON CALC:PAR:SW2:DISP? returns 1

CALCulate:PARameters:SW[1...3]:FMODe

Description	This command enables/disables the **Fit to Mode** function for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Fitting Options on page 177**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 (for the corresponding tool) is set to THReshold. ➤ *CALCulate:PARameters:SW[1...3]:MANalysis* on page 382 (for the corresponding tool) is set to ON.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:FMODe<wsp><state>
Parameter(s)	*state:* Activation state of the **Fit to Mode** function. The allowed values are: 0|OFF: disables the function. 1|ON: enables the function.
Example(s)	CALC:PAR:SW1:FMOD ON

CALCulate:PARameters:SW[1...3]:FMODe?

Description	This query returns the activation state of the **Fit to Mode** function for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 (for the corresponding tool) is set to THReshold. ➤ *CALCulate:PARameters:SW[1...3]:MANalysis* on page 382 (for the corresponding tool) is set to ON.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:FMODe?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the **Fit to Mode** function: 0: the function is disabled. 1: the function is enabled.
Example(s)	CALC:PAR:SW1:FMOD ON CALC:PAR:SW1:FMOD? returns 1

CALCulate:PARameters:SW[1...3]:MANalysis

Description	This command enables/disables the **Modal Analysis** function for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Fitting Options on page 177**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 (for the corresponding tool) is set to THReshold, GFIT or LFIT.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MANalysis<wsp><state>
Parameter(s)	*state:* Activation state of the **Modal Analysis** function. The allowed values are: 0|OFF: disables the function. 1|ON: enables the function.
Example(s)	CALC:PAR:SW1:MAN ON

CALCulate:PARameters:SW[1...3]:MANalysis?

Description	This query returns the activation state of the **Modal Analysis** function for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 (for the corresponding tool) is set to THReshold, GFIT or LFIT.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MANalysis?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the **Modal Analysis** function: 0: the function is disabled. 1: the function is enabled.
Example(s)	CALC:PAR:SW1:MAN OFF CALC:PAR:SW1:MAN? returns 0

CALCulate:PARameters:SW[1...3]:METhod

Description	This command sets the **Method** setting for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Spectral Width Detection Settings *(PCT WDM analysis mode)* on page 178**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:METhod<wsp><method>
Parameter(s)	*method:* Bandwidth calculation method to use for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool. The allowed values are: 0|WTHReshold: sets the calculation method to **Width at Threshold**. 1|G671: sets the calculation method to **ITU-T G.671**.
Example(s)	CALC:PAR:SW1:MET G671

CALCulate:PARameters:SW[1...3]:METhod?

Description	This query returns the bandwidth calculation method used for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:METhod?
Parameter(s)	None.
Response Syntax	<method>
Response(s)	*method:* Integer corresponding to the method used for bandwidth calculation of the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool: 0: the **Width at Threshold** method is used. 1: the **ITU-T G.671** method is used.
Example(s)	CALC:PAR:SW1:MET G671 CALC:PAR:SW1:MET? returns 1

CALCulate:PARameters:SW[1...3]:MULTiplier

Description	This command sets the **Multiplier** value for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Spectral Width Detection Settings *(PCT analysis mode)* on page 175**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MULTiplier<wsp><value>| MIN | MAX
Parameter(s)	➤ *value:* Multiplier factor as float value, in the range 1 to 10. ➤ *MIN:* Minimum value: 1. ➤ *MAX:* Maximum value: 10.
Example(s)	CALC:PAR:SW1:MULT 2.45

CALCulate:PARameters:SW[1...3]:MULTiplier?

Description	This query returns the **Multiplier** value set for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to PCT. ➤ *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MULTiplier? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the Multiplier parameter.
Example(s)	CALC:PAR:SW1:MULT 2.45 CALC:PAR:SW1:MULT? returns +2.45000000E+000

CALCulate:PARameters:SW[1...3]:MTHReshold

Description	This command sets the **Mode Threshold** value for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Spectral Width Detection Settings *(PCT analysis mode)* on page 175**).
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 *is set to PCT.* ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 (for the corresponding tool) is set to ENVelope, GFIT or LFIT.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MTHReshold<wsp><value>|MIN | MAX
Parameter(s)	➤ *value:* Mode detection threshold as float value in dB, in the range 0.01 to 50. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:SW1:MTHR 40

CALCulate:PARameters:SW[1...3]:MTHReshold?

Description	This query returns the **Mode Threshold** value for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 *is set to PCT.* ➤ *CALCulate:PARameters:SW[1...3]:ALGorithm* on page 378 *(for the corresponding tool) is set to ENVelope, GFIT or LFIT.*
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:MTHReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the Mode threshold parameter in dB.
Example(s)	CALC:PAR:SW1:MTHR 40 CALC:PAR:SW1:MTHR? returns +4.00000000E+001

CALCulate:PARameters:SW[1...3]:WTHReshold

Description	This command sets the **Width Threshold** value for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool (for more details, see **Spectral Width Detection Settings *(PCT analysis mode)* on page 175**).
Applicability	This command is only available if *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:WTHReshold<wsp> <value>| MIN | MAX
Parameter(s)	➤ *value:* Detection threshold for the measurement of width as float value in dB, in the range 0.01 to 50. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:SW1:WTHR 10

CALCulate:PARameters:SW[1...3]:WTHReshold?

Description	This query returns the **Width Threshold** value for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW[1...3]:WTHReshold? [MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<value>
Response(s)	*value:* Value set for the Width threshold parameter in dB.
Example(s)	CALC:PAR:SW1:WTHR 10 CALC:PAR:SW1:WTHR? returns +1.00000000E+001

CALCulate:PARameters:SW2|SW3:[:ACTivate]

Description	This command enables/disables the Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This command is only available if: *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW2|SW3:[:ACTivate]<wsp><state>
Parameter(s)	*state:* Activation state of the Spectral Width 2 or Spectral Width 3 tool. The allowed values are: 0|OFF: disables the tool. 1|ON: enables the tool.
Example(s)	CALC:PAR:SW2:ACT ON

CALCulate:PARameters:SW2|SW3:[:ACTivate]?

Description	This query returns the activation state of the Spectral Width 2 or Spectral Width 3 analysis tool.
Applicability	This query is only available if: *CALCulate:PARameters:CSELector:TYPE* on page 314 is set to PASS.
Type	Sequential.
Syntax	CALCulate:PARameters:SW2|SW3:[:ACTivate]?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Integer corresponding to the activation state set for the Spectral Width 2 or Spectral Width 3 tool: 0: the tool is disabled. 1: the tool is enabled.
Example(s)	CALC:PAR:SW3:ACT OFF CALC:PAR:SW3:ACT? returns 0

CALCulate:PARameters:WDMChannel:BAND

Description	This command sets the **Band** setting for the Channel Detection analysis tool set to ITU Grid. The corresponding GUI setting is **Band on page 170**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to ITU.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:BAND<wsp><band>
Parameter(s)	*band:* Band value for the ITU grid. The allowed values are: 0|C-BAND: sets the ITU grid band to C-band. 1|L-BAND: sets the ITU grid band to L-band.
Example(s)	CALC:PAR:WDMC:BAND C-BAND

CALCulate:PARameters:WDMChannel:BAND?

Description	This query returns the **Band** setting for the Channel Detection analysis tool set to ITU Grid.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to ITU.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:BAND?
Parameter(s)	None.
Response Syntax	*<band>*
Response(s)	*band:* Integer corresponding to the ITU grid band in use: 0: the ITU grid is set to C-band. 1: the ITU grid is set to L-band.
Example(s)	CALC:PAR:WDMC:BAND L-BAND CALC:PAR:WDMC:BAND? returns 1

CALCulate:PARameters:WDMChannel:BTHReshold

Description	This command sets the **Bandwidth Threshold** setting for the Channel Detection analysis tool. The corresponding GUI setting is *Bandwidth Threshold*.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:BTHReshold<wsp><*threshold*>|MIN|MAX
Parameter(s)	➤ *threshold:* Detection threshold in dB for the calculation of the central wavelength/frequency of the channel's signal, in the range 0.01 to 50. ➤ *MIN:* Minimum value: 0.01 dB. ➤ *MAX:* Maximum value: 50 dB.
Example(s)	CALC:PAR:WDMC:BTHR 3

CALCulate:PARameters:WDMChannel:BTHReshold?

Description	This query returns the **Bandwidth Threshold** setting for the Channel Detection analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:BTHReshold?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<*threshold*>
Response(s)	*threshold:* Threshold as float value in dB.
Example(s)	CALC:PAR:WDMC:BTHReshold 3 CALC:PAR:WDMC:BTHReshold? returns +3.00000000E+000

CALCulate:PARameters:WDMChannel:DISPlay

Description	This command sets the **Display on Graph** setting for the Channel Detection analysis tool.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:DISPlay<wsp><state>
Parameter(s)	*state:* State of the analysis graphical items visibility on graph. The allowed values are: 0|OFF: makes the analysis graphical items invisible on graph. 1|ON: displays the analysis graphical items on graph.
Example(s)	CALC:PAR:WDMC:DISP ON

CALCulate:PARameters:WDMChannel:DISPlay?

Description	This query returns the **Display on Graph** setting for the Pass Band Test analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:DISPlay?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the analysis graphical items visibility on graph: 0: the analysis graphical items are not displayed on graph. 1: the analysis graphical items are displayed on graph.
Example(s)	CALC:PAR:WDMC:DISP ON CALC:PAR:WDMC:DISP? returns 1

CALCulate:PARameters:WDMChannel:ECHannels

Description	This command sets the **Empty Channel** setting for the Channel Detection analysis tool. The corresponding GUI setting is *Empty Channels*.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:ECHannels<wsp><*display*>
Parameter(s)	*display:* State of the channel visibility in the analysis result table. The allowed values are: 0|HIDE: hides the empty channels from the analysis result table. 1|SHOW: shows the empty channels in the analysis result table.
Example(s)	CALC:PAR:WDMC:ECH HIDE

CALCulate:PARameters:WDMChannel:ECHannels?

Description	This query returns the **Empty Channel** setting for the Channel Detection analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:ECHannels?
Parameter(s)	None.
Response Syntax	<*display*>
Response(s)	*display:* Integer corresponding to the channel visibility in the result table: 0: the empty channels are hidden. 1: the empty channels are shown.
Example(s)	CALC:PAR:WDMC:ECH HIDE CALC:PAR:WDMC:ECH? returns 0

CALCulate:PARameters:WDMChannel:FCHannel

Description	This command sets the **First Channel** setting for the Channel Detection analysis tool set to CWDM Grid. The corresponding GUI setting is **First Channel on page 170**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CWDM.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:FCHannel<wsp><channel>
Parameter(s)	*channel:* Center wavelength of the first channel of the CWDM grid. The allowed values are: 0|1270nm: sets the first channel to 1270 nm. 1|1271nm: sets the first channel to 1271 nm.
Example(s)	CALC:PAR:WDMC:FCH 1270nm

CALCulate:PARameters:WDMChannel:FCHannel?

Description	This query returns the **First Channel** setting for the Channel Detection analysis tool set to CWDM Grid.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CWDM.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:FCHannel?
Parameter(s)	None.
Response Syntax	*<band>*
Response(s)	*band:* Integer corresponding to the center wavelength of the first channel of the CWDM grid: 0: the first channel is set to 1270 nm. 1: the first channel is set to 1271 nm.
Example(s)	CALC:PAR:WDMC:FCH 1271nm CALC:PAR:WDMC:FCH? returns 1

CALCulate:PARameters:WDMChannel:GSPacing

Description	This command sets the **Grid Spacing** setting for the Channel Detection analysis tool. The corresponding GUI setting is **Grid Spacing on page 169**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CGRID.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:GSPacing<wsp><*spacing*>|MIN|MAX
Parameter(s)	➤ *spacing:* Grid spacing in GHz, in the range 1 to 200. ➤ *MIN:* Minimum value: 1 dB. ➤ *MAX:* Maximum value: 200 dB.
Example(s)	CALC:PAR:WDMC:GSP 12.5

CALCulate:PARameters:WDMChannel:GSPacing?

Description	This query returns the **Grid Spacing** setting for the Channel Detection analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CGRID.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:GSPacing?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<*threshold*>
Response(s)	*threshold:* Grid Spacing as float value in Hz.
Example(s)	CALC:PAR:WDMC:GSP 12.5 CALC:PAR:WDMC:GSP? returns +1.25000000E+010

CALCulate:PARameters:WDMChannel:MODe

Description	This command sets the **WDM Channel Mode** setting for the Channel Detection analysis tool. The corresponding GUI setting is **WDM Display Mode on page 168**.
Applicability	This command is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:MODe<wsp><mode>
Parameter(s)	*mode:* Method used for WDM channel detection. The allowed values are: 0|CGRID: sets the **Custom Grid** as WDM channel detection method. 1|ITU: sets the **ITU Grid** as WDM channel detection method. 2|CWDM: set the **CWDM** grid as WDM channel detection method.
Example(s)	CALC:PAR:WDMC:MOD CGRID

CALCulate:PARameters:WDMChannel:MODe?

Description	This query returns the **WDM Channel Mode** setting for the Channel Detection analysis tool.
Applicability	This query is only available if *CALCulate:MODe* on page 279 is set to WPCT.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:MODe?
Parameter(s)	None.
Response Syntax	<mode>
Response(s)	*mode:* Integer corresponding to the method used for WDM channel detection: 0: the **Custom Grid** is set as WDM channel detection method. 1: the **ITU Grid** is set as WDM channel detection method. 2: the **CWDM** grid is set as WDM channel detection method.
Example(s)	CALC:PAR:WDMC:MOD ITU CALC:PAR:WDMC:MOD? returns 2

CALCulate:PARameters:WDMChannel:RFRequency

Description This command sets the **Reference Frequency** setting for the Channel Detection analysis tool set to Custom Grid.

The corresponding GUI setting is **Reference Frequency on page 169**.

Applicability This command is only available if:

- *CALCulate:MODe* on page 279 is set to WPCT.
- *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CGRID.

Type Sequential.

Syntax CALCulate:PARameters:WDMChannel:RFRequency<wsp><*value*>|MIN|MAX

Parameter(s)

- *value:*
  Reference frequency as float value in THz to use for the calculation of the grid channels, in the range 178.4479 to 241.7681 THz.
- *MIN:*
  Minimum value: 178.4479 THz.
- *MAX:*
  Maximum value: 241.7681 THz.

Example(s) CALC:PAR:WDMC:RFR 193.1

CALCulate:PARameters:WDMChannel:RFRequency?

Description This query returns the **Reference Frequency** setting for the Channel Detection analysis tool.

Applicability This query is only available if:

- *CALCulate:MODe* on page 279 is set to WPCT.
- *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to CGRID.

Type Sequential.

Syntax CALCulate:PARameters:WDMChannel:RFRequency?[MIN|MAX]

Parameter(s)

- MIN
  The query returns the minimum programmable value.
- MAX
  The query returns the maximum programmable value.

Response Syntax <*value*>

Response(s) *value:*

Reference frequency as float value in Hz.

Example(s) CALC:PAR:WDMC:RFR 193.1

CALC:PAR:WDMC:RFR? returns +1.93100000E+014

CALCulate:PARameters:WDMChannel:SPACing

Description	This command sets the **Spacing** setting for the Channel Detection analysis tool set to ITU Grid. The corresponding GUI setting is **Spacing on page 170**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to ITU.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:SPACing<wsp><*spacing*>
Parameter(s)	*spacing:* Grid spacing value for the ITU grid. The allowed values are: 0|25GHz: sets the spacing value for the ITU grid to 25 GHz. 1|50GHz: sets the spacing value for the ITU grid to 50 GHz. 2|100GHz: sets the spacing value for the ITU grid to 100GHz. 3|200GHz: sets the spacing value for the ITU grid to 200 GHz.
Example(s)	CALC:PAR:WDMC:SPAC 25GHz

CALCulate:PARameters:WDMChannel:SPACing?

Description	This query returns the **Spacing** setting for the Channel Detection analysis tool set to ITU Grid.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT. ➤ *CALCulate:PARameters:WDMChannel:MODe* on page 395 is set to ITU.
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:SPACing?
Parameter(s)	None.
Response Syntax	<*spacing*>
Response(s)	*spacing:* Integer corresponding to the ITU grid spacing value: 0: the spacing value for the ITU grid is set to 25 GHz. 1: the spacing value for the ITU grid is set to 50 GHz. 2: the spacing value for the ITU grid is set to 100GHz. 3: the spacing value for the ITU grid is set to 200 GHz.
Example(s)	CALC:PAR:WDMC:SPAC 25GHz CALC:PAR:WDMC:SPAC? returns 0

CALCulate:PARameters:WDMChannel:STARt

Description	This command defines the **Start Wavelength/Frequency** parameter of the Channel Detection analysis tool. The corresponding GUI setting is **Start Wavelength/Frequency on page 169**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:STARt<wsp><start>[<unit>] | MIN | MAX
Parameter(s)	➤ *start:* Start wavelength or frequency for the generation of the grid, as float value in the range 1240 to 1679.99 nm or 178.448 to 241.767 THz. ➤ *unit* Unit of the set value. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or Hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN* Minimum programmable value: 1240 nm or 178.448 THz ➤ *MAX:* Maximum programmable value: 1679.99 nm or 241.767 THZ
Example(s)	CALC:PAR:WDMC:STAR 1525NM

CALCulate:PARameters:WDMChannel:STARt?

Description	This query returns the **Start Wavelength/Frequency** parameter of the Channel Detection analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:STARt?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<start>
Response(s)	*start:* Wavelength or frequency start value in meters or Hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	CALC:PAR:WDMC:STAR 1525NM CALC:PAR:WDMC:STAR? returns +1.52500000E-006

CALCulate:PARameters:WDMChannel:STOP

Description	This command defines the **Stop Wavelength/Frequency** parameter of the Channel Detection analysis tool. The corresponding GUI setting is **Stop Wavelength/Frequency on page 169**.
Applicability	This command is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:STOP<wsp><stop>[<unit>] | MIN | MAX
Parameter(s)	➤ *stop:* Start wavelength or frequency for the generation of the grid, as float value in the range 1240.01 to 1680 nm or 178.449 to 241.768 THz. ➤ *unit* Unit of the set value. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or Hertz, depending on the unit setting (set with command *UNIT:X* on page 556). ➤ *MIN* Minimum programmable value: 1240.01 nm or 178.449 THz ➤ *MAX:* Maximum programmable value: 1680 nm or 241.768 THZ
Example(s)	CALC:PAR:WDM:STOP 1625NM

CALCulate:PARameters:WDMChannel:STOP?

Description	This query returns the **Stop Wavelength/Frequency** parameter of the Channel Detection analysis tool.
Applicability	This query is only available if: ➤ *CALCulate:MODe* on page 279 is set to WPCT ➤ *CALCulate:PARameters:IMEASurement:RANGe* on page 320 is set to FIXed
Type	Sequential.
Syntax	CALCulate:PARameters:WDMChannel:STOP?[MIN|MAX]
Parameter(s)	➤ MIN The query returns the minimum programmable value. ➤ MAX The query returns the maximum programmable value.
Response Syntax	<stop>
Response(s)	*stop:* Wavelength or frequency stop value in meters or Hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	CALC:PAR:WDMC:STOP 1525NM CALC:PAR:WDMC:STOP? returns +1.62500000E-006

CTP Commands and Queries

- In CTP:SENSe[1...20]:CHANnel[1...6]:
  - [1...20] (or [1...10]) designates the module identification number, which is the position of the module in the mainframe from left to right.
    In Daisy chaining mode, the modules located on the Primary mainframe are identified using positions 1 to 10, and the modules located on the Secondary mainframe are identified using positions 11 to 20. Once entered in the Daisy chaining mode, you must execute all commands and queries on the Primary CTP10. You cannot send any commands or queries to the Secondary CTP10, except: *SYSTem:ERRor[:NEXT]?* on page 525, *STATus:PRESet* on page 521, *CTP:DCHAINing:STATus?* on page 411, *CTP:DCHAINing:CLOSe* on page 405, **RST* on page 253, **IDN?* on page 251.
  - [1...6] designates the detector identification number, which is the detector position on the module from top to bottom. This number is not taken into account for BR traces.
- In CTP:RLASER[1...10]:

  [1...10] designates the laser identification number, which is defined with the command *CTP:RLASer[1...10]:TYPE* on page 436 (in the GUI, it corresponds to the position of the laser in the **Modules & Lasers** window from left to right).

Quick Reference

Command Overview					Parameter(s)	Section
CTP	DCHAINing	CLOSe				see *p. 405*
		ID1	CPARameters		<IP address>: <Secondary port>	see *p. 406*
			CPARameters?			see *p. 406*
			LINK		<connection state>	see *p. 407*
			LINK?			see *p. 408*
		PPORt			<port>	see *p. 409*
		PPORt?			[MIN|MAX]	see *p. 409*
		SPORt			<port>	see *p. 410*
		SPORt?			[MIN|MAX]	see *p. 410*
		STATus?				see *p. 411*
	DLOG				<filename>	see *p. 411*
	FUNCtion	PARameter	LOGGing		<points>,<averaging time>[<unit>], [<wavelength/frequency >][<unit>]	see *p. 412*
			LOGGing?			see *p. 413*

Command Overview					Parameter(s)	Section
			PLOGging		<port>,<pulses>, <averaging time> [<unit>],[<wavelength/ frequency>][<unit>]	see *p. 414*
			PLOGging?			see *p. 415*
			STABility		<total time>,<period time>,<averaging time>[<unit>], <wavelength/frequency> [<unit>]	see *p. 416*
			STABility?			see *p. 417*
		STATe			<function>,<state>	see *p. 418*
	LOCal					see *p. 419*
	LSHARing	CLOSe				see *p. 420*
		CPORt			<port>	see *p. 421*
		CPORt?			[MIN|MAX]	see *p. 421*
		DPORt			<port>	see *p. 422*
		DPORt?			[MIN|MAX]	see *p. 422*
		ID[1...7]	CPARameters		<IP address>: <Distributed port>	see *p. 423*
			CPARameters?			see *p. 423*
			LINK		<connection state>	see *p. 424*
			LINK?			see *p. 425*
		STATus?				see *p. 425*
	RLASER[1...10]	ACTRL			<state>	see *p. 426*
		ACTRL?				see *p. 426*
		BSUPPR			<state>	see *p. 427*
		BSUPPR?				see *p. 427*
		COHErence			<state>	see *p. 428*
		COHErence?				see *p. 428*
		CPARameters			<type>,<parameters>	see *p. 429*
		CPARameters?				see *p. 430*
		IDN?				see *p. 431*
		LINK			<status>	see *p. 432*
		LINK?				see *p. 432*
		POWer			<power>[<unit>]	see *p. 433*
		POWer?				see *p. 433*
		POWer	STATe		<state>	see *p. 434*

Command Overview					Parameter(s)	Section
			STATe?			see *p. 434*
		REFerencing				see *p. 435*
		TYPE			<model>	see *p. 436*
		TYPE?				see *p. 437*
		WAVelength			<value>[<unit>]	see *p. 438*
		WAVelength?				see *p. 438*
	SENSe[1...10]	CHANnel[1...6]	AVG		<value>	see *p. 439*
			AVG?			see *p. 439*
			CURrent?			see *p. 440*
			FUNCtion	ACTivate	<state>	see *p. 441*
				ACTivate?		see *p. 441*
				RESult?	<format>	see *p. 442*
				STATe?		see *p. 443*
				TRIGGer	<trigger>	see *p. 444*
				TRIGGer?		see *p. 444*
			OFFset		<offset>	see *p. 445*
			OFFset?			see *p. 445*
			POWer?			see *p. 446*
			UNIT	X	<unit>	see *p. 447*
				X?		see *p. 447*
				Y	<unit>	see *p. 448*
				Y?		see *p. 448*
			WAVelength		<value>[<unit>]	see *p. 449*
			WAVelength?			see *p. 449*
	SENSe[1...20]	CHANnel[1...6]	ZEROing			see *p. 450*
			ZEROing?			see *p. 450*
		IDN?				see *p. 451*
	SENSe[1...10]	FBC			<input>	see *p. 452*
	SENSe[1...10]	FBC?				see *p. 452*
	SENSe[1...20]	OPTion?				see *p. 453*
	SENSe[1...20]	RST				see *p. 453*
	SENSe[1...20]	TST?				see *p. 454*
	SENSe[1...20]	TYPE?				see *p. 455*

Commands and Queries

CTP:DCHAINing:CLOSe

Description	This command closes the connection to the Primary CTP10 (from the Secondary CTP10). For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Applicability	This command is only available if the current CTP10 daisy chaining status is Secondary (response 2 to *CTP:DCHAINing:STATus?* on page 411).
Type	Sequential.
Syntax	CTP:DCHAINing:CLOSe
Parameter(s)	None.
Example(s)	CTP:DCHAIN:CLOSe

CTP:DCHAINing:ID1:CPARameters

Description	This command sets the daisy chaining connection parameters of a given CTP10 to which you want to connect for daisy chaining. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Applicability	In Daisy chaining mode, this command is not available on Secondary CTP10s (response 2 to *CTP:DCHAINing:STATus?* on page 411).
Type	Sequential.
Syntax	CTP:DCHAINing:ID1:CPARameters<wsp> <IP address>:<Secondary port>
Parameter(s)	1 designates the Secondary CTP10 number. ➤ *IP address:* IP address of the CTP10 to which you want to connect. ➤ *Secondary port*: Daisy chaining secondary port of the CTP10 to which you want to connect. Default value: 53002
Example(s)	CTP:DCHAIN:ID1:CPAR 172.31.5.10:53002

CTP:DCHAINing:ID1:CPARameters?

Description	This query returns the daisy chaining connection parameters of a given Secondary CTP10.
Applicability	In Daisy chaining mode, this query is not available on Secondary CTP10s (response 2 to *CTP:DCHAINing:STATus?* on page 411).
Type	Overlapping.
Syntax	CTP:DCHAINing:ID1:CPARameters?
Parameter(s)	None.
Response Syntax	<IP address>:<Secondary port>
Response(s)	➤ *IP address:* IP address of the given CTP10. ➤ *Secondary port:* Daisy chaining Secondary port of the given CTP10.
Example(s)	CTP:DCHAIN:ID1:CPAR? returns 172.31.5.10:53002

CTP:DCHAINing:ID1:LINK

Description	This command opens or closes the connection of the current CTP10 to a given CTP10 for Daisy chaining. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109. Before opening a connection to another CTP10 for daisy chaining, you must have defined the location of modules and detectors on the CTP10s that you want to set as Secondary, and the connection parameters. The connection parameters are available using the following command: *CTP:DCHAINing:ID1:CPARameters* on page 406
Applicability	In Daisy chaining mode, this command is not available on Secondary CTP10s (response 2 to *CTP:DCHAINing:STATus?* on page 411).
Type	Overlapped. When the system executes this command, the bit 10 "Updating setup for Daisy chaining" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	CTP:DCHAINing:ID1:LINK<wsp><connection state>
Parameter(s)	1 designates the Secondary CTP10 number. *connection state:* Connection state of the given Secondary CTP10. The allowed values are: 0|CLOSE: closes the connection to the given Secondary CTP10. 1|OPEN: opens the connection to the given CTP10.
Example(s)	CTP:DCHAIN:ID1:LINK 1

CTP:DCHAINing:ID1:LINK?

Description	This query returns the Daisy chaining connection state of a given Secondary CTP10.
Applicability	In daisy chaining mode, this query is not available on Secondary CTP10s (response 2 to *CTP:DCHAINing:STATus?* on page 411).
Type	Overlapping.
Syntax	CTP:DCHAINing:ID1:LINK?
Parameter(s)	None.
Response Syntax	<connection state>
Response(s)	*connection state:* Connection state of the given Secondary CTP10: 0: the connection to the given CTP10 is closed. 1: the connection to the given CTP10 is open. 2: the given CTP10 is connecting.
Example(s)	CTP:DCHAIN:ID1:LINK? returns 1

CTP:DCHAINing:PPORt

Description	This command sets the daisy chaining Primary port of the current CTP10. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Applicability	This command is only available if the CTP10 has not entered the daisy chaining mode (response 0 to *CTP:DCHAINing:STATus?* on page 411).
Type	Sequential.
Syntax	CTP:DCHAINing:PPORt<wsp><port>
Parameter(s)	*port:* Integer corresponding to the Primary port of the current CTP10 (for daisy chaining), in the range 1 to 65535. The default value is 53000.
Example(s)	CTP:DCHAIN:PPORt 53001

CTP:DCHAINing:PPORt?

Description	This query returns the Primary port (for daisy chaining) set for the current CTP10.
Type	Overlapping.
Syntax	CTP:DCHAINing:PPORt?[MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<port>
Response(s)	*port:* Integer corresponding to the Primary port of the current CTP10 (for daisy chaining), in the range 1 to 65535.
Example(s)	CTP:DCHAIN:PPORt? returns 53001

CTP:DCHAINing:SPORt

Description	This command sets the daisy chaining Secondary port of the current CTP10. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Applicability	This command is only available if the CTP10 has not entered the daisy chaining mode (response 0 to *CTP:DCHAINing:STATus?* on page 411).
Type	Sequential.
Syntax	CTP:DCHAINing:SPORt<wsp><port>
Parameter(s)	*port:* Integer corresponding to the Secondary port of the current CTP10 (for daisy chaining), in the range 1 to 65535. The default value is 53002.
Example(s)	CTP:DCHAIN:SPOR 53003

CTP:DCHAINing:SPORt?

Description	This query returns the Secondary port (for daisy chaining) set for the current CTP10.
Type	Overlapping.
Syntax	CTP:DCHAINing:SPORt?[MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<port>
Response(s)	*port:* Integer corresponding to the Secondary port of the current CTP10 (for daisy chaining), in the range 1 to 65535.
Example(s)	CTP:DCHAINing:SPORt? returns 53003

CTP:DCHAINing:STATus?

Description	This query returns the daisy chaining status of the current CTP10. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109.
Type	Overlapping, query only.
Syntax	CTP:DCHAINing:STATus?
Parameter(s)	None.
Response Syntax	<status>
Response(s)	*status:* Integer corresponding to the daisy chaining status of the current CTP10: ➤ 0: the daisy chaining mode is disabled. ➤ 1: the CTP10 is set as Primary ➤ 2: the CTP10 is set as Secondary. In this case, additional information is returned: <IP address of Primary>:<Primary port of the Primary CTP10>,<Secondary number, as viewed by the Primary>
Example(s)	CTP:DCHAIN:STAT? returns 2,172.31.5.10:53000,1

CTP:DLOG

Description	This command saves log data into a file in the current directory.
Type	Overlapped. When the system executes this command, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	CTP:DLOG<wsp><filename>
Parameter(s)	*filname:* Name of the file into which you want to save log data, with or without quotes. The .dbg exfo extension will be automatically added to the file name.
Example(s)	CTP:DLOG "theDebugLog"

CTP:FUNCtion:PARameter:LOGGing

Description

This command sets the parameters for the logging function.

For more details on this function, see *Performing Power Level Data Acquisition* on page 80.

Type

Sequential.

Syntax

CTP:FUNCtion:PARameter:LOGGing<wsp><points>,
<averaging time>[<unit avg>],
[<wavelength/frequency>][<unit wavelength/frequency>]

Parameter(s)

- *points:*

  Integer corresponding to the number of data points to record to complete the logging, in the range 1 to 1000000.

- *averaging time:*

  Averaging time of each measurement, in the range 1 μs to 500 ms.

- *unit avg:*

  Unit of the averaging time value.
  The allowed units are US (microsecond), MS (millisecond) or S (second).
  The default unit is microsecond (US).

- *wavelength/frequency:*

  Wavelength or frequency value of the signal received by the OPM module detector.
  The default value is 1550.
  This parameter does not apply to PCM module detectors.

- *unit wavelength/frequency:*

  Unit of the wavelength/frequency value.
  The allowed units are PM|NM|M|HZ|GHZ|THZ.
  The default unit is meter (M).

Example(s)

CTP:FUNC:PAR:LOGGing 1000,10us,1550nm

CTP:FUNCtion:PARameter:LOGGing?

Description	This query returns the parameters set for the logging function.
Type	Sequential.
Syntax	CTP:FUNCtion:PARameter:LOGGing?
Parameter(s)	None.
Response Syntax	<points>,<averaging time>,<wavelength>
Response(s)	➤ *points:* Number of data points to record to complete the logging. ➤ *averaging time:* Averaging time of each measurement as float value in seconds. ➤ *wavelength:* Wavelength of the signal received by the OPM module detector as float value in meters. This parameter does not apply to PCM module detectors.
Example(s)	CTP:FUNCtion:PARameter:LOGGing 1000,10us,1550nm CTP:FUNC:PAR:LOGG? returns 1000,+1.00000000E-005,+1.55000000E-006

CTP:FUNCtion:PARameter:PLOGging

Description	This command sets the parameters for the pulse logging function. For more details on this function, see *Performing Power Level Data Acquisition* on page 80.
Type	Sequential.
Syntax	CTP:FUNCtion:PARameter:PLOGging<wsp><port>, <pulses>,<averaging time>[<unit avg>], [<wavelength/frequency>][<unit wavelength/frequency>]
Parameter(s)	➤ *port:* Integer corresponding to the TRIG IN port number that receives the pulse trigger signal to use for the pulse logging function. ➤ *pulses:* Integer corresponding to the number of pulse triggers to receive to complete the pulse logging function, in the range 1 to 1000000. ➤ *averaging time:* Averaging time of each measurement, in the range 1 μs to 500 ms. ➤ *unit avg:* Unit of the averaging time value. The allowed units are US (microsecond), MS (millisecond) or S (second). The default unit is microsecond (US). ➤ *wavelength/frequency:* Wavelength or frequency value of the signal received by the OPM module detector. The default value is 1550. This parameter does not apply to PCM module detectors. ➤ *unit wavelength/frequency:* Unit of the wavelength/frequency value. The allowed units are PM|NM|M|HZ|GHZ|THZ. The default unit is meter (M).
Example(s)	CTP:FUNC:PAR:PLOGging 1,1000,25us,1550nm

CTP:FUNCtion:PARameter:PLOGging?

Description	This query returns the parameters set for the pulse logging function.
Type	Sequential.
Syntax	CTP:FUNCtion:PARameter:PLOGging?
Parameter(s)	None.
Response Syntax	<port>,<pulses>,<averaging time>[,<wavelength>]
Response(s)	➤ *port:* TRIG IN port number used for the pulse logging function. ➤ *pulses:* Number of pulse triggers to receive to receive to complete the logging. ➤ *averaging time:* Averaging time of each measurement as float value in seconds. ➤ *wavelength:* Wavelength of the signal received by the OPM module detector as float value in meters. This parameter does not apply to PCM module detectors.
Example(s)	CTP:FUNCtion:PARameter:PLOGging 1,1000,25us,1550nm CTP:FUNC:PAR:PLOG? returns 1,1000,+2.50000000E-005,+1.55000000E-006

CTP:FUNCtion:PARameter:STABility

Description

This command sets the parameters for the stability function.

For more details on this function, see *Performing Power Level Data Acquisition* on page 80.

Type

Sequential.

Syntax

CTP:FUNCtion:PARameter:STABility<wsp><total time>, <period time>,<averaging time>[<unit avg>], [<wavelength/frequency>][<unit wavelength/frequency>]

Parameter(s)

- *total time:*

  Total time in seconds from the start of the stability data acquisition until its entire completion, in the range 1 to 86400 s.

- *period time:*

  Period of time in seconds between the start of two consecutive measurements, in the range 1 to 3600 s. A new measurement is started after the end of each period time. This value must be lower than the total time.

- *averaging time:*

  Averaging time of each measurement, in the range 1 μs to 500 ms.

- *unit avg:*

  Unit of the averaging time value.
  The allowed units are US (microsecond), MS (millisecond) or S (second).
  The default unit is microsecond (US).

- *wavelength/frequency:*

  Wavelength or frequency value of the signal received by the OPM module detector.
  The default value is 1550.
  This parameter does not apply to PCM module detectors.

- *unit wavelength/frequency:*

  Unit of the wavelength/frequency value.
  The allowed units are PM|NM|M|HZ|GHZ|THZ.
  The default unit is meter (M).

Example(s)

CTP:FUNC:PARameter:STABility 30,1,25US,1550NM

CTP:FUNCtion:PARameter:STABility?

Description	This query returns the parameters set for the stability function.
Type	Sequential.
Syntax	CTP:FUNCtion:PARameter:STABility?
Parameter(s)	None.
Response Syntax	<total time>,<period time>,<averaging time>,<wavelength>
Response(s)	➤ *total time:* Total time in seconds from the start of the stability data acquisition until its entire completion. ➤ *period time:* Period of time in seconds between the start of two consecutive measurements. A new measurement is started after the end of each period time. ➤ *averaging time:* Averaging time in seconds of each measurement. ➤ *wavelength:* Wavelength of the signal received by the OPM module detector as float value in meters. This parameter does not apply to PCM module detectors.
Example(s)	CTP:FUNCtion:PARameter:STABility 30,1,25us,1550nm CTP:FUNC:PAR:STAB? returns 30.000000,1.000000,+2.50000000E-005,+1.55000000E-006

CTP:FUNCtion:STATe

Description	This command starts/stops the logging, pulse logging or stability measurement function. For more details on these functions, see *Performing Power Level Data Acquisition* on page 80.
Type	Overlapped, no query.
Syntax	CTP:FUNCtion:STATe<wsp><function>,<state>
Parameter(s)	➤ *function:* Function that you want to start or stop. The allowed values are: 0|STABility: sets the stability function. 1|LOGGing: sets the logging function. 2|PLOGging: sets the pulse logging function. ➤ *state:* State of the function selected with the <function> parameter. The allowed values are: 0|STOP: stops the selected function. 1|STARt: starts the selected function on all detectors for which the command *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate* on page 441 is set to ACTive. The start command is ignored if a logging, pulse logging or stability function is already in progress. ➤ For the pulse logging and stability function: data acquisition starts immediately. ➤ For the logging function: the data acquisition start depends on the trigger defined for the detector: see *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer* on page 444.
Example(s)	CTP:FUNC:STAT LOGG,STAR

CTP:LOCal

Description	This command exits the remote mode and enables you to get back to the local control of the CTP10.
Type	Overlapping.
Syntax	CTP:LOCal
Parameter(s)	None.
Example(s)	CTP:LOCal

CTP:LSHARing:CLOSe

Description	This command closes the connection to the Controller CTP10 (from the Distributed CTP10). For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.
Applicability	This command is only available if the current CTP10 laser sharing status is Distributed (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:LSHARing:CLOSe
Parameter(s)	None.
Example(s)	CTP:LSHAR:CLOSe

CTP:LSHARing:CPORt

Description	This command sets the laser sharing Controller port of the current CTP10. For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.
Applicability	This command is only available if the CTP10 has not entered the laser sharing mode (response 0 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:LSHARing:CPORt<wsp><port>
Parameter(s)	*port:* Integer corresponding to the Controller port of the current CTP10 (for laser sharing), in the range 1 to 65535. The default value is 60000.
Example(s)	CTP:LSHAR:CPORt 60001

CTP:LSHARing:CPORt?

Description	This query returns the Controller port (for laser sharing) set for the current CTP10.
Type	Overlapping.
Syntax	CTP:LSHARing:CPORt?[MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<port>
Response(s)	*port:* Integer corresponding to the Controller port of the current CTP10 (for laser sharing), in the range 1 to 65535.
Example(s)	CTP:LSHAR:CPORt? returns 60001

CTP:LSHARing:DPORt

Description	This command sets the laser sharing Distributed port of the current CTP10. For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.
Applicability	This command is only available if the CTP10 has not entered the laser sharing mode (response 0 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:LSHARing:DPORt<wsp><port>
Parameter(s)	*port:* Integer corresponding to the Distributed port of the current CTP10 (for laser sharing), in the range 1 to 65535. The default value is 50000.
Example(s)	CTP:LSHAR:DPORt 50001

CTP:LSHARing:DPORt?

Description	This query returns the Distributed port (for laser sharing) set for the current CTP10.
Type	Overlapping.
Syntax	CTP:LSHARing:DPORt?[MIN|MAX]
Parameter(s)	➤ *MIN:* The query returns the minimum programmable value. ➤ *MAX:* The query returns the maximum programmable value.
Response Syntax	<port>
Response(s)	*port:* Integer corresponding to the Distributed port of the current CTP10 (for laser sharing), in the range 1 to 65535.
Example(s)	CTP:LSHAR:DPORt? returns 50001

CTP:LSHARing:ID[1...7]:CPARameters

Description	This command sets the laser sharing connection parameters of a given CTP10 to which you want to connect for laser sharing. For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:LSHARing:ID[1...7]:CPARameters<wsp> <IP address>:<Distributed port>
Parameter(s)	[1...7] designates the Distributed CTP10 number. ➤ *IP address:* IP address of the CTP10 to which you want to connect. ➤ *Distributed port*: Laser sharing distributed port of the CTP10 to which you want to connect. Default value: 50000
Example(s)	CTP:LSHAR:ID1:CPARameters 172.31.5.10:50000

CTP:LSHARing:ID[1...7]:CPARameters?

Description	This query returns the laser sharing connection parameters of a given Distributed CTP10.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:LSHARing:ID[1...7]:CPARameters?
Parameter(s)	None.
Response Syntax	<IP address>:<Distributed port>
Response(s)	➤ *IP address:* IP address of the given CTP10. ➤ *Distributed port:* Laser sharing Distributed port of the given CTP10.
Example(s)	CTP:LSHARing:ID1:CPARameters? returns 172.31.5.10:50000

CTP:LSHARing:ID[1...7]:LINK

Description	This command opens or closes the connection of the current CTP10 to a given CTP10 for laser sharing. For more details on laser sharing, see *Sharing the Lasers with Several CTP10s* on page 95. Before opening a connection to another CTP10 for laser sharing, you must have defined the subsystem on the CTP10s that you want to set as Distributed. The connection parameters are available using the following command: *CTP:LSHARing:ID[1...7]:CPARameters?* on page 423
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapped. When the system executes this command, the bit 9 "Updating setup from Controller CTP10" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational* / *Questionable Status Reporting* on page 211).
Syntax	CTP:LSHARing:ID[1...7]:LINK<wsp><connection state>
Parameter(s)	[1...7] designates the Distributed CTP10 number. *connection state:* Connection state of the given Distributed CTP10. The allowed values are: 0|CLOSE: closes the connection to the given Distributed CTP10. 1|OPEN: opens the connection to the given CTP10.
Example(s)	CTP:LSHAR:ID1:LINK 1

CTP:LSHARing:ID[1...7]:LINK?

Description	This query returns the connection state of a given Distributed CTP10.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:LSHARing:ID[1...7]:LINK?
Parameter(s)	None.
Response Syntax	<connection state>
Response(s)	*connection state:* Connection state of the given Distributed CTP10: 0: the connection to the given CTP10 is closed. 1: the connection to the given CTP10 is open. 2: the given CTP10 is connecting.
Example(s)	CTP:LSHARing:ID1:LINK? returns 1

CTP:LSHARing:STATus?

Description	This query returns the laser sharing status of the current CTP10.
Type	Overlapping, query only.
Syntax	CTP:LSHARing:STATus?
Parameter(s)	None.
Response Syntax	<status>
Response(s)	*status:* Integer corresponding to the laser sharing status of the current CTP10: ➤ 0: the laser sharing mode is disabled. ➤ 1: the CTP10 is set as Controller ➤ 2: the CTP10 is set as Distributed. In this case, additional information is returned: <IP address of Controller>:<Controller port of the Controller>,<Distributed number>
Example(s)	CTP:LSHAR:STAT? returns 2,172.31.5.10:5025,4

CTP:RLASer[1...10]:ACTRL

Description	This command enables/disables the "active cavity control" mode for the given laser. The corresponding GUI setting is **Cavity control** (see **Cavity control on page 93**).
Applicability	➤ This command only applies to T100S-HP and mSWS-A1SLS lasers. ➤ In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:ACTRL<wsp><state>
Parameter(s)	*state:* Sets the state of the cavity control mode for the given laser. The allowed values are: 0|OFF: disables the active cavity control mode. 1|ON: enables the active cavity control mode.
Example(s)	CTP:RLASer2:ACTRL ON

CTP:RLASer[1...10]:ACTRL?

Description	This query returns the state of the "active cavity control" mode for the given laser.
Applicability	➤ This query only applies to T100S-HP and mSWS-A1SLS lasers. ➤ In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:ACTRL?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the active cavity control mode for the given laser: 0: the active cavity control mode is disabled. 1: the active cavity control mode is enabled.
Example(s)	CTP:RLASer2:ACTRL ON CTP:RLASer2:ACTRL? returns 1

CTP:RLASer[1...10]:BSUPpr

Description	This command enables/disables the backlash suppression control for the given laser. The corresponding GUI setting is **Backlash suppression control** (see **Backlash suppression control on page 93**).
Applicability	➤ This query only applies to T100S-HP and mSWS-A1SLS lasers. ➤ In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:BSUPpr<wsp><state>
Parameter(s)	*state:* Sets the state of the backlash suppression control for the given laser. The allowed values are: 0|OFF: disables the backlash suppression control. 1|ON: enables the backlash suppression control.
Example(s)	CTP:RLASer2:BSUP ON

CTP:RLASer[1...10]:BSUPpr?

Description	This query returns the state of the backlash suppression control for the given laser.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:BSUPpr?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the backlash suppression control for the given laser: 0: the backlash suppression control is disabled. 1: the backlash suppression control is enabled.
Example(s)	CTP:RLASer2:BSUP OFF CTP:RLASer2:BSUP? returns 0

CTP:RLASer[1...10]:COHErence

Description	This command enables/disables the coherence control for the given laser. The corresponding GUI setting is **Coherence control** (see **Coherence control on page 93**).
Applicability	➤ This command only applies to T100S-HP and mSWS-A1SLS lasers. ➤ In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:COHErence<wsp><state>
Parameter(s)	*state:* Sets the state of the coherence control for the given laser. The allowed values are: 0|OFF: disables the coherence control. 1|ON: enables the coherence control.
Example(s)	CTP:RLASer2:COHE ON

CTP:RLASer[1...10]:COHErence?

Description	This query returns the state of the coherence control for the given laser.
Applicability	➤ This command only applies to T100S-HP and mSWS-A1SLS lasers. ➤ In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:COHErence?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the coherence control for the given laser: 0: the coherence control is disabled. 1: the coherence control is enabled.
Example(s)	CTP:RLASer2:COHE ON CTP:RLASer2:COHE? returns 1

CTP:RLASer[1...10]:CPARameters

Description	This command sets the laser communication parameters.
Applicability	➤ This command is only available if the specified laser is disconnected. ➤ In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:CPARameters<wsp><type>,<parameters>
Parameter(s)	➤ *type:* Integer corresponding to the type of connection to the laser: 1: GPIB 2: Ethernet 3: USB Serial ➤ *parameters:* Connection type specific parameters, in the following format: GPIB: <GPIB Interface ID>_<GPIB address> Ethernet: <IP1.IP2.IP3.IP4>:<Port> USB: <port>,<speed>,<parity (0: none|1: odd|2: even)>, <bit stop count (1|1.5|2)>, <flux control (0: none|2: rts/cts|4: dtr/dsr)>
Example(s)	GPIB: CTP:RLASer3:CPARameters 1,GPIB0_16 Ethernet: CTP:RLASer1:CPARameters 2,172.31.5.10:5025 USB: CTP:RLASer2:CPARameters 3,COM5:115200_0_1_0

CTP:RLASer[1...10]:CPARameters?

Description

This query returns the laser communication parameters.

Applicability

In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).

Type

Overlapping.

Syntax

CTP:RLASer[1...10]:CPARameters?

Parameter(s)

None.

Response Syntax

<type>,<parameters>

Response(s)

➤ *type:*

Integer corresponding to the connection type:

1: GPIB

2: Ethernet

3: USB Serial

➤ *parameters:*

Connection type specific parameters, in the following format:

GPIB: <GPIB Interface ID>_<GPIB address>

Ethernet: <IP1.IP2.IP3.IP4>:<Port>

USB: <port>,<speed>,<parity (0: none|1: odd|2: even)>,
<bit stop count (1|1.5|2)>,
<flux control (0: none|2: rts/cts|4: dtr/dsr)>

Example(s)

CTP:RLASer2:CPARameters 1,GPIB0_16

CTP:RLASer2:CPARameters? returns 1,GPIB0_16

CTP:RLASer[1...10]:IDN?

Description	This query returns the identification of the given laser.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping, query only.
Syntax	CTP:RLASer[1...10]:IDN?
Parameter(s)	None.
Response Syntax	<manufacturer>,<model>,<serial>,<firmware>
Response(s)	➤ *manufacturer:* Manufacturer of the laser. ➤ *model:* Instrument model. ➤ *serial:* Instrument serial number. ➤ *firmware:* Instrument firmware version.
Example(s)	CTP:RLAS2:IDN? returns EXFO,T100S-HP,0,6.06

CTP:RLASer[1...10]:LINK

Description	This command sets the status of the connection to the given laser.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapped.
Syntax	CTP:RLASer[1...10]:LINK<wsp><status>
Parameter(s)	*status:* Status of the connection to the given laser: 0|CLOSE: closes the connection to the laser. 1|OPEN: opens the connection to the laser.
Example(s)	CTP:RLASer2:LINK 1

CTP:RLASer[1...10]:LINK?

Description	This query returns the status of the connection to the given laser.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:LINK?
Parameter(s)	None.
Response Syntax	<status>
Response(s)	*status:* Status of the connection to the given laser: 0: the connection to the given laser is closed. 1: the connection to the given laser is open. 2: the given laser is connecting.
Example(s)	CTP:RLASer2:LINK OPEN CTP:RLASer2:LINK? returns 1

CTP:RLASer[1...10]:POWer

Description	This command sets the laser output power value in static control.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:POWer<wsp><power>[<unit>]
Parameter(s)	➤ *power:* Output power of the given laser as a float value. Possible values depend on the laser specifications. On T500S, the maximum power is limited to 13 dBm. To avoid permanent damage to the CTP10 module detectors, do not apply a higher output power value than the maximum safe power specified for the detector to which the laser is connected (refer to *Optical Measurement Specifications* on page 3) ➤ *unit:* Unit of the power value. The allowed units are DBM (dBm) or MW (mW). The default unit is dBm.
Example(s)	CTP:RLASer2:POWer 1.5

CTP:RLASer[1...10]:POWer?

Description	This query returns the power value set for the given laser in static control, or the actual laser power after an acquisition.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:POWer?
Parameter(s)	None.
Response Syntax	<power>
Response(s)	*power:* Output power set for the laser in dBm as float value (in static control). If an acquisition has been made, the value returned is the actual laser power.
Example(s)	CTP:RLASer2:POWer -2.1 CTP:RLASer2:POWer? returns -2.10000000E+00

CTP:RLASer[1...10]:POWer:STATe

Description	This command enables/disables the laser output.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:POWer:STATe<wsp><state>
Parameter(s)	*state:* State of the laser output power: 0|OFF: disables the laser output. 1|ON: enables the laser output. This operation can take time, depending on the laser model.
Example(s)	CTP:RLASer2:POWer:STATe ON

CTP:RLASer[1...10]:POWer:STATe?

Description	This query returns the state of the given laser output.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:POWer:STATe?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the laser output power: 0|OFF: the laser output is disabled. 1|ON: the laser output is enabled.
Example(s)	CTP:RLASer2:POWer:STATe OFF CTP:RLASer2:POWer:STATe? returns 0

CTP:RLASer[1...10]:REFerencing

Description	This command launches the internal wavelength referencing sequence of the laser.
Applicability	This command only applies to T100S-HP, T200S and T500S lasers. In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapped. When the system executes this command, the bit 11 "Laser referencing" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211). If the wavelength referencing has not been properly completed, the -316 error "Laser referencing error" is added to the error queue (see *SCPI-Based Errors* on page 559).
Syntax	CTP:RLASer[1...10]:REFerencing
Parameter(s)	None.
Example(s)	CTP:RLASer1:REFerencing

CTP:RLASer[1...10]:TYPE

Description	This command adds or removes the given laser and sets its model.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:TYPE<wsp><model>
Parameter(s)	*model:* Integer corresponding to the model of the given laser. The allowed values are: 0: None (removes an existing laser). 1: reserved. 2: reserved. 3: reserved. 4: reserved. 5: adds a T100S-HP laser model. 6: adds an mSWS-A1SLS laser model. 7: reserved. 8: reserved. 9: reserved. 10: adds a T200S laser model. 11: adds a T500S laser model.
Example(s)	CTP:RLASer2:TYPE 3

CTP:RLASer[1...10]:TYPE?

Description	This query returns the given laser model.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:TYPE?
Parameter(s)	None.
Response Syntax	<model>
Response(s)	*model:* Integer corresponding to the model of the selected laser: 0: None. 1: reserved. 2: reserved. 3: reserved. 4: reserved. 5: T100S-HP model. 6: mSWS-A1SLS model. 7: reserved. 8: reserved. 9: reserved. 10: T200S laser model. 11: T500S laser model.
Example(s)	CTP:RLASer2:TYPE 3 CTP:RLASer2:TYPE? returns 3

CTP:RLASer[1...10]:WAVelength

Description	This command sets the laser emission wavelength or frequency (static control).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	CTP:RLASer[1...10]:WAVelength<wsp><value>[<unit>]
Parameter(s)	➤ *value:* Sets the laser emission wavelength or frequency as float value. ➤ *unit:* Unit of the laser emission value. The allowed units are: PM|NM|M|HZ|GHZ|THZ The default unit is meter (M).
Example(s)	CTP:RLASer2:WAV 1500NM

CTP:RLASer[1...10]:WAVelength?

Description	This query returns the laser emission wavelength set for the given laser in static control, or the actual laser wavelength after an acquisition.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Overlapping.
Syntax	CTP:RLASer[1...10]:WAVelength?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Emission wavelength of the given laser in meters. If an acquisition has been made, the value returned is the actual laser wavelength.
Example(s)	CTP:RLASer2:WAV 1500NM CTP:RLASer2:WAV? returns +1.50000000E-006

CTP:SENSe[1...10]:CHANnel[1...6]:AVG

Description	This command sets the averaging time on the given detector (static control). This command is not available if the detector is scanning. On IL RL OPM2 modules, if the command applies to one of the following connectors, the value set also applies to the two other connectors of the module: TLS IN, Out to SCAN SYNC or Out to DUT.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:AVG<wsp><value>
Parameter(s)	*value:* Averaging time value to apply on the detector in millisecond (ms) in the range 0.001 and 1000.
Example(s)	CTP:SENS6:CHAN3:AVG 0.002

CTP:SENSe[1...10]:CHANnel[1...6]:AVG?

Description	This query returns the averaging time applied on the given detector.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:AVG?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Averaging time applied on the detector in millisecond (ms).
Example(s)	CTP:SENS6:CHAN3:AVG 0.002 CTP:SENS6:CHAN3:AVG? returns 0.002

CTP:SENSe[1...10]:CHANnel[1...6]:CURrent?

Description	This query returns the current measured on a detector of a PCM module.
Applicability	This query is only available on a PCM module detector. To measure power on OPM detectors, see *CTP:SENSe[1...10]:CHANnel[1...6]:POWer?* on page 446.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:CURrent?
Parameter(s)	None.
Response Syntax	<current>
Response(s)	*current:* Instant current in dBmA measured on the given detector.
Example(s)	CTP:SENS1:CHAN2:CUR? returns -3.1

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate

Description	This command sets the activation state of the logging, pulse logging or stability function for the given detector. For more details on these functions, see *Performing Power Level Data Acquisition* on page 80.
Type	Sequential.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate<wsp> <state>
Parameter(s)	*state:* Activation state of the logging, pulse logging or stability function on the given detector. The allowed values are: 0|INACTive: disables the function on the detector. 1|ACtive: enables the function on the detector.
Example(s)	CTP:SENS6:CHAN3:FUNC:ACT 1

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate?

Description	This query returns the activation state of the logging, pulse logging or stability function for the given detector.
Type	Sequential.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* Activation state of the logging, pulse logging or stability function on the given detector: 0: the function is disabled. 1: the function is enabled.
Example(s)	CTP:SENS6:CHAN3:FUNC:ACT ACT CTP:SENS6:CHAN3:FUNC:ACT? returns 1

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:RESult?

Description	This query returns the results of the last logging, pulse logging or stability measurement on the given detector.
Type	Sequential, query only.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:RESult?<wsp> <format>
Parameter(s)	*format:* Format of the trace data. The allowed values are: 0|ASCii: trace data is formatted as ASCII values, such as <value1>,<value2>, ... 1|BINary: trace data is formatted as binary blocks such as: #<length><Nb of bytes><blocks> where: <length>: number of subsequent bytes that you have to check to know the total length. <Nb of bytes>: size of <blocks> in bytes. <blocks>: float data bytes (packet of 4 bytes, big endian). For example, data containing 10 data points will results in the header "#240<blocks>" as 40 bytes are needed to define the data and "40" length is 2.
Response Syntax	<data>
Response(s)	*data:* If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <value1>,<value2>, ... If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks.
Example(s)	CTP:SENS10:CHAN1:FUNC:RES? ASCii returns -8.94719849E+001,-8.94894485E+001,… CTP:SENS10:CHAN1:FUNC:RES? BIN returns #280::V::q::::V::::::::V::v ::V::::::…

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:STATe?

Description	This query returns the measurement mode in use on the given detector and the progress status of the data acquisition on the detector.
Type	Sequential, query only.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:STATe?
Parameter(s)	None.
Response Syntax	<function>,<status>
Response(s)	➤ *function:* Name of the measurement mode in use on the given detector: 0: the stability function is in use on the detector. 1: the logging function is in use on the detector. 2: the pulse logging function is in use on the detector. ➤ *status:* 0: data acquisition is completed. 1: data acquisition is in progress.
Example(s)	CTP:SENS6:CHAN4:FUNC:STAT? returns 1,1

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer

Description	This command sets the incoming trigger to use for the logging function on the given detector. For more details on this function, see *Performing Power Level Data Acquisition* on page 80.
Type	Sequential.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer<wsp><trigger>
Parameter(s)	*value:* Integer corresponding to the trigger to use for the logging function, in the range 0 to 8: 0: software trigger, which means that the data acquisition is triggered with the command *CTP:FUNCtion:STATe* on page 418. 1 to 8: sets the number of the TRIG IN port to use for the detectors of the module. When the logging function is started (see *CTP:FUNCtion:STATe* on page 418), the detectors waits for the trigger signal coming from this port to start the acquisition. The acquisition starts when the voltage level at the port is "high".
Example(s)	CTP:SENS6:CHAN3:FUNC:TRIGG 4

CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer?

Description	This query returns the incoming trigger used for the logging function on the given detector.
Type	Sequential.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:TRIGGer?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Integer corresponding to the trigger used for the logging function, in the range 0 to 8: 0: software trigger. 1 to 8: number of the TRIG IN port used.
Example(s)	CTP:SENS6:CHAN4:FUNC:TRIGG 5 CTP:SENS6:CHAN4:FUNC:TRIGG? returns 5

CTP:SENSe[1...10]:CHANnel[1...6]:OFFset

Description	This command sets the power offset of the given detector (static control). This command is not available if the detector is scanning. On IL RL OPM2 modules, if the command applies to one of the following connectors, the value set also applies to the two other connectors of the module: TLS IN, Out to SCAN SYNC or Out to DUT.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:OFFset<wsp><offset>
Parameter(s)	*offset:* Power offset that you want to apply to the given detector, as float value in dB in the range -2 to 2. The default unit is 0.
Example(s)	CTP:SENS1:CHAN2:OFF 0.2

CTP:SENSe[1...10]:CHANnel[1...6]:OFFset?

Description	This query returns the power offset set on the given detector.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:OFFset?
Parameter(s)	None.
Response Syntax	<offset>
Response(s)	*offset:* Float value in dB corresponding to the offset set on the detector:
Example(s)	CTP:SENS1:CHAN2:OFF 0.5 CTP:SENS1:CHAN2:OFF? returns 0.5

CTP:SENSe[1...10]:CHANnel[1...6]:POWer?

Description	This query returns the power measured on the given detector.
Applicability	This query is not available on a PCM detector. To measure current on PCM detectors, see *CTP:SENSe[1...10]:CHANnel[1...6]:CURrent?* on page 440.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:POWer?
Parameter(s)	None.
Response Syntax	<power>
Response(s)	*power:* Instant power in dBm measured on the given detector. On an IL RL OPM2 module, the response value for channel 3 is the instant power measured on the TLS IN port and the response value for channel 4 is the back reflection value measured on the port. On an IL PDL or IL PDL OPM2 module, the response value for channel 3 is the instant power measured on the TLS IN port.
Example(s)	CTP:SENS2:CHAN2:POW? returns -3.1

CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X

Description	This command sets the spectral unit of the given detector.
Applicability	This command is not available on PCM modules. This command is not available if the detector is scanning.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X<wsp><unit>
Parameter(s)	*unit:* Spectral unit for the given detector. The allowed values are: 0|WAVelength: sets the unit to nm. 1|FREQuency: sets the unit to THz.
Example(s)	CTP:SENS1:CHAN2:UNIT:X FREQ

CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X?

Description	This query returns the spectral unit set for the given detector.
Applicability	This query is not available on PCM module detectors.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X?
Parameter(s)	None.
Response Syntax	<unit>
Response(s)	*unit:* Integer corresponding to the spectral unit set for the detector: 0: the unit is set to nm. 1: the unit is set to THz.
Example(s)	CTP:SENS1:CHAN2:UNIT:X WAV CTP:SENS1:CHAN2:UNIT:X? returns 0

CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:Y

Description	This command sets the power or current unit of the given detector.
Applicability	This command is not available if the detector is scanning.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:Y<wsp><unit>
Parameter(s)	*unit:* Spectral unit for the given detector. The allowed values are: ➤ 0|DBM|DBMA (default unit): sets the unit to dBm or dBmA. ➤ 1|MW|MA: sets the unit to mW or mA.
Example(s)	CTP:SENS1:CHAN2:UNIT:Y DBM

CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:Y?

Description	This query returns the power unit set for the given detector.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:Y?
Parameter(s)	None.
Response Syntax	<unit>
Response(s)	*unit:* Integer corresponding to the power unit set for the detector: ➤ 0: the unit is set to dBm or dBmA. ➤ 1: the unit is set to mW or mA.
Example(s)	CTP:SENS1:CHAN2:UNIT:Y MW CTP:SENS1:CHAN2:UNIT:Y? returns 1

CTP:SENSe[1...10]:CHANnel[1...6]:WAVelength

Description	This command sets the wavelength or frequency of the signal received on the given detector (static control). This command is not available if the detector is scanning. On IL RL OPM2 modules, if the command applies to the TLS IN, Out to SCAN SYNC or Out to DUT connector, the value set also applies to the two other connectors of the module.
Applicability	This query is not available on PCM module detectors.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:WAVelength<wsp><value>[<unit>]
Parameter(s)	➤ *value:* Wavelength or frequency as float value, in the range 1240 to 1680 nm or 178.4479 to 241.7681 THz. ➤ *unit:* Unit of the set value. The allowed units are PM|NM|M|HZ|GHZ|THZ The default unit is meter or Hertz, depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	CTP:SENS1:CHAN2:WAV 1550NM

CTP:SENSe[1...10]:CHANnel[1...6]:WAVelength?

Description	This query returns the wavelength or frequency set for the signal received on the given detector (static control)
Applicability	This query is not available on PCM module detectors.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:CHANnel[1...6]:WAVelength?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Wavelength or frequency as float value in meters or Hertz depending on the unit settings (set with command *CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X* on page 447).
Example(s)	CTP:SENS6:CHAN2:WAV 1550NM CTP:SENS1:CHAN2:WAV? returns +1.50000000E-006

CTP:SENSe[1...20]:CHANnel[1...6]:ZEROing

Description	This command performs a dark current zeroing on the given detector (for more details, see *Zeroing the Dark Current on Detectors* on page 83). This command is not available if the detector is scanning. ➤ use channels 1 and 2 to perform a zeroing on the first and second optical detectors (IL RL OPM2 or IL PDL OPM2 module only) ➤ use channel 3 to perform a Reference zeroing. ➤ use channel 4 to perform a BR zeroing (IL RL OPM2 only).
Type	Overlapped. When the system executes this command, the bit 0 "Zeroing" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211). If the zeroing operation has not been properly completed, the -310 error "Zeroing error" is added to the error queue (see *SCPI-Based Errors* on page 559).
Syntax	CTP:SENSe[1...20]:CHANnel[1...6]:ZEROing
Parameter(s)	None.
Example(s)	CTP:SENS2:CHAN2:ZERO

CTP:SENSe[1...20]:CHANnel[1...6]:ZEROing?

Description	This query returns the date and time of the last dark current measurement on the given detector.
Type	Overlapping.
Syntax	CTP:SENSe[1...20]:CHANnel[1...6]:ZEROing?
Parameter(s)	None.
Response Syntax	<date>,<time>
Response(s)	➤ *date:* Date of the last zeroing measurement, expressed as YYYYMMDD. ➤ *time:* Time of the last zeroing measurement, expressed as HHMMSS.
Example(s)	CTP:SENS2:CHAN2:ZERO? returns 20190104,145623

CTP:SENSe[1...20]:IDN?

Description	This query returns the identification of the module.
Type	Overlapping, query only.
Syntax	CTP:SENSe[1...20]:IDN?
Parameter(s)	None.
Response Syntax	<manufacturer>,<model>,<serial>,<FPGA>
Response(s)	➤ *manufacturer:* Manufacturer name. ➤ *model:* Module name. ➤ *serial number:* Module serial number. ➤ *FPGA:* Module FPGA version.
Example(s)	CTP:SENSE4:IDN? returns EXFO,EXFO,OPM6,EX1405103XX,0.2.45

CTP:SENSe[1...10]:FBC

Description	This command only applies to an FBC module. It selects the TLS IN laser input to use for static measurements.
Type	Sequential if the module is scanning, overlapping if the module is not scanning.
Syntax	CTP:SENSe[1...10]:FBC<wsp><input>
Parameter(s)	*input:* Integer corresponding to the laser input to select. The allowed values are: 0: no input, all inputs are shut 1: IN 1 input 2: IN 2 input 3: IN 3 input 4: IN 4 input
Example(s)	CTP:SENS1:FBC 3

CTP:SENSe[1...10]:FBC?

Description	This query only applies to an FBC module. It returns the selected laser input.
Type	Overlapping.
Syntax	CTP:SENSe[1...10]:FBC?
Parameter(s)	None.
Response Syntax	<input>
Response(s)	*input:* Integer corresponding to the selected laser input: 0: no input, all inputs are shut 1: IN 1 input 2: IN 2 input 3: IN 3 input 4: IN 4 input.
Example(s)	CTP:SENS1:FBC 3 CTP:SENS1:FBC? 3

CTP:SENSe[1...20]:OPTion?

Description	This query returns the option of the module.
Type	Overlapping, query only.
Syntax	CTP:SENSE[1...20]:OPTion?
Parameter(s)	None.
Response Syntax	<option>
Response(s)	*option:* String corresponding to the module option.
Example(s)	CTP:SENSE5:OPT? returns SC (SC type FOA)

CTP:SENSe[1...20]:RST

Description	This command restores the factory settings of the given module. The corresponding GUI button is **Restore factory settings** (see *Restoring the Factory Settings of a Module* on page 84).
Type	Sequential, no query.
Syntax	CTP:SENSe[1...20]:RST
Parameter(s)	None.
Example(s)	CTP:SENS8:RST

CTP:SENSe[1...20]:TST?

Description	This query performs the self-test of the given module and returns the test result.
Type	Sequential.
Syntax	CTP:SENSe[1...20]:TST?
Parameter(s)	None.
Response Syntax	<result>

Response(s)	*result:*
	Result of the self-test. Possible values are:
	➤ 0: no error was found on the module.
	➤ <error code>: an error occurred. In this case, remove the module and insert it again. If the error appears again, contact the EXFO customer support. Possible error values are:
	  ➤ -3004: test registry error. The access to the module internal registry failed.
	  ➤ -3005: clock error.
	  ➤ -3010: error on the polarization state generator.
	  ➤ -3011: temperature error.
	  ➤ -6001: detector analog error.
	  ➤ -6002: CTN error.

Example(s)	CTP:SENSe8:TST? returns 0 (self-test was completed with success)

CTP:SENSe[1...20]:TYPE?

Description	This query returns the module type.
Type	Overlapping, query only.
Syntax	CTP:SENSe[1...20]:TYPE?
Parameter(s)	None.
Response Syntax	<type>
Response(s)	*type:* Integer corresponding to the module type. 0: no module in the slot. 1: OPM2 module. 2: OPM4 module. 3: OPM6 module. 4: IL RL OPM2 module. 5: IL PDL module 6: SCAN SYNC module. 7: FBC module. 8: IL PDL OPM2 module. 9: PCM2. 10: PCM6.
Example(s)	CTP:SENSe9:TYPE? returns 2 (OPM4 module)

DISPlay Commands and Queries

Quick Reference

Command Overview		Parameter(s)	Section
DISPlay	FOCUS	<category>,<trace>[,<channel>,<type>]	see *p. 456*
	FOCUS?		see *p. 457*

Commands and Queries

DISPlay:FOCUS

Description This command selects a trace for auto-scale, zooming operations and marker measurements.

Type Overlapping.

Syntax DISPlay:FOCUS<wsp><category>[,<trace>,<channel>,<type>]

Parameter(s)

➤ *category:*
Category of the trace to select:
0|NONE: no trace is selected.
1|SENse: trace linked to a measuring connector.
2|STORe: stored trace.

➤ *trace:*
For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right, in the range 1 to 20.
For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529.

➤ *channel:*
For SENse traces only: integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6. This number is not taken into account for BR traces.

➤ *type:*
For SENse traces only: integer corresponding to the trace type, in the range 1 to 10 and 14 to 23. For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526.

Example(s) DISP:FOCUS 1,2,5,3

DISPlay:FOCUS?

Description	This query returns the selected trace.
Type	Overlapping.
Syntax	DISPlay:FOCUS?
Parameter(s)	None.
Response Syntax	<category>,<trace>,<channel>,<type>
Response(s)	➤ *category:* Category of the trace to select: 0|NONE: no trace is selected. 1|SENse: trace linked to a measuring connector. 2|STORe: stored trace. ➤ *trace:* For SENse traces: integer corresponding to the module identification number, which is the position of the module in the mainframe from left to right, in the range 1 to 20. For STORe traces: integer corresponding to the store trace identifier, in the range 1 to 20. To know the store trace identifier, use the command *TRACe:LIST:STORe?* on page 529. ➤ *channel:* For SENse traces only: integer corresponding to the detector identification number, which is the detector position on the module from top to bottom, in the range 1 to 6. This number is not taken into account for BR traces. ➤ *type:* For SENse traces: integer corresponding to the trace type, in the range 1 to 10 and 14 to 23. For details on the corresponding trace types, see *TRACe Commands and Queries* on page 526. For STORe traces: 0.
Example(s)	DISP:FOCUS 2,15,0,0 DISP:FOCUS? returns 2,15,0,0

INITiate Commands and Queries

In INITiate:TLS[1...4]:

[1...4] designates the TLS in use in the subsystem (TLS1 to TLS4) to which you want to apply the command or query.

Quick reference

Command Overview				Parameter(s)	Section
INITiate	[IMMediate]				see *p. 459*
	CURRent?				see *p. 460*
	DCHAINing	TRIGout[1...4]		<Secondary Trig in>	see *p. 461*
		TRIGout[1...4]?			see *p. 461*
	FBC	[SENSe]			see *p. 462*
		[SENSe?]			see *p. 462*
		INPut[1...4]		<TLS>	see *p. 463*
		INPut[1...4]?			see *p. 464*
	PROGress?				see *p. 470*
	REFerence	[SENSe]		<slot>	see *p. 471*
		[SENSe]?			see *p. 471*
		TLSIn		<TLS>	see *p. 472*
		TLSIn?			see *p. 473*
	SCAN	ILPDL?			see *p. 474*
	SCANsync	[SENSe]		<slot>	*see p. 475*
		[SENSe?]			see *p. 475*
	SMODe			<mode>	see *p. 477*
	SMODe?				see *p. 477*
	SOP			<state of polarization>	see *p. 478*
	SOP?				see *p. 479*
	SOP	CURRent?			see *p. 480*
		DATA?		<format>[,<reduction>]	see *p. 481*
	STABilization			<output>[,<duration>]	see *p. 483*
	STABilization?				see *p. 484*
	STARtup	PROGress?			see *p. 484*
	TLS[1...4]	[IDentifier]		<identifier>	see *p. 485*
		[IDentifier]?			see *p. 485*
		ACTive		<state>	see *p. 486*
		ACTive?			see *p. 486*
		AVG		<mode>[,<value>[<unit>]]	see *p. 487*

Command Overview				Parameter(s)	Section
		AVG?			see *p. 488*
		POWer		<power>[<unit>]	see *p. 489*
		POWer?			see *p. 489*
		SPEed		<speed>	see *p. 490*
		SPEed?			see *p. 490*
		TRIGin		<trigger>	see *p. 491*
		TRIGin?			see *p. 491*
		WAVelength	STARt	<start value>[<unit>]	see *p. 492*
			STARt?		see *p. 493*
			STOP	<stop value>[<unit>]	see *p. 494*
			STOP?		see *p. 495*
	TMODe			<start mode>	see *p. 496*
	TMODe?				see *p. 496*
	WAVelength	SAMPling		<sampling>[PM]	see *p. 497*
		SAMPling?			see *p. 497*
		STARt		<start value>[<unit>]	see *p. 498*
		STARt?			see *p. 498*
		STOP		<stop value>[<unit>]	see *p. 499*
		STOP?			see *p. 499*

Commands and Queries

INITiate[:IMMediate]

Description	This command performs a scan with the current parameters. You can abort the scan with the :ABORt command.
Type	Overlapped, no query. When the system executes this command, the bit 2 "Scanning" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	INITiate[:IMMediate]
Parameter(s)	None.
Example(s)	INIT

INITiate:CURRent?

Description	This query returns the number of sweeps performed for the in progress acquisition.
Type	Overlapping, query only.
Syntax	INITiate:CURRent?
Parameter(s)	None.
Response Syntax	<count>
Response(s)	*count:*
	Integer corresponding to the current number of sweeps.
Example(s)	INIT:CURRent? returns 50

INITiate:DCHAINing:TRIGout[1...4]

Description	This command sets the electrical trigger link between the Primary CTP10 and the Secondary CTP10. For more details on daisy chaining, see *Using Additional OPMs (Daisy Chaining mode)* on page 109
Applicability	This command is only available in Daisy chaining mode: the Daisy chaining connexion must have previously been open (response 1 to *CTP:DCHAINing:ID1:LINK?* on page 408). In daisy chaining mode, this command is not available on Secondary CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:DCHAINing:TRIGout[1...4]<wsp><Secondary TRIG IN>
Parameter(s)	[1...4] designates the TRIG OUT port (on the current CTP10) to use for daisy chaining. *Secondary TRIG IN:* Integer representing the identifier of the TRIG IN port of the Secondary CTP10 to use for daisy chaining, in the range 11 to 18: ➤ 0: no trigger input port is used. ➤ 11 to 18: TRIG IN 1 to TRIG IN 8 input ports of the Secondary CTP10.
Example(s)	INIT:DCHAIN:TRIG3 11

INITiate:DCHAINing:TRIGout[1...4]?

Description	This query returns the electrical trigger input used on the Secondary CTP10 for the given TRIG OUT port on the current CTP10.
Type	Overlapping.
Syntax	INITiate:DCHAINing:TRIGout[1...4]?
Parameter(s)	None. [1...4] designates the TRIG OUT port (on the current CTP10) used for daisy chaining.
Response Syntax	<Secondary TRIG IN>
Response(s)	*Secondary TRIG IN:* Integer representing the identifier of the TRIG IN port of the Secondary CTP10 used for daisy chaining, in the range 11 to 18: ➤ 0: no trigger input port is used. ➤ 11 to 18: TRIG IN 1 to TRIG IN 8 input ports of the Secondary CTP10.
Example(s)	INIT:DCHAIN:TRIG3 11 INIT:DCHAIN:TRIG3 returns 11

INITiate:FBC[:SENSe]

Description	This command defines the slot number of the FBC module in use in the CTP10 mainframe.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:FBC[:SENSe]<wsp><slot>
Parameter(s)	*slot:* Integer representing the position of the FBC module in the mainframe (from left to right), in the range 1 to 10. If no FBC module is in use, set 0.
Example(s)	INIT:FBC:SENSe 2

INITiate:FBC[:SENSe]?

Description	This query returns the slot number of the FBC module in use in the CTP10 mainframe.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:FBC[:SENSe]?
Parameter(s)	None.
Response Syntax	<slot>
Response(s)	*slot:* Integer representing the position of the FBC module in the mainframe (from left to right), in the range 1 to 10. The query returns 0 if no IL RL OPM2 or IL PDL OPM2 module is defined.
Example(s)	INIT:FBC:SENSe 2 INIT:FBC:SENSe? returns 2

INITiate:FBC:INPut[1...4]

Description	This command defines the TLS connected to the given TLS IN port of the FBC module in use in the CTP10 mainframe. [1...4] designates the TLS IN port of the FBC module to which the command applies.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:FBC:INPut[1...4]<wsp><TLS>
Parameter(s)	*TLS:* Integer representing the TLS connected to the given TLS IN port of the FBC module, in the range 0 to 4: 0: no TLS is connected. 1: laser set as TLS 1 in the subsystem (with command *INITiate:TLS[1...4][:IDentifier]* on page 485). 2: laser set as TLS 2 in the subsystem (with command *INITiate:TLS[1...4][:IDentifier]* on page 485). 3: laser set as TLS 3 in the subsystem (with command *INITiate:TLS[1...4][:IDentifier]* on page 485). 4: laser set as TLS 4 in the subsystem (with command *INITiate:TLS[1...4][:IDentifier]* on page 485).
Example(s)	INIT:FBC:INP1 3

INITiate:FBC:INPut[1...4]?

Description	This query returns the TLS connected to the given TLS IN port of the FBC module in use in the CTP10 mainframe.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:FBC:INPut[1...4]?
Parameter(s)	None.
Response Syntax	<laser>
Response(s)	*laser:* Integer representing the TLS connected to the given TLS IN port of the FBC module, in the range 0 to 4: 0: no TLS is connected. 1: laser set as TLS 1 in the subsystem. 2: laser set as TLS 2 in the subsystem. 3: laser set as TLS 3 in the subsystem. 4: laser set as TLS 4 in the subsystem.
Example(s)	INIT:FBC:INP1 3 INIT:FBC:INP1? returns 3

INITiate:ILRL[:SENSe] (Deprecated)

Description	This command is deprecated, use *INITiate:REFerence[:SENSe]* on page 471 instead. This command defines the slot number of the IL RL OPM2 or IL PDL or IL PDL OPM2 measurement module in use in the CTP10 mainframe and sets the optical link from the Out to DUT port of this module to the input port of the DUT. If trace types are activated (see *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive* on page 530), this command deletes traces that are not compatible with the selected module: ➤ If you select an IL RL OPM2 module, all existing PDL trace types are deleted. ➤ If you select an IL PDL or IL PDL OPM2 module, all existing BR trace types are deleted.
Type	Sequential.
Syntax	INITiate:ILRL[:SENSe]<wsp><slot>
Parameter(s)	*slot:* Integer representing the position of the IL RL OPM2 or IL PDL or IL PDL OPM2 measurement module in the mainframe (from left to right), in the range 1 to 10. If no IL RL OPM2 or IL PDL or IL PDL OPM2 module is in use, set 0.
Example(s)	INIT:ILRL:SENSe 4

INITiate:ILRL[:SENSe]? (Deprecated)

Description	This query is deprecated, use *INITiate:REFerence[:SENSe]?* on page 471 instead. This query returns the slot number of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe.
Type	Sequential.
Syntax	INITiate:ILRL[:SENSe]?
Parameter(s)	None.
Response Syntax	<slot>
Response(s)	*slot:* Integer representing the position of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in the mainframe (from left to right), in the range 1 to 10. The query returns 0 if no IL RL OPM2 or IL PDL or IL PDL OPM2 module is defined.
Example(s)	INIT:ILRL:SENSe 4 INIT:ILRL:SENSe? returns 4

INITiate:ILRL:TLSin (Deprecated)

Description	This query is deprecated, use *INITiate:REFerence:TLSin* on page 472 instead. This command defines and sets the optical link to the TLS (or FBC module) connected to the input port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe. To modify the connection of a TLS previously connected to the IL RL OPM2 or IL PDL or IL PDL OPM2 module (to connect the IL RL OPM2 module to the FBC module for example), do not forget to cancel the connection by setting this command to 0 before setting the new connection of the TLS.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:ILRL:TLSin<wsp><TLS>
Parameter(s)	*laser:* Integer representing the TLS or FBC output port connected to the TLS IN port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module, in the range 0 to 5: 0: no TLS is connected. 1: laser set as TLS 1 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 2: laser set as TLS 2 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 3: laser set as TLS 3 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 4: laser set as TLS 4 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 5: only available with the IL RL OPM2 or IL PDL OPM2 module. Output port of the FBC module (FBC OUT).
Example(s)	INIT:ILRL:TLS 4

INITiate:ILRL:TLSin? (Deprecated)

Description	This query is deprecated, use *INITiate:REFerence:TLSin?* on page 473 instead. This query returns the TLS (or FBC module) set as connected to the input port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:ILRL:TLSin?
Parameter(s)	None.
Response Syntax	<TLS>
Response(s)	*laser:* Integer representing the TLS or FBC output port connected to the TLS IN port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module, in the range 0 to 5: 0: no laser is connected. 1: laser set as TLS 1 in the subsystem. 2: laser set as TLS 2 in the subsystem. 3: laser set as TLS 3 in the subsystem. 4: laser set as TLS 4 in the subsystem. 5: output port of the FBC module (FBC OUT). Only available with the IL RL OPM2 or IL PDL OPM2 module.
Example(s)	INIT:ILRL:TLSin 4 INIT:ILRL:TLSin? returns 4

INITiate:LASer:POWer (Deprecated)

Description	This command is deprecated, use *INITiate:TLS[1...4]:POWer* on page 489 instead. This command sets the power of all lasers used for the sweep.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:LASer:POWer<wsp><power>[<unit>]
Parameter(s)	➤ *power:* Laser power as float value for the sweep. ➤ *unit:* Unit of the power value. The allowed units are DBM (dBm) or MW (mW). The default unit is dBm.
Example(s)	INIT:LAS:POW 1DBM

INITiate:LASer:POWer? (Deprecated)

Description	This query is deprecated, use *INITiate:TLS[1...4]:POWer?* on page 489 instead. This query returns the laser power for the sweep, only if a single laser is used for the sweep.
Type	Overlapping.
Syntax	INITiate:LASer:POWer?
Parameter(s)	None.
Response Syntax	<power>
Response(s)	*power:* Laser power set for the sweep in dBm or W depending on the unit setting (set with command *UNIT:Y* on page 557).
Example(s)	INIT:LAS:POW 1DBM INIT:LAS:POW? returns +1.00000000E+000

INITiate:PROGress?

Description	This query returns the progress value of the current sweep.
Type	Overlapping, query only.
Syntax	INITiate:PROGress?
Parameter(s)	None.
Response Syntax	<progress>
Response(s)	*progress:*
	Integer corresponding to the progress of the current sweep in percent.
Example(s)	INIT:PROGress? returns 27

INITiate:REFerence[:SENSe]

Description	This command defines the slot number of the IL RL OPM2 or IL PDL or IL PDL OPM2 measurement module in use in the CTP10 mainframe and sets the optical link from the Out to DUT port of this module to the input port of the DUT. If trace types are activated (see *TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive* on page 530), this command deletes traces that are not compatible with the selected module: ➤ If you select an IL RL OPM2 module, all existing PDL trace types are deleted. ➤ If you select an IL PDL or IL PDL OPM2 module, all existing BR trace types are deleted.
Type	Sequential.
Syntax	INITiate:REFerence[:SENSe]<wsp><slot>
Parameter(s)	*slot:* Integer representing the position of the IL RL OPM2 or IL PDL or IL PDL OPM2 measurement module in the mainframe (from left to right), in the range 1 to 10. If no IL RL OPM2 or IL PDL or IL PDL OPM2 module is in use, set 0.
Example(s)	INIT:REFerence:SENSe 4

INITiate:REFerence[:SENSe]?

Description	This query returns the slot number of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe.
Type	Sequential.
Syntax	INITiate:REFerence[:SENSe]?
Parameter(s)	None.
Response Syntax	<slot>
Response(s)	*slot:* Integer representing the position of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in the mainframe (from left to right), in the range 1 to 10. The query returns 0 if no IL RL OPM2 or IL PDL or IL PDL OPM2 module is defined.
Example(s)	INIT:REFerence:SENSe 4 INIT:REFerence:SENSe? returns 4

INITiate:REFerence:TLSin

Description	This command defines and sets the optical link to the TLS (or FBC module) connected to the input port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe. To modify the connection of a TLS previously connected to the IL RL OPM2 or IL PDL or IL PDL OPM2 module (to connect the IL RL OPM2 module to the FBC module for example), do not forget to cancel the connection by setting this command to 0 before setting the new connection of the TLS.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:REFerence:TLSin<wsp><TLS>
Parameter(s)	*laser:* Integer representing the TLS or FBC output port connected to the TLS IN port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module, in the range 0 to 5: 0: no TLS is connected. 1: laser set as TLS 1 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 2: laser set as TLS 2 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 3: laser set as TLS 3 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 4: laser set as TLS 4 in the subsystem (with *INITiate:TLS[1...4][:IDentifier]* on page 485). 5: only available with the IL RL OPM2 or IL PDL OPM2 module. Output port of the FBC module (FBC OUT).
Example(s)	INIT:REFerence:TLS 4

INITiate:REFerence:TLSin?

Description	This query returns the TLS (or FBC module) set as connected to the input port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module in use in the CTP10 mainframe.
Applicability	In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:REFerence:TLSin?
Parameter(s)	None.
Response Syntax	<TLS>
Response(s)	*laser:* Integer representing the TLS or FBC output port connected to the TLS IN port of the IL RL OPM2 or IL PDL or IL PDL OPM2 module, in the range 0 to 5: 0: no laser is connected. 1: laser set as TLS 1 in the subsystem. 2: laser set as TLS 2 in the subsystem. 3: laser set as TLS 3 in the subsystem. 4: laser set as TLS 4 in the subsystem. 5: output port of the FBC module (FBC OUT). Only available with the IL RL OPM2 or IL PDL OPM2 module.
Example(s)	INIT:REFerence:TLSin 4 INIT:REFerence:TLSin? returns 4

INITiate:SCAN:ILPDL?

Description	This query returns the measurement scan type that will be performed at next scan, based on the current list of traces when the query is received.
Type	Overlapping, query only.
Syntax	INITiate:SCAN:ILPDL?
Parameter(s)	None.
Response Syntax	<scan type>
Response(s)	*scan type:* Integer corresponding to the scan type that will be performed at next scan: 0: single-sweep scan (IL-only measurement scan) 1: 4-sweeps scan (IL/PDL or PDL-only measurement scan)
Example(s)	INIT:SCAN:ILPDL? returns 1

INITiate:SCANsync[:SENSe]

Description	This command defines the slot number of the SCAN SYNC module in use in the CTP10 mainframe and sets the optical link to the Out to SCAN SYNC (or OUT1) port of the IL RL OPM2 or Il PDL or IL PDL OPM2 module.
Type	Sequential.
Syntax	INITiate:SCANsync[:SENSe]<wsp><slot>
Parameter(s)	*slot:* Integer representing the position of the SCAN SYNC module in the mainframe (from left to right), in the range 1 to 10. If no SCAN SYNC module is in use, set 0.
Example(s)	INIT:SCANsync:SENSe 5

INITiate:SCANsync[:SENSe]?

Description	This query returns the slot number of the SCAN SYNC module in use in the CTP10 mainframe.
Type	Sequential.
Syntax	INITiate:SCANsync[:SENSe]?
Parameter(s)	None.
Response Syntax	<slot>
Response(s)	*slot:* Integer representing the position of the SCAN SYNC module in the mainframe (from left to right), in the range 1 to 10. The query returns 0 if no SCAN SYNC module is defined.
Example(s)	INIT:SCAN:SENSe 5 INIT:SCAN:SENSe? returns 5

INITiate:SINTerval (Deprecated)

Description	This command is deprecated and will be removed from the next version. This command sets the sweep interval for continuous scans.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10. (response 2 to *CTP:LSHARing:STATus?* on page 425)
Type	Sequential.
Syntax	INITiate:SINTerval<wsp><interval>[,<duration>]
Parameter(s)	➤ *interval:* Activation state of the sweep interval. The allowed values are: 0|OFF: no pause between sweeps. 1|ON: sets a pause between sweeps in continuous scan mode, defined by the <duration> parameter (see below). In laser sharing mode, this parameter is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425). ➤ *duration:* Period of time between the beginning of two successive scans, in the range 1 to 999 seconds.
Example(s)	INIT:SINT ON,6.9

INITiate:SINTerval? (Deprecated)

Description	This query is deprecated and will be removed from the next version. This query returns the sweep interval set for continuous scans.
Type	Overlapping.
Syntax	INITiate:SINTerval?
Parameter(s)	None.
Response Syntax	<interval>,<duration>
Response(s)	➤ *interval:* Activation state of the sweep interval: 0: no pause is set between sweeps. 1: a pause is observed between sweeps in continuous scan mode, defined by the <duration> value (see below). ➤ *duration:* Period of time between the beginning of two successive scans.
Example(s)	INIT:SINT OFF,5.3 INIT:SINT? returns 0,5.3

INITiate:SMODe

Description	This command sets the acquisition scanning mode. The corresponding GUI setting is **Scan mode** (see **Scan mode on page 125**).
Type	Sequential.
Syntax	INITiate:SMODe<wsp><mode>
Parameter(s)	*mode:* Scanning mode. The allowed values are: 0 | SINGle: single scan mode. 1 | CONTinuous: continuous scan mode.
Example(s)	INIT:SMOD SING

INITiate:SMODe?

Description	This query returns the acquisition scanning mode.
Type	Overlapping.
Syntax	INITiate:SMODe?
Parameter(s)	None.
Response Syntax	<mode>
Response(s)	*mode:* Scanning mode: 0: single scan mode. 1: continuous scan mode.
Example(s)	INIT:SMOD CONT INIT:SMOD? returns 1

INITiate:SOP

Description	This command sets the state of polarization to use for the next IL only measurements with an IL PDL or IL PDL OPM2 module.
Applicability	This command is only available on setups using an IL PDL module.
Type	Sequential.
Syntax	INITiate:SOP<wsp><state of polarization>
Parameter(s)	*state of polarization:* Integer representing the state of polarization. ➤ The allowed values on the IL PDL are: 1: LVP Linearly vertical polarized. 2: LHP Linearly horizontal polarized. 3: L-45 Linear -45° polarized. 4: RCP Right circularly polarized. ➤ The allowed values on the IL PDL OPM2 are: 1: state of polarization #1 2: state of polarization #2 3: state of polarization #3 4: state of polarization #4
Example(s)	INIT:SOP 2

INITiate:SOP?

Description	This query returns the state of polarization used for the IL only measurements with an IL PDL or IL PDL OPM2 module.
Applicability	This command is only available on setups using an IL PDL module.
Type	Overlapping.
Syntax	INITiate:SOP?
Parameter(s)	None.
Response Syntax	<state of polarization>
Response(s)	*state of polarization:* Integer corresponding to the state of polarization set. ➤ On the IL PDL module: 1: LVP Linearly vertical polarized. 2: LHP Linearly horizontal polarized. 3: L-45 Linear -45° polarized. 4: RCP Right circularly polarized. 0: not applicable on the module. ➤ On the IL PDL OPM2 module: 1: state of polarization #1 2: state of polarization #2 3: state of polarization #3 4: state of polarization #4 0: not applicable on the module.
Example(s)	INIT:SOP? returns 2

INITiate:SOP:CURRent?

Description	This query returns the current state of polarization used for the TF/PDL measurement in progress, with an IL PDL or IL PDL OPM2 module.
Applicability	This command is only available on setups using an IL PDL or IL PDL OPM2 module.
Type	Overlapping, query only.
Syntax	INITiate:SOP:CURRent?
Parameter(s)	None.
Response Syntax	<state of polarization>
Response(s)	*state of polarization:* Integer corresponding to the state of polarization currently used during the TF/PDL measurement in progress. ➤ On the IL PDL module: 0: not applicable 1: LVP Linearly vertical polarized. 2: LHP Linearly horizontal polarized. 3: L-45 Linear -45° polarized. 4: RCP Right circularly polarized. ➤ On the IL PDL OPM2 module: 0: not applicable. 1: state of polarization #1 2: state of polarization #2 3: state of polarization #3 4: state of polarization #4
Example(s)	INITiate:SOP:CURRent? returns 2

INITiate:SOP:DATA?

Description	This query returns data that describe the state of polarization (SOP) of the last measurement performed with an IL PDL or IL PDL OPM2 module. ➤ For a TF-only or I-only measurement, data retrieved corresponds to the state of polarization set using the *INITiate:SOP* command (see *p. 478*), for each wavelength/frequency of the trace sample (or the default state of polarization if the *INITiate:SOP* command has not been used). ➤ For a 4 state IL-PDL measurement (4 sweeps), data retrieved corresponds to the four states of polarization.
Applicability	This command is only available on setups using an IL PDL or IL PDL OPM2 module.
Type	Sequential.
Syntax	INITiate:SOP:DATA?<wsp><format>[,<reduction>]
Parameter(s)	➤ *format* Format of the SOP data. The allowed values are: 0|ASCii: SOP data is formatted as ASCII values, such as <value1>,<value2>,<value3>, ... 1|BINary: SOP data is formatted as binary blocks such as: #<length><Nb of bytes><blocks> where: <length>: number of subsequent bytes that you have to check to know the total length. <Nb of bytes>: size of <blocks> in bytes. <blocks>: float data bytes (packet of 4 bytes, big endian). For example, data containing 12 data points will results in the header "#248<blocks>" as 48 bytes are needed to define the data and "48" length is 2. ➤ *reduction* Reduction factor (optional), which decimates the number of data points for faster data retrieval. A reduction factor of 5 would select a point out of every 5 points available on the trace. The first value received always corresponds to the "start wavelength" data point.

INITiate:SOP:DATA?

Response Syntax	<SOP data>
Response(s)	*SOP data:* Triplets of values corresponding to the normalized Stokes parameters of the Stokes vector: <S1>,<S2>,<S3> ➤ If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <S1>,<S2>,<S3>,<S1>,<S2>,<S3> ... ➤ If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks. On 4-state IL-PDL measurement (4 sweeps), the query returns SOP data of the four states of polarization one after another, formatted as follows: [[<S1>,<S2>,<S3>] trace SOP#1],[[<S1>,<S2>,<S3>] trace SOP#2],[[<S1>,<S2>,<S3>] trace SOP#3],[[<S1>,<S2>,<S3>] trace SOP#4]
Example(s)	INITiate:SOP:DATA? ASCII returns -1.0000,-0.0002,-0.0049,...

INITiate:STABilization

Description	This command sets the output settings of the lasers used for the scan.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10 (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:STABilization<wsp><output>[,<duration>]
Parameter(s)	➤ *output:* Activation state of the laser after scan stop. The allowed values are: 0|OFF: disables the laser optical output when the scan stops. 1|ON (default): sets the laser optical output to stay enabled after scan stop. In laser sharing mode, this parameter is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425). The corresponding GUI setting is **Keep enabled after scan stop** (see **Keep enabled after scan stop on page 120**). ➤ *duration:* Period of time during which you want the laser to stabilize before starting the acquisition, in the range 0 to 60 seconds. The default value is 0. The corresponding GUI setting is **Stabilization Time** (see **Stabilization Time on page 120**).
Example(s)	INIT:STAB OFF,12.3

INITiate:STABilization?

Description	This query returns the output settings of the lasers used for the scan.
Type	Overlapping.
Syntax	INITiate:STABilization?
Parameter(s)	None.
Response Syntax	<output>,<duration>
Response(s)	➤ *output:* Activation state of the laser after scan stop: 0: the laser optical output is disabled when the scan stops. 1: the laser optical output stays enabled after scan stop. ➤ *duration:* Period of time during which you want the laser to stabilize before starting the acquisition.
Example(s)	INIT:STAB ON,5.6 INIT:STAB? returns 1,5.6

INITiate:STARtup:PROGress?

Description	This query returns the progress value of the scan initialization (for the current sweep).
Type	Overlapping, query only.
Syntax	INITiate:STARtup:PROGress?
Parameter(s)	None.
Response Syntax	<progress>
Response(s)	*progress:* Integer corresponding to the progress of the scan initialization in percent.
Example(s)	INIT:STAR:PROG? returns 95

INITiate:TLS[1...4][:IDentifier]

Description	This command defines the identifier of the laser to use as a TLS in the subsystem. The corresponding GUI setting is the selection of a TLS in the **Subsystem setup** menu (see *Selecting/Removing the Laser(s)* on page 105).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4][:IDentifier]<wsp><identifier>
Parameter(s)	*identifier:* Integer representing the identifier of the laser that you want to use as a TLS in the subsystem, in the range 0 to 10. 0 means that the laser is not selected for use in the subsystem. The laser identification number is defined with the command *CTP:RLASer[1...10]:TYPE* on page 436 (in the GUI, it corresponds to the position of the laser in the **Modules & Lasers** window from left to right).
Example(s)	INIT:TLS1:IDentifier 4

INITiate:TLS[1...4][:IDentifier]?

Description	This query returns the identifier of the selected laser in use in the subsystem.
Type	Overlapping.
Syntax	INITiate:TLS[1...4][:IDentifier]?
Parameter(s)	None.
Response Syntax	<identifier>
Response(s)	*identifier:* Integer representing the identification number of the laser in use in the subsystem. 0 means that the laser is not selected for use in the subsystem.
Example(s)	INIT:TLS2:IDentifier 5 INIT:TLS2:IDentifier? returns 5

INITiate:TLS[1...4]:ACTive

Description	This command selects the TLS to use for the scan. The corresponding GUI setting is the TLS selection check box in the **Scan** menu (see *Defining the Scanning Lasers* on page 118).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:ACTive<wsp><state>
Parameter(s)	[1...4] designates the identifier of the TLS in use in the subsystem. *state:* Activation state of the given TLS. The allowed values are: ➤ 0|INACtive: clears the TLS selection for the scan. ➤ 1|ACTive: selects the TLS for the scan.
Example(s)	INIT:TLS1:ACT 0

INITiate:TLS[1...4]:ACTive?

Description	This query returns the scan activation state of the TLS in the subsystem.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:ACTive?
Parameter(s)	None. [1...4] designates the identifier of the TLS in use in the subsystem.
Response Syntax	<state>
Response(s)	*state:* Activation state of the given TLS: ➤ 0: the TLS is not used for the scan. ➤ 1: the TLS is used for the scan.
Example(s)	INIT:TLS1:ACT 0 INIT:TLS1:ACT? returns 0

INITiate:TLS[1...4]:AVG

Description	This command sets the averaging time of the sweep part defined for the given TLS. The corresponding GUI setting is **Averaging Time on page 119**.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:AVG<wsp><mode>[,<value>[<unit>]]
Parameter(s)	➤ *mode:* Averaging time mode for the given TLS. The allowed values are: 0|MANUAL: sets the averaging time to Manual. In this case, you must set the <value> parameter. 1|AUTO: sets the averaging time to Automatic. ➤ *value:* Averaging time value between 1μs and 1s as float value. ➤ *unit:* Unit of the sweeping start value. The allowed values are: US (microsecond) or MS (millisecond). The default unit is microsecond.
Example(s)	INIT:TLS1:AVG 0,100MS

INITiate:TLS[1...4]:AVG?

Description	This query returns the averaging time mode and value of the sweep part defined for the given TLS.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:AVG?
Parameter(s)	None. [1...4] designates the identifier of the TLS in use in the subsystem.
Response Syntax	<mode>,<value>
Response(s)	➤ *mode:* Averaging time mode for the given TLS: 0: the averaging time is set to Manual. 1: the averaging time is set to Automatic. ➤ *value:* Averaging time value in second. If the averaging time is set to automatic, the query returns the automatically calculated value.
Example(s)	INIT:TLS1:AVG 0,100mS INIT:TLS1:AVG? returns 0,+1.00000000E-001

INITiate:TLS[1...4]:POWer

Description	This command sets the power of the TLS for the sweep. The corresponding GUI setting is **Power on page 119**.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:POWer<wsp><power>[<unit>]
Parameter(s)	➤ *power:* Laser power as float value for the sweep. Possible values depend on the laser power specifications. On T500S laser, the power is limited to +13 dBm. ➤ *unit:* Unit of the power value. The allowed units are DBM (dBm) or MW (mW). The default unit is dBm.
Example(s)	INIT:TLS1:POW 8 INIT:TLS1:POW? returns +8.00000000E+000

INITiate:TLS[1...4]:POWer?

Description	This query returns the laser power for the sweep.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:POWer?
Parameter(s)	None.
Response Syntax	<power>
Response(s)	*power:* Laser power set for the sweep in dBm or W depending on the unit setting (set with command *UNIT:Y* on page 557).
Example(s)	INIT:TLS1:POW 8 INIT:TLS1:POW? returns +8.00000000E+000

INITiate:TLS[1...4]:SPEed

Description	This command sets the sweeping speed of the TLS for the scan. The corresponding GUI setting is **Speed on page 119**.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:SPEed<wsp><speed>
Parameter(s)	[1...4] designates the identifier of the TLS in use in the subsystem. *speed:* Sweeping speed of the given TLS in nm/s. The allowed values depend on the laser: ➤ EXFO T100S-HP: 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 17; 18; 20; 22; 25; 29; 33; 40; 50; 67; 100. ➤ VIAVI mSWS-A1SLS: 5 to 100 ➤ T200S: 10 (if available on the laser); 20; 50; 100; 200 (if available on the laser). Possible values depend on the laser model. ➤ T500S: 10 (if available on the laser); 20; 50; 100; 200 (if available on the laser). Possible values depend on the laser model.
Example(s)	INIT:TLS2:SPE 100

INITiate:TLS[1...4]:SPEed?

Description	This query returns the sweeping speed of the TLS for the scan.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:SPEed?
Parameter(s)	None. [1...4] designates the identifier of the TLS in use in the subsystem.
Response Syntax	<speed>
Response(s)	*speed:* Sweeping speed of the given TLS in nm/s.
Example(s)	INIT:TLS2:SPE 100 INIT:TLS2:SPE? returns 100

INITiate:TLS[1...4]:TRIGin

Description	This command sets the electrical trigger input to use for the given laser, for Pulse trigger output.
Applicability	This command does not apply to VIAVI mSWS-A1SLS lasers. In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:TRIGin<wsp><trigger>
Parameter(s)	[1...4] designates the identifier of the laser in use in the subsystem. *trigger:* Integer representing the identifier of the TRIG IN port to use for the laser, in the range 0 to 8: 0: no trigger input port is used. 1 to 8: TRIG IN 1 to TRIG IN 8 input ports.
Example(s)	INIT:TLS1:TRIG 3

INITiate:TLS[1...4]:TRIGin?

Description	This query returns the electrical trigger input used (for Pulse trigger) for the given laser.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:TRIGin?
Parameter(s)	None. [1...4] designates the identifier of the laser in use in the subsystem.
Response Syntax	<trigger>
Response(s)	*trigger:* Integer representing the identifier of the TRIG IN port used for the laser, in the range 0 to 8.
Example(s)	INIT:TLS1:TRIG 3 INIT:TLS1:TRIG? returns 3

INITiate:TLS[1...4]:WAVelength:STARt

Description	This command sets the sweeping start wavelength or frequency of the given TLS for the scan (the overall scan range is set with commands *INITiate:WAVelength:STARt* on page 498 and *INITiate:WAVelength:STOP* on page 499). The corresponding GUI setting is **Low wav./freq. on page 119**. As the TLS start and stop values are interdependent, this command may modify the already set stop value to ensure consistency and comply with the minimum and maximum limits of each command.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:WAVelength:STARt<wsp><start value>[<unit>]
Parameter(s)	[1...4] designates the identifier of the TLS in use in the subsystem. ➤ *start value:* Start wavelength or frequency of the sweep part of the TLS. ➤ *unit:* Unit of the sweeping start value. The allowed units are: PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:TLS2:WAV:STAR 1500NM

INITiate:TLS[1...4]:WAVelength:STARt?

Description	This query returns the sweeping start wavelength or frequency of the TLS for the scan.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:WAVelength:STARt?
Parameter(s)	None. [1...4] designates the identifier of the TLS in use in the subsystem.
Response Syntax	<start value>
Response(s)	*start value:* Sweeping start wavelength or frequency of the TLS in meters or hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:TLS2:WAV:STAR 1500NM INIT:TLS2:WAV:STAR? returns +1.50000000E-006

INITiate:TLS[1...4]:WAVelength:STOP

Description	This command sets the sweeping stop wavelength or frequency of the given TLS for the scan (the overall scan range is set with commands *INITiate:WAVelength:STARt* on page 498 and *INITiate:WAVelength:STOP* on page 499). The corresponding GUI setting is **High wav./freq. on page 119**. As the TLS start and stop values are interdependent, this command may modify the already set start value to ensure consistency and comply with the minimum and maximum limits of each command.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:TLS[1...4]:WAVelength:STOP<wsp><stop value>[<unit>]
Parameter(s)	[1...4] designates the identifier of the TLS in use in the subsystem. ➤ *stop value:* Stop wavelength or frequency of the sweep part of the TLS. ➤ *unit:* Unit of the sweeping stop value. The allowed units are: PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:TLS2:WAV:STOP 1650NM

INITiate:TLS[1...4]:WAVelength:STOP?

Description	This query returns the sweeping stop wavelength or frequency of the TLS for the scan.
Type	Overlapping.
Syntax	INITiate:TLS[1...4]:WAVelength:STOP?
Parameter(s)	None. [1...4] designates the identifier of the TLS in use in the subsystem.
Response Syntax	<stop value>
Response(s)	*stop value:* Sweeping stop wavelength or frequency set for the TLS in meters or hertz depending on the unit settings (set with command *UNIT:X* on page 556).
Example(s)	INIT:TLS2:WAV:STOP 1650NM INIT:TLS2:WAV:STOP? returns +1.65000000E-006

INITiate:TMODe

Description	This command sets the acquisition scanning start mode. The corresponding GUI setting is **Scan start** (see **Scan start on page 125**).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10. (response 2 to *CTP:LSHARing:STATus?* on page 425)
Type	Sequential.
Syntax	INITiate:TMODe<wsp><start mode>
Parameter(s)	*start mode:* Scanning start mode. The allowed values are: 0|MANual: manual scan start. 1|TRIGgered: triggered scan start. In laser sharing mode, this parameter is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Example(s)	INIT:TMODe MAN

INITiate:TMODe?

Description	This query returns the acquisition scanning start mode.
Type	Overlapping.
Syntax	INITiate:TMODe?
Parameter(s)	None.
Response Syntax	<start mode>
Response(s)	*start mode:* Scanning start mode: 0: manual scan start. 1: triggered scan start.
Example(s)	INIT:TMODe MAN INIT:TMODe? returns 0

INITiate:WAVelength:SAMPling

Description	This command sets the scan sampling value. The corresponding GUI setting is **Sampling on page 123**.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:WAVelength:SAMPling<wsp><sampling>[PM]
Parameter(s)	*sampling:* Scan sampling value in picometer. Possible values are: ➤ Standard sampling: integers in the range 1 to 250. ➤ High resolution sampling: 0.5; 0.2; 0.1; 0.05 or 0.02. Selecting a high resolution sampling value reduces the possible sweep span and laser speed. For more details, see **Sampling on page 123**.
Example(s)	INIT:WAVelength:SAMPling 20PM

INITiate:WAVelength:SAMPling?

Description	This query returns the scan sampling value.
Type	Overlapping.
Syntax	INITiate:WAVelength:SAMPling?
Parameter(s)	None.
Response Syntax	<sampling>
Response(s)	*sampling:* Scan sampling value in meters.
Example(s)	INIT:WAVelength:SAMPling 20PM INIT:WAVelength:SAMPling? returns +2.00000000E-011

INITiate:WAVelength:STARt

Description	This command sets the scan start wavelength or frequency. The corresponding GUI setting is **Start** (see **Start/Stop on page 122**). As the scan start and stop values are interdependent, this command may modify the already set stop value to ensure consistency and comply with the minimum and maximum limits of each command.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:WAVelength:STARt<wsp><start value> [<unit>]
Parameter(s)	➤ *start value:* Scan start wavelength or frequency. ➤ *unit:* Unit of the scan start value. The allowed units are: PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:WAV:STAR 1500NM

INITiate:WAVelength:STARt?

Description	This query returns the scan start wavelength or frequency.
Type	Overlapping.
Syntax	INITiate:WAVelength:STARt?
Parameter(s)	None.
Response Syntax	<start value>
Response(s)	*start value:* Scan start wavelength or frequency in meters or hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:WAV:STAR 1500NM INIT:WAV:STAR? returns +1.50000000E-006

INITiate:WAVelength:STOP

Description	This command sets the scan stop wavelength or frequency. The corresponding GUI setting is **Stop** (see **Start/Stop on page 122**). As the scan start and stop values are interdependent, this command may modify the already set start value to ensure consistency and comply with the minimum and maximum limits of each command.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	INITiate:WAVelength:STOP<wsp><stop value> [<unit>]
Parameter(s)	➤ *stop value:* Scan stop wavelength or frequency. ➤ *unit:* Unit of the scan stop value. The allowed units are: PM|NM|M|HZ|GHZ|THZ The default unit is meter or hertz, depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:WAV:STOP 1650NM

INITiate:WAVelength:STOP?

Description	This query returns the scan stop wavelength or frequency.
Type	Overlapping.
Syntax	INITiate:WAVelength:STOP?
Parameter(s)	None.
Response Syntax	<stop value>
Response(s)	*stop value:* Scan stop wavelength or frequency in meters or hertz depending on the unit setting (set with command *UNIT:X* on page 556).
Example(s)	INIT:WAV:STOP 1650NM INIT:WAV:STOP? returns +1.65000000E-006

MMEMory Commands and Queries

Quick Reference

Command Overview			Parameter(s)	Section
MMEMory	CATalog	[IMMediate]?		see *p. 501*
		DRIVe?		see *p. 502*
	CDIRectory		<directory>	see *p. 503*
	CDIRectory?			see *p. 503*
	CDRive		<drive>	see *p. 504*
	CDRive?			see *p. 504*
	COPY		<pathname1>,<pathname2>	see *p. 505*
	DELete		<name>	see *p. 505*
	LOAD	DEFault		see *p. 506*
		SETTings	<filename>	see *p. 506*
		TRACe	<filename>	see *p. 507*
	MDIRectory		<directory>	see *p. 507*
	STORe	ARESults	<filename>	see *p. 507*
		SCREenshot	<filename>	see *p. 508*
		SETTings	<filename>	see *p. 508*

Syntax of pathnames and filenames

- The path must be specified as follows: "<drive>:\<directory>\...\filename.ext" (double quotes can be omitted).
  - If <drive> is not specified, the current drive is used.
  - If the <directory>\...\ is also not specified, the current drive and directory is used.
- The file extension can be omitted when loading a file. In case it is omitted in a command to store a file, the default extension is applied.

Commands and Queries

MMEMory:CATalog[:IMMediate]?

Description	This query returns the state of the current directory or drive and the list of files and folders that it contains.
Type	Overlapping, query only.
Syntax	MMEMory:CATalog[:IMMediate]?
Parameter(s)	None.
Response Syntax	<pathname>,<free space>,<occupied space>, <number of folders>,<number of files>,{<folder name>,DIR,-}, {<file name>,<file type>,<file size>}
Response(s)	➤ *pathname:* Name of the current directory or drive. ➤ *free space:* Directory memory size available on the drive in MB (1,048576 bytes). ➤ *occupied space:* Memory size occupied by the files under the current directory in MB (1,048576 bytes). ➤ *number of folders:* Number of folders contained in the current directory. ➤ *number of files:* Number of folders contained in the current directory. ➤ *folder name:* Name of a folder contained in the current directory or drive. ➤ *file name:* Name of a file in the current directory or drive. ➤ *file type:* Filename extension. ➤ *file size:* File size in KB (1,024 bytes).
Example(s)	MMEM:CAT? returns E:\SWEEPRESULT,+2.535152E+003,+1.302739E+001,12,46, TRACE1, csv , +2.14015000E+002 , …

MMEMory:CATalog:DRIVe?

Description	This query returns the list of available storage drives connected to the instrument with their name, their type and the memory space available on them.
Type	Overlapping, query only.
Syntax	MMEMory:CATalog:DRIVe?
Parameter(s)	None.
Response Syntax	<number of drives>{<drive letter>,<drive size>, <drive free space>,<drive name>,<drive type>}
Response(s)	➤ *number of drives:* Number of drives connected to the CTP10. ➤ *drive letter:* Letter of (one of the) drive(s) connected to the CTP10. ➤ *drive size:* Connected drive memory size in MB (1,048576 Bytes). ➤ *drive free space:* Memory size available on the drive in MB (1,048576 Bytes). ➤ *drive name:* Name of the connected drive (if any). If the device has no name, the response is: "UNTITLED". ➤ *drive type:* Type of device connected to the CTP10: FIXED: the drive is the internal CTP10 drive. REMOTE: the drive is a network drive. REMOVABLE: the drive is an USB removable drive.
Example(s)	MMEM:CAT:DRIV? returns 2, D:\ ,+2.59401452E+003 , +2.25351452E+003, USER, FIXED, E:\, +1.90804500E+003, +5.31145148E+002, myUSBKey, REMOVABLE

MMEMory:CDIRectory

Description	This command sets the current directory pathname.
Type	Overlapping.
Syntax	MMEMory:CDIRectory<wsp><directory>
Parameter(s)	*directory:* Pathname of the directory that you want to set as current in the current drive (with or without outer backslashes).
Example(s)	MMEM:CDIR "NEWDUT\SAMPLES"

MMEMory:CDIRectory?

Description	This query returns the current directory path.
Type	Overlapping.
Syntax	MMEMory:CDIRectory?
Parameter(s)	None.
Response Syntax	<directory>
Response(s)	*directory:* Current directory pathname, including the drive letter.
Example(s)	MMEM:CDIR "NEWDUT\SAMPLES" MMEM:CDIR? returns E:\NEWDUT\SAMPLES\

MMEMory:CDRive

Description	This command sets the current drive letter.
Type	Overlapping.
Syntax	MMEMory:CDRive<wsp><drive>
Parameter(s)	*drive:* Letter of the drive that you want to set as current.
Example(s)	MMEM:CDR "E:"

MMEMory:CDRive?

Description	This query returns the current drive letter.
Type	Overlapping.
Syntax	MMEMory:CDRive?
Parameter(s)	None.
Response Syntax	<drive>
Response(s)	*drive:* Drive letter.
Example(s)	MMEM:CDR "E:" MMEM:CDR? returns E: where E: is the current drive.

MMEMory:COPY

Description	This command copies a specified file/folder from one directory and pastes it to another directory.
Type	Overlapping, no query.
Syntax	MMEMory:COPY<wsp><pathname1>,<pathname2>
Parameter(s)	➤ *pathname1:* Source file/folder pathname (absolute or relative to current directory/drive) that you want to copy. ➤ *pathname2:* Destination file/folder pathname (absolute or relative to current directory/drive) to which you want to paste the copied file/folder. The current drive or directory is not modified after command execution, even if you specify the full path. If you copy subsystem settings, make sure to place the corresponding trace folders in the same location as the copied setting file.
Example(s)	MMEM:COPY "D:\TRACE1.csv","E:\SPECTRUM\SAMPLES\SAMPLE1\TRACE1.csv"

MMEMory:DELete

Description	This command deletes a specified file or empty folder from the current directory.
Type	Overlapping, no query.
Syntax	MMEMory:DELete<wsp><name>
Parameter(s)	*name:* Name of the empty folder or file that you want to delete from the current directory. You cannot delete a folder that is not empty.
Example(s)	MMEM:DEL "TRACE1.csv"

MMEMory:LOAD:DEFault

Description	This command loads the default subsystem settings (blank subsystem). This command deletes all unsaved data of the current subsystem. Make sure to save the current subsystem data and settings before executing this command (*MMEMory:STORe:SETTings* on page 508).
Type	Overlapped, no query. When the system is loading default subsystem settings, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	MMEMory:LOAD:DEFault
Parameter(s)	None.
Example(s)	MMEM:LOAD:DEF

MMEMory:LOAD:SETTings

Description	This command loads the settings of an existing subsystem (*.CTP10 format) from a file (and folder) located in the current directory.
Type	Overlapped, no query. When the system is loading default subsystem settings, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	MMEMory:LOAD:SETTings<wsp><filename>
Parameter(s)	*filename:* Name of the subsystem file to load (in *.CTP10 format) from the current directory. This command deletes all unsaved data of the current subsystem. Make sure to save the current subsystem data and settings before executing this command (*MMEMory:STORe:SETTings* on page 508).
Example(s)	MMEM:LOAD:SETT "subsystemSettings.CTP10"

MMEMory:LOAD:TRACe

Description	This command loads a trace file (*.tra format) located in the current directory at the end of the store trace list.
Type	Overlapped, no query. When the system is loading a trace file, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	MMEMory:LOAD:TRACe<wsp><filename>
Parameter(s)	*filename:* Name of the trace file to load (in *.tra format) from the current directory. The trace is loaded at the end of the store trace list.
Example(s)	MMEM:LOAD:TRAC "DUTCHANNEL1.tra"

MMEMory:MDIRectory

Description	This command creates a new directory in the current drive or directory.
Type	Sequential, no query.
Syntax	MMEMory:MDIRectory<wsp><directory>
Parameter(s)	*directory:* Directory name that you want to create.
Example(s)	MMEM:MDIR "\SAMPLE1\"

MMEMory:STORe:ARESults

Description	This command saves the analysis results to a specific file in the current directory, in .csv format.
Type	Sequential, no query.
Syntax	MMEMory:STORe:ARESults<wsp><filename>
Parameter(s)	*filename:* Name of the file to which you want to save the analysis results in csv format.
Example(s)	MMEM:STOR:ARES "results.csv"

MMEMory:STORe:SCREenshot

Description	This command captures and saves a screenshot of the subsystem window to a specific file in the current directory.
Type	Sequential, no query.
Syntax	MMEMory:STORe:SCREenshot<wsp><filename>
Parameter(s)	*filename:* Name of the file to which you want to save the screenshot in *.jpg or *.png format. Default file extension, if not specified: .jpg
Example(s)	MMEM:STOR:SCRE "Subsystem Screenshot.jpg"

MMEMory:STORe:SETTings

Description	This command saves the entire subsystem settings into a file in the current directory to a specific file (and folder) in the current directory.
Type	Overlapped, no query. When the system is saving subsystem settings, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	MMEMory:STORe:SETTings<wsp><filename>
Parameter(s)	*filename:* Name of the file to which you want to save the subsystem in *.CTP10 format. It also saves in a separate folder (same name as the settings file: <filename>.CTP10 Traces) all the traces in their current state (in *.tra format), analysis parameters (*.ana format file), analysis results (*.anaresu format file), detectors reference data (.trc format file) and detectors quick reference data (.trc format file).
Example(s)	MMEM:STOR:SETT "Subsystem Settings.CTP10"

REFerence Commands and Queries

In REFerence:SENSe[1...20]:CHANnel[1...6]:

- [1...20] or [1...10] designates the module identification number, which is the position of the module in the mainframe from left to right.
  In Daisy chaining mode, the modules located on the Primary mainframe are identified using positions 1 to 10, and the modules located on the Secondary mainframe are identified using positions 11 to 20.
- [1...6] designates the detector identification number, which is the detector position on the module from top to bottom. This number is not taken into account for BR traces.

Quick reference

Command Overview					Parameter(s)	Section
REFerence	CLEAR					see *p. 509*
	SENSe[1...20]	CHANnel[1...6]	INIT			see *p. 510*
			RESult?			see *p. 511*
	QUICk	CLEAR				see *p. 511*
		RESult?				see *p. 512*
		SENSe[1...10]	CHANnel[1...6]	INIT		see *p. 513*
	WAVelength	RESult?				see *p. 514*
		SENSe[1...10]	CHANnel[1...6]	INIT	<gas cell>	see *p. 515*

Commands and Queries

REFerence:CLEAR

Description	This command clears all the references of the subsystem.
Type	Sequential, no query.
Syntax	REFerence:CLEAR
Parameter(s)	None.
Example(s)	REF:CLEAR

	REFerence:SENSe[1...20]:CHANnel[1...6]:INIT
Description	This command performs a reference of the given detector. Before sending this command, make sure that the patch cord is properly connected to the given detector. Fore more details on the referencing operation, see *Referencing the Subsystem* on page 130.
Type	Overlapped, no query. When the system executes this command, the bit 6 "Referencing" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	REFerence:SENSe[1...20]:CHANnel[1...6]:INIT
Parameter(s)	None.
Example(s)	REFerence:SENSe5:CHANnel1:INIT

REFerence:SENSe[1...20]:CHANnel[1...6]:RESult?

Description	This query returns the result of the referencing operation on the given detector.
Type	Sequential, query only.
Syntax	REFerence:SENSe[1...20]:CHANnel[1...6]:RESult?
Response Syntax	<state>,<type>,<date>,<time>
Response(s)	➤ *state:* Result of the referencing operation on the detector: 0: there is no valid reference. 1: the reference is valid. ➤ *type:* Type of the referencing operation on the detector: 0: TF reference (1 sweep) with the IL RL OPM2 module. 1: TF/PDL reference (4 sweeps) with the IL PDL or IL PDL OPM2 module. If the state is equal to 0: no value. ➤ *date:* If the state is equal to 1: date of the referencing operation in YYYYMMDD format. If the state is equal to 0: no value. ➤ *time:* If the state is equal to 1: time of the referencing operation in HHMMSS format. If the state is equal to 0: no value
Example(s)	REFerence:SENS5:CHAN1:RESULT? returns 1,0,20181024,173427 REFerence:SENS5:CHAN1:RESULT? returns 0,,,

REFerence:QUICK:CLEAR

Description	This command clears the quick reference of the subsystem.
Type	Sequential, no query.
Syntax	REFerence:QUICK:CLEAR
Parameter(s)	None.
Example(s)	REFerence:QUICK:CLEAR

REFerence:QUICk:RESult?

Description	This query returns the result of the quick referencing operation.
Type	Sequential, query only.
Syntax	REFerenceQUICk:RESULt:RESult?
Response Syntax	<state>,<date>,<time>,<module>,<detector>
Response(s)	➤ *state:* Result of the quick referencing operation: 0: there is no valid quick reference. 1: the quick reference is valid. ➤ *date:* If the state is equal to 1: date of the quick referencing operation in YYYYMMDD format. If the state is equal to 0: no value. ➤ *time:* If the state is equal to 1: time of the quick referencing operation in HHMMSS format. If the state is equal to 0: no value. ➤ *module:* If the state is equal to 1: identification number of the module used for the quick reference, in the range 1 to 10 (position of the module in the mainframe from left to right). If the state is equal to 0: no value. ➤ *detector:* If the state is equal to 1: identification number of the detector used for the quick reference, in the range 1 to 6 (detector position on the module from top to bottom). If the state is equal to 0: no value.
Example(s)	REF:QUIC:RESUL? returns 1,20181024,173427,6,3

REFerence:QUICk:SENSe[1...10]:CHANnel[1...6]:INIT

Description	This command performs a quick reference of the given detector. Before sending this command, make sure that the patch cord is properly connected to the given detector. For more details on the quick referencing operation, see *Referencing the Subsystem* on page 130.
Applicability	This command is only available if you use an IL RL OPM2 module (not available with an IL PDL or IL PDL OPM2 module).
Type	Overlapped, no query. When the system executes this command, the bit 7 "Quick referencing" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	REFerence:QUICk:SENSe[1...10]:CHANnel[1...6]:INIT
Parameter(s)	None.
Example(s)	REF:QUIC:SENS5:CHAN1:INIT

REFerence:WAVelength:RESult?

Description	This query returns the result of the last wavelength referencing operation.
Type	Sequential, query only.
Syntax	REFerence:WAVelength:RESult?
Response Syntax	<shift>,<date>,<time>
Response(s)	➤ *shift:* Frequency shift as a float value in Hertz. ➤ *date:* If the wavelength referencing is valid: date of the referencing operation in YYYYMMDD format. If there is no valid wavelength referencing: no value. ➤ *time:* If the wavelength referencing is valid: time of the referencing operation in HHMMSS format. If there is no valid wavelength referencing: no value.
Example(s)	REFerence:WAVelength:RES? returns +193,28978594E+011,20181024,173427

REFerence:WAVelength:SENSe[1...10]:CHANnel[1...6]:INIT

Description	This command performs a wavelength referencing of the SCAN SYNC module. Before sending this command, make sure that the gas cell is properly connected to the given OPM detector (wavelength referencing is not available on PCM detectors). Fore more details on the wavelength referencing operation, see *Performing Wavelength Referencing* on page 134.
Type	Sequential, no query. When the system executes this command, the bit 1 "Calibrating" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	REFerence:WAVelength:SENSe[1...10]:CHANnel[1...6]:INIT <gas cell>
Parameter(s)	*gas cell:* Type of the connected gas cell: 1: Acetylene C2H2 50 Torr 2: Acetylene C2H2 200 Torr 3: Hydrogen Fluoride HF 4: Hydrogen Cyanide HCN 25 Torr 5: Hydrogen Cyanide HCN 100 Torr 6: Carbon Monoxide 12C16O 1000 Torr 7: Carbon Monoxide 13C16O 1000 Torr
Example(s)	REFerence:WAVelength:SENSe5:CHANnel1:INIT 2

STATus Commands and Queries

Quick Reference

Command Overview			Parameter(s)	Section
STATus	OPERation	[EVENt]?		see *p. 516*
		CONDition?		see *p. 517*
		ENABle	<value>	see *p. 518*
		ENABle?		see *p. 518*
	QUEStionable	[EVENt]?		see *p. 519*
		CONDition?		see *p. 519*
		ENABle	<value>	see *p. 520*
		ENABle?		see *p. 520*
	PRESet			see *p. 521*

Commands and Queries

STATus:OPERation[:EVENt]?

Description

This query returns the value of the Operational Status Event Register for the current subsystem.

This event register is cleared after reading.

Type

Overlapping, query only.

Syntax

STATus:OPERation[:EVENt]?

Parameter(s)

None.

Response Syntax

<value>

Response(s)

value:

Unique integer in the range 0 to 65535, which represents the bit values of the Operational Status Event Register.

See the content of this register in *Operational / Questionable Status Reporting* on page 211.

The zero value is used to indicate the idle state.

Example(s)

STAT:OPER? returns 4

where 4 = Scanning

STATus:OPERation:CONDition?

Description	This query returns the value of the Operational Status Condition Register for the current subsystem.
Type	Overlapping, query only.
Syntax	STATus:OPERation:CONDition?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 65535, which represents the bit values of the Operational Status Condition Register. See the content of this register in *Operational / Questionable Status Reporting* on page 211. The zero value is used to indicate the idle state.
Example(s)	STAT:OPER:COND? returns 4 where 4 = Scanning

STATus:OPERation:ENABle

Description	This command sets the value of the Operational Status Enable Register.
Type	Overlapping.
Syntax	STATus:OPERation:ENABle<wsp><value>
Parameter(s)	*value:* Unique integer in the range 0 to 65535, which sets the value of the Operational Status Enable Register bit. See the content of this register in *Operational / Questionable Status Reporting* on page 211. Setting a bit in the register enables the corresponding bit in the Operational Status Event Register.
Example(s)	STAT:OPER:ENAB 4 where 4 = scanning.

STATus:OPERation:ENABle?

Description	This query returns the value of the Operational Status Enable Register bits.
Type	Overlapping.
Syntax	STATus:OPERation:ENABle?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 65535, which represents the value of the Operational Status Enable Register bit. See the content of this register in *Operational / Questionable Status Reporting* on page 211. A bit set in the register enables the corresponding bit in the Operational Status Event Register.
Example(s)	STAT:OPER:ENAB? returns 12 where 12 = scanning and analyzing.

STATus:QUEStionable[:EVENt]?

Description	This query returns the value of the Questionable Status Event Register for the current subsystem.
Type	Overlapping, query only.
Syntax	STATus:QUEStionable[:EVENt]?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 65535, which represents the bit values of the Questionable Status Event Register. See the content of this register in *Operational / Questionable Status Reporting* on page 211.
Example(s)	STAT:QUES? returns 1

STATus:QUEStionable:CONDition?

Description	This query returns the value of the Questionable Status Condition Register for the current subsystem.
Type	Overlapping, query only.
Syntax	STATus:QUEStionable:CONDition?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 65535, which represents the bit values of the Questionable Status Condition Register. See the content of this register in *Operational / Questionable Status Reporting* on page 211.
Example(s)	STAT:QUES:COND? returns 1

STATus:QUEStionable:ENABle

Description	This command sets the value of the Questionable Status Enable Register.
Type	Overlapping.
Syntax	STATus:QUEStionable:ENABle<wsp><value>
Parameter(s)	*value:* Unique integer in the range 0 to 65535, which sets the value of the Questionable Status Enable Register bit. See the content of this register in *Operational / Questionable Status Reporting* on page 211. Setting a bit in the register enables the corresponding bit in the Questionable Status Event Register.
Example(s)	STAT:QUES:ENAB 4

STATus:QUEStionable:ENABle?

Description	This query returns the value of the Questionable Status Enable Register bits.
Type	Overlapping.
Syntax	STATus:QUEStionable:ENABle?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 65535, which represents the value of the Questionable Status Enable Register bit. See the content of this register in *Operational / Questionable Status Reporting* on page 211. A bit set in the register enables the corresponding bit in the Questionable Status Event Register.
Example(s)	STAT:QUES:ENAB? returns 12

STATus:PRESet

Description	This command clears the Operational Event Status Register register for the current subsystem and sets all bits of the Enable registers (ESE, OSE, SRE, QSE). The command does not affect the instrument settings.
Type	Overlapping, no query.
Syntax	STATus:PRESet
Parameter(s)	None.
Example(s)	STAT:PRES

SYSTem Commands and Queries

Quick Reference

Command Overview				Parameter(s)	Section
SYSTem	ANLG	OUT[1|2]	SOURce	<module><detector>	see *p. 522*
			SOURce?		see *p. 523*
	COMMunicate	GPIB	[:ADDRess]	<value>	see *p. 524*
			[:ADDRess?]		see *p. 524*
	ERRor	[:NEXT]?			see *p. 525*
	VERSion?				see *p. 525*

Commands and Queries

SYSTem:ANLG:OUT[1|2]:SOURce

Description This command sets the OPM or PCM source detector for the given electrical analog output.

Type Overlapping.

Syntax SYSTem:ANLG:OUT[1|2]:SOURce<wsp><module>,<detector>

Parameter(s)

➤ *module:*

Module identification number in the range 1 to 10, which is the position of the module in the mainframe from left to right.

If you set this value to 0, it clears the OPM or PCM selection for the analog output.

➤ *detector:*

Detector identification number in the range 1 to 6, which is the detector position on the module from top to bottom.

Example(s) SYST:ANLG:OUT1:SOUR 5,2

SYSTem:ANLG:OUT[1|2]:SOURce?

Description	This query returns the OPM or PCM source detector selected for the given electrical analog output.
Type	Overlapping.
Syntax	SYSTem:ANLG:OUT[1|2]:SOURce?
Parameter(s)	None.
Response Syntax	<module>,<detector>
Response(s)	➤ *module:* Identification number (in the range 1 to 10) of the module selected for the given electrical analog output. ➤ *detector:* Identification number (in the range 1 to 6) of the module detector selected for the given electrical analog output. If no OPM or PCM source is attached to the given analog output, the return value is "0,0"
Example(s)	SYST:ANLG:OUT1:SOUR? returns 5,2

SYSTem:COMMunicate:GPIB[:ADDRess]

Description	This command sets the address of the GPIB port.
Type	Overlapping.
Syntax	SYSTem:COMMunicate:GPIB[:ADDRess]<wsp><value>
Parameter(s)	*value:* Unique integer in the range 0 to 30, which sets the GPIB address of the CTP10.
Example(s)	SYSTem:COMMunicate:GPIB 10

SYSTem:COMMunicate:GPIB[:ADDRess]?

Description	This query returns the GPIB address of the CTP10.
Type	Overlapping.
Syntax	SYSTem:COMMunicate:GPIB[:ADDRess]?
Parameter(s)	None.
Response Syntax	<value>
Response(s)	*value:* Unique integer in the range 0 to 30, which represents the GPIB address of the CTP10.
Example(s)	SYSTem:COMMunicate:GPIB 10 SYSTem:COMMunicate:GPIB:ADDRess? returns 10

SYSTem:ERRor[:NEXT]?

Description	This query returns the error queue for the next item and removes it from the queue. SYSTem:ERRor[:NEXT]? is a query only and, therefore, does not have an associated *RST state.
Type	Overlapping, query only.
Syntax	SYSTem:ERRor[:NEXT]?
Parameter(s)	None.
Response Syntax	<code>,<description[,Info]>
Response(s)	➤ *code:* Error code as a unique integer in the range -32768 to 32767. All positive numbers are instrument-dependent. All negative numbers are reserved by the SCPI standard with certain standard error/event codes described in *SCPI-Based Errors* on page 559. The zero value indicates that no error or event has occurred. ➤ *description:* Quoted string containing a description. Each <code> has a unique and fixed <description> associated with it. For standard defined error <code>, the <description> is sent exactly as indicated in *SCPI-Based Errors* on page 559.
Example(s)	SYST:ERR:NEXT? returns -222,"Data out of range"

SYSTem:VERSion?

Description	This query returns the SCPI revision to which the instrument complies.
Type	Overlapping, query only.
Syntax	SYSTem:VERSion?
Parameter(s)	None.
Response Syntax	<version>
Response(s)	*version:* The year followed by the revision number of the SCPI standard to which the instrument complies.
Example(s)	SYST:VER? returns 1999.0

TRACe Commands and Queries

In TRACe:STORe[1...n]:

[1...n] designates the store trace identifier. The store trace identifier, is available with the command *TRACe:LIST:STORe?* on page 529.

In TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:

- SENSe[1...20] designates the module identification number, which is the position of the module in the mainframe from left to right.
  In Daisy chaining mode, the modules located on the Primary mainframe are identified using positions 1 to 10, and the modules located on the Secondary mainframe are identified using positions 11 to 20.
- CHANnel[1...6] designates the detector identification number, which is the detector position on the module from top to bottom. This number is not taken into account for BR traces.
- TYPE[1...23] designates the possible trace type (some commands are not available on all existing trace types):
  - 1: TF live (only available on an OPM detector)
  - 2: TF max (only available on an OPM detector)
  - 3: TF min (only available on an OPM detector)
  - 4: TF average (only available on an OPM detector)
  - 5: TF roll average (only available on an OPM detector)
  - 6: BR live (only available on an IL RL OPM2 module)
  - 7: BR max (only available on an IL RL OPM2 module)
  - 8: BR min (only available on an IL RL OPM2 module)
  - 9: BR average (only available on an IL RL OPM2 module)
  - 10: BR roll average (only available on an IL RL OPM2 module)
  - 11: Raw Live, which is the unreferenced "TF live" or "PDL live" trace type. For more details on this trace type, see *Retrieving Raw Data from a Detector* on page 139.
  - 12: Raw Reference, which is the reference trace of the "TF live" or "PDL live" trace type. For more details, see *Retrieving Raw Data from a Detector* on page 139.
  - 13: Raw Quick Reference, which is the quick reference trace of the "TF live" trace type (only available with an IL RL OPM2 module). For more details on this trace type, see *Retrieving Raw Data from a Detector* on page 139.
  - 14: PDL live (only available with an IL PDL or IL PDL OPM2 module, on an OPM detector)
  - 15: PDL max (only available with an IL PDL or IL PDL OPM2 module, on an OPM detector)
  - 16: PDL min (only available with an IL PDL or IL PDL OPM2 module, on an OPM detector)
  - 17: PDL average (only available with an IL PDL or IL PDL OPM2 module, on an OPM detector)
  - 18: PDL roll average (only available with an IL PDL or IL PDL OPM2 module, on an OPM detector)
  - 19: I live (only available on a PCM detector)
  - 20: I max (only available on a PCM detector)
  - 21: I min (only available on a PCM detector)
  - 22: I average (only available on a PCM detector)
  - 23: I roll average (only available on a PCM detector)

Quick Reference

Command Overview							Parameter(s)	Section
TRACe	LIST	SENSe?						see *p. 528*
		STORe?						see *p. 529*
	SENSe[1...20]	CHANnel [1...6]	TYPE[1...10]| [14...23]	ACTive			<state>	see *p. 530*
				ACTive?				see *p. 531*
				COLor			<red>,<green>,<blue>	see *p. 532*
				COLor?				see *p. 532*
			TYPE[1...23]	DATA	X	[IMMediate]?	<format>, <unit>, <reduction>	see *p. 533*
					[Y]	[IMMediate]?	<format>, <unit>, <reduction>	see *p. 535*
					LENGth?			see *p. 536*
					SAMPling?			see *p. 537*
					STARt?			see *p. 537*
			TYPE[1...10]| [14...23]	DELete				see *p. 537*
				NOTE				see *p. 538*
				NOTE?				see *p. 538*
			TYPE5|10|18 |23	RAVG			<count>	see *p. 539*
				RAVG?				see *p. 539*
			TYPE[1...23]	SAVE			<filename>	see *p. 540*
			TYPE[1...10]| [14...23]	STATe			<visibility>	see *p. 541*
				STATe?				see *p. 541*
	STORe[1...n]	COLor					<red>,<green>,<blue>	see *p. 542*
		COLor?						see *p. 542*
		DATA	X	[IMMediate]?			<format>, <unit>, <reduction>	see *p. 543*
			[Y]	[IMMediate]?			<format>, <unit>, <reduction>	see *p. 544*
			LENGth?					see *p. 545*
			SAMPling?					see *p. 545*
			STARt?					see *p. 546*
		DELete						see *p. 547*
		NOTE					<comment>	see *p. 547*
		NOTE?						see *p. 547*
		SAVE					<filename>	see *p. 548*

Commands and Queries

TRACe:LIST:SENSe?

Description	This query returns the list of traces of type sense (all traces that are not store traces).
Type	Overlapping, query only.
Syntax	TRACe:LIST:SENSe?
Parameter(s)	None.
Response Syntax	<list>
Response(s)	*list:* List of traces of type sense such as: {MOD<module number> DET<detector number><trace name>}
Example(s)	TRAC:LIST:SENS? returns MOD 1 DET 1 TF LIVE MOD 1 DET 1 TF MAX MOD 1 DET 1 TF MIN MOD 1 DET 1 TF AVERAGE MOD 1 DET 1 TF ROLL AVERAGE MOD 1 DET 2 TF LIVE MOD 1 DET 2 TF MAX MOD 1 DET 2 TF MIN MOD 1 DET 2 TF AVERAGE MOD 1 DET 2 TF ROLL AVERAGE MOD 4 DET 1 TF LIVE MOD 4 DET 1 TF MAX MOD 4 DET 1 TF MIN MOD 4 DET 1 TF AVERAGE MOD 4 DET 1 TF ROLL AVERAGE

TRACe:LIST:STORe?

Description	This query returns the list of traces of type store.
Type	Overlapping, query only.
Syntax	TRACe:LIST:STORe?
Parameter(s)	None.
Response Syntax	<list>
Response(s)	*list:* List of traces of type "store" such as: {<trace number><tab><trace name>}
Example(s)	TRAC:LIST:STOR? returns 1 my TF trace 2 BR trace test2 3 TF mytrace3

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive

Description

This command selects the trace type to create for the given detector and sets the optical link to the DUT output.

In Daisy chaining mode, before using this command for a detector located on the Secondary CTP10, make sure that you have entered the Daisy chaining mode (response 1 to *CTP:LSHARing:STATus?* on page 425).

Applicability

- The trace type to create must be compatible with the measurement module used in the subsystem (see *INITiate:ILRL[:SENSe] (Deprecated)* on page 465):
  - With IL RL OPM2 measurement module: TF traces (types 1 to 5) and BR traces (types 6 to 10).
  - With IL PDL and IL PDL OPM2 measurement modules: TF trace (types 1 to 5) and PDL traces (types 14 to 18).
- The trace type to create must be compatible with the given detector:
  - On an OPM module: TF traces (types 1 to 5), BR traces (types 6 to 10) and PDL traces (types 14 to 18).
  - On a PCM module: I traces (types 19 to 23).

Type

Sequential.

Syntax

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive <wsp><state>

Parameter(s)

state:

Trace type selection state. The allowed values are:

- 0: clears the trace type for the given detector.
  The link to the DUT output is not removed. To remove this link, you must load the default subsystem settings (see *MMEMory:LOAD:DEFault* on page 506).
- 1: creates the given trace type for the given detector. The connection link from the DUT to the given detector is automatically configured.

Example(s)

TRACe:SENSe1:CHANnel4:TYPE1:ACTive 1

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive?

Description	This query returns the state of the trace.
Type	Sequential.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:ACTive?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the trace: 0: the trace does not exist. 1: the trace is created.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE1:ACTive 1 TRACe:SENSe3:CHANnel2:TYPE3:ACTive? returns 1

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:COLor

Description	This command defines the color of the given trace in RGB format.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:COLor<wsp><red>,<green>,<blue>
Parameter(s)	➤ *red:* Integer corresponding to the level of red in the trace color, in the range 0 to 255. ➤ *green:* Integer corresponding to the level of green in the trace color, in the range 0 to 255. ➤ *blue:* Integer corresponding to the level of blue in the trace color, in the range 0 to 255.
Example(s)	TRAC:SENS5:CHAN3:TYPE8:COL 75,0,130

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:COLor?

Description	This query returns the color of the given trace in RGB format.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:COLor?
Parameter(s)	None.
Response Syntax	<red>,<green>,<blue>
Response(s)	➤ *red:* Integer corresponding to the level of red in the trace color, in the range 0 to 255. ➤ *green:* Integer corresponding to the level of green in the trace color, in the range 0 to 255. ➤ *blue:* Integer corresponding to the level of blue in the trace color, in the range 0 to 255.
Example(s)	TRAC:SENS5:CHAN3:TYPE8:COL 75,0,130 TRAC:SENS5:CHAN3:TYPE8:COL? returns 75,0,130

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA:X[:IMMediate]?

Description

This query returns the wavelength or frequency data for the given trace.

This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).

Type

Sequential, query only.

Syntax

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA:X [:IMMediate]?<wsp><format>,<unit>[,<reduction>]

Parameter(s)

- *format:*

  Format of the trace data. The allowed values are:

  0|ASCii: trace data is formatted as ASCII values, such as <value1>,<value2>, ...

  1|BINary: trace data is formatted as binary blocks such as:

  #<length><Nb of bytes><blocks>

  where:

  <length>: number of subsequent bytes that you have to check to know the total length.

  <Nb of bytes>: size of <blocks> in bytes.

  <blocks>: float data bytes (packet of 8 bytes, big endian).

  For example, data containing 10 data points will results in the header "#280<blocks>" as 80 bytes are needed to define the data and "80" length is 2.

- *unit:*

  Unit of the trace data. The allowed values are:

  M or 0: trace data is retrieved in meter.

  HZ or 1: trace data is retrieved in Hertz.

- *reduction:*

  Reduction factor (optional), which decimates the number of data points for faster data retrieval. A reduction factor of 5 would select a point out of every 5 points available on the trace. The first point received is always the "start wavelength" data point.

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :X[:IMMediate]?

Response Syntax

<trace data>

Response(s)

trace data:
List of measured wavelength or frequency data points.

- If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <data point 1>,<data point 2>, ...
- If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks, as explained above.

For TYPE11 (raw live) and TYPE12 (raw reference) on 4-state IL-PDL measurement (4 sweeps), the query returns data of four traces, formatted as follow: <SOP#1 trace data>,<SOP#2 trace data>,<SOP#3 trace data>,<SOP#4 trace data>.

Example(s)

TRAC:SENS1:CHAN3:TYPE2:DATA:X? ASC,M
returns +1.62298303E-006,+1.62298401E-006, ...

TRAC:SENS1:CHAN3:TYPE2:DATA:X? BIN,HZ
returns #1821AÔ³Ë’³"¹2LÒ´2…

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA [:Y][:IMMediate]?

Description This query returns the power or current data for the given trace.

This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).

Type Sequential, query only.

Syntax TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA[:Y][:IMMediate]?<wsp><format>,<unit>[,<reduction>]

Parameter(s)

➤ *format:*

Format of the trace data. The allowed values are:

0|ASCii: trace data is formatted as ASCII values, such as <value1>,<value2>, ...

1|BINary: trace data is formatted as binary blocks such as:

#<length><Nb of bytes><blocks>

where:

<length>: number of subsequent bytes that you have to check to know the total length.

<Nb of bytes>: size of <blocks> in bytes.

<blocks>: float data bytes (packet of 4 bytes, big endian).

For example, data containing 10 data points will results in the header "#240<blocks>" as 40 bytes are needed to define the data and "40" length is 2.

➤ *unit:*

Unit of the trace data. The allowed values are:

RATIO or 0: trace data is retrieved in ratio.

DB or 1: trace data is retrieved in dB.

➤ *reduction:*

Reduction factor (optional), which decimates the number of data points for faster data retrieval. A reduction factor of 5 would select a point out of every 5 points available on the trace. The first point received is always the "start wavelength" data point.

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA[:Y][:IMMediate]?

Response Syntax <trace data>

Response(s) *trace data:*

List of measured power (on OPM module) or current (on PCM module) data points.

➤ If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <data point 1>,<data point 2>, ...

➤ If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks, as explained above.

For TYPE11 (raw live) and TYPE12 (raw reference) on 4-state IL-PDL measurement (4 sweeps), the query returns data of four traces, formatted as follow: <SOP#1 trace data>,<SOP#2 trace data>,<SOP#3 trace data>,<SOP#4 trace data>.

Example(s) TRAC:SENS1:CHAN3:TYPE2:DATA? ASC,DB
returns -5.00000000E+000,-5.10000000E+000,...

TRAC:SENS1:CHAN3:TYPE2:DATA? BIN,RATIO
returns #1821AÔ³Ë’³"¹2LÒ´2…

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA:LENGth?

Description This query returns the length of a trace.

This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).

Type Sequential, query only.

Syntax TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA:LENGth?

Parameter(s) None.

Response Syntax <length>

Response(s) *length:*

Number of points in the trace.

Example(s) TRAC:SENS1:CHAN3:TYPE2:DATA:LENG? returns 225001

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :SAMPling?

Description	This query returns the trace sampling interval.
Type	Overlapping, query only.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :SAMPling?
Parameter(s)	None.
Response Syntax	<sampling>
Response(s)	*sampling:* Trace sampling interval in meters.
Example(s)	TRAC:SENS1:CHAN3:TYPE2:DATA:SAMP? returns +2.00000000E-012

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA :STARt?

Description	This query returns the start wavelength of a trace.
Type	Overlapping, query only.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:DATA:STARt?
Parameter(s)	None.
Response Syntax	<wavelength>
Response(s)	*wavelength:* Trace start wavelength in meters.
Example(s)	TRAC:SENS1:CHAN3:TYPE2:DATA:STAR? returns +1.25000000E-006

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]\|[14...23]:DELete

Description	This command clears the given trace data and all the associated analysis results (the trace type is not deleted).
Type	Sequential, no query.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]: DELete
Parameter(s)	None.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE5:DEL

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:NOTE

Description	This command adds a comment on the given trace.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:NOTE <wsp><comment>
Parameter(s)	*comment:* Comment to associate with the trace. It must be different from whitespace or empty (240 characters maximum, characters over this limit are ignored).
Example(s)	TRAC:SENS6:CHAN4:TYPE3:NOTE my comment on the trace

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:NOTE?

Description	This query returns the comment associated with the given trace.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:NOTE?
Parameter(s)	None.
Response Syntax	<comment>
Response(s)	*comment:* Comment associated with the trace, in upper case.
Example(s)	TRAC:SENS6:CHAN4:TYPE3:NOTE my comment on the trace TRAC:SENS6:CHAN4:TYPE3:NOTE? returns MY COMMENT ON THE TRACE

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE5|10|18|23: RAVG

Description	This command only applies to traces of type "roll average" (TYPE5, TYPE10, TYPE18 and TYPE23). It sets the number of scans to take into account for the roll averaging calculation.
Type	Sequential.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE5:RAVG<wsp><count> TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE10:RAVG<wsp><count> TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE18:RAVG<wsp><count> TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE23:RAVG<wsp><count>
Parameter(s)	*count:* Integer corresponding to the number of scans to take into account for the roll averaging calculation, in the range 2 to 10.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE10:RAVG 4

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE5|10|18|23: RAVG?

Description	This query only applies to traces of type "roll average" (TYPE5, TYPE10, TYPE18 and TYPE23). It returns the number of scans defined for the roll averaging calculation.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE5:RAVG? TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE10:RAVG? TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE18:RAVG? TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE23:RAVG?
Parameter(s)	None.
Response Syntax	<count>
Response(s)	*count:* Number of scans defined for the roll averaging calculation.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE5:RAVG 4 TRACe:SENSe3:CHANnel2:TYPE5:RAVG? returns 4

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:SAVE

Description	This command saves the trace data into a trace file in the current directory. This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).
Applicability	In Daisy chaining mode, the .csv saving format is not available on TYPE11 and TYPE12 on 4-state IL-PDL measurement (4 sweeps) on detectors located on the Secondary CTP10 (SENS11 to SENS20).
Type	Overlapped, no query. When the system executes this command, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...23]:SAVE<wsp> <filename>
Parameter(s)	*filename:* Name of the file in which you want to save trace data, with or without quotes. Possible extensions are: ➤ .tra (binary file) for trace types 1 to 10 and 14 to 23 only. ➤ .csv (csv file) for all types of traces. For TYPE11 (raw live) and TYPE12 (raw reference) on 4-state IL-PDL measurement (4 sweeps), the four SOP traces are saved one after the other in the .csv file (SOP#1 to SOP#4). Default extension (if not specified): .tra
Example(s)	TRACe:SENS1:CHAN3:TYPE2:SAVE "trace.tra"

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:STATe

Description	This command makes the trace visible/invisible on graph.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:STATe <wsp><visibility>
Parameter(s)	*visibility:* State of the trace visibility. The allowed values are: 0|OFF: makes the trace invisible on graph. 1|ON: makes the trace visible on graph.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE5:STAT ON

TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:STATe?

Description	This query returns the visibility state of the trace.
Type	Overlapping.
Syntax	TRACe:SENSe[1...20]:CHANnel[1...6]:TYPE[1...10]|[14...23]:STATe?
Parameter(s)	None.
Response Syntax	<visibility>
Response(s)	*visibility:* State of the trace visibility: 0: the trace is not visible on graph. 1: the trace is visible on graph.
Example(s)	TRACe:SENSe1:CHANnel4:TYPE5:STAT ON TRACe:SENSe3:CHANnel2:TYPE3:STATe? returns 1

TRACe:STORe[1...n]:COLor

Description	This command defines the color of the given store trace in RGB format.
Type	Overlapping.
Syntax	TRACe:STORe[1...n]:COLor<wsp><red>,<green>,<blue>
Parameter(s)	➤ *red:* Integer corresponding to the level of red in the trace color, in the range 0 to 255. ➤ *green:* Integer corresponding to the level of green in the trace color, in the range 0 to 255. ➤ *blue:* Integer corresponding to the level of blue in the trace color, in the range 0 to 255.
Example(s)	TRAC:STOR3:COL 70,130,180

TRACe:STORe[1...n]:COLor?

Description	This query returns the color of the given store trace in RGB format.
Type	Overlapping.
Syntax	TRACe:STORe[1...n]:COLor?
Parameter(s)	None.
Response Syntax	<red>,<green>,<blue>
Response(s)	➤ *red:* Integer corresponding to the level of red in the trace color, in the range 0 to 255. ➤ *green:* Integer corresponding to the level of green in the trace color, in the range 0 to 255. ➤ *blue:* Integer corresponding to the level of blue in the trace color, in the range 0 to 255.
Example(s)	TRAC:STOR3:COL 70,130,180 TRAC:STOR3:COL? returns 70,130,180

TRACe:STORe[1...n]:DATA:X[:IMMediate]?

Description

This query returns the wavelength or frequency data for the given store trace.

This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).

Type

Sequential, query only.

Syntax

TRACe:STORe[1...n]:DATA:X[:IMMediate]?<wsp><format>, <unit>[,<reduction>]

Parameter(s)

➤ *format:*

Format of the trace data. The allowed values are:

0|ASCii: trace data is formatted as ASCII values, such as <value1>,<value2>, ...

1|BINary: trace data is formatted as binary blocks such as:

#<length><Nb of bytes><blocks>

where:

<length>: number of subsequent bytes that you have to check to know the total length.

<Nb of bytes>: size of <blocks> in bytes.

<blocks>: float data bytes (packet of 8 bytes, big endian).

For example, data containing 10 data points will results in the header "#280<blocks>" as 80 bytes are needed to define the data and "80" length is 2.

➤ *unit:*

Unit of the trace data. The allowed values are:

M or 0: trace data is retrieved in meter.

HZ or 1: trace data is retrieved in Hertz.

➤ *reduction:*

Reduction factor (optional), which decimates the number of data points for faster data retrieval. A reduction factor of 5 would select a point out of every 5 points available on the trace. The first point received is always the "start wavelength" data point.

Response Syntax

<data>

Response(s)

data:

If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <value1>,<value2>, ...

If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks.

It corresponds to the trace data, which is the list of measured power data points.

Example(s)

TRAC:STOR1:DATA:X? ASC,M returns -+1.62298303E-006,+1.62298401E-006,...

TRAC:STOR1:DATA:X? BIN,HZ returns #1821AÔ³Ë’³"¹2LÒ´2…

TRACe:STORe[1...n]:DATA[:Y][:IMMediate]?

Description

This query returns the power or current data for the given store trace.

This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).

Type

Sequential, query only.

Syntax

TRACe:STORe[1...n]:DATA[:Y][:IMMediate]?<wsp><format>,<unit>[,<reduction>]

Parameter(s)

➤ *format:*

Format of the trace data. The allowed values are:

0|ASCii: trace data is formatted as ASCII values, such as <value1>,<value2>, ...

1|BINary: trace data is formatted as binary blocks such as:

#<length><Nb of bytes><blocks>

where:

<length>: number of subsequent bytes that you have to check to know the total length.

<Nb of bytes>: size of <blocks> in bytes.

<blocks>: float data bytes (packet of 4 bytes, big endian).

For example, data containing 10 data points will results in the header "#240<blocks>" as 40 bytes are needed to define the data and "40" length is 2.

➤ *unit:*

Unit of the trace data. The allowed values are: RATIO | DB | 0 | 1

RATIO or 0: trace data is retrieved in ratio.

DB or 1: trace data is retrieved in dB.

➤ *reduction:*

Reduction factor (optional), which decimates the number of data points for faster data retrieval. A reduction factor of 5 would select a point out of every 5 points available on the trace. The first point received is always the "start wavelength" data point.

Response Syntax

<data>

Response(s)

data:

If the <format> parameter is ASCii, the response data syntax for <data> is formatted as follows: <value1>,<value2>, ...

If the <format> parameter is BINary, the response data syntax for <data> is formatted as binary blocks.

It corresponds to the trace data, which is the list of measured power data points.

Example(s)

TRAC:STOR1:DATA? ASC,DB returns -5.00000000E+000,-5.10000000E+000,...

TRAC:STOR1:DATA? BIN,RATIO returns #1821AÔ³Ë’³"¹2LÒ´2…

TRACe:STORe[1...n]:DATA:LENGth?

Description	This query returns the length of a store trace. This query can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).
Type	Sequential, query only.
Syntax	TRACe:STORe[1...n]:DATA:LENGth?
Parameter(s)	None.
Response Syntax	<length>
Response(s)	*length:* Number of points in the trace.
Example(s)	TRAC:STOR1:DATA:LENG? returns 225001

TRACe:STORe[1...n]:DATA:SAMPling?

Description	This query returns the trace sampling interval.
Type	Overlapping, query only.
Syntax	TRACe:STORe[1...n]:DATA:SAMPling?
Parameter(s)	None.
Response Syntax	<sampling>
Response(s)	*sampling:* Trace sampling interval in meters.
Example(s)	TRAC:STOR1:DATA:SAMP? returns +2.00000000E-012

TRACe:STORe[1...n]:DATA:STARt?

Description	This query returns the start wavelength of a trace of type store.
Type	Overlapping, query only.
Syntax	TRACe:STORe[1...n]:DATA:STARt?
Parameter(s)	None.
Response Syntax	<wavelength>
Response(s)	*wavelength:* Trace start wavelength in meters.
Example(s)	TRAC:STOR1:DATA:STAR? returns +1.25000000E-006

TRACe:STORe[1...n]:DELete

Description	This command removes the given store trace and all the associated analysis results.
Type	Sequential, no query.
Syntax	TRACe:STORe[1...n]:DELete
Parameter(s)	None.
Example(s)	TRAC:STOR1:DEL

TRACe:STORe[1...n]:NOTE

Description	This command adds a comment on the given store trace.
Type	Overlapping.
Syntax	TRACe:STORe[1...n]:NOTE<wsp><comment>
Parameter(s)	*comment:* Comment to associate with the trace with 240 characters maximum; characters over this limit are ignored. It must be different from whitespace and must not be empty.
Example(s)	TRAC:STOR3:NOTE my comment on the trace

TRACe:STORe[1...n]:NOTE?

Description	This query returns the comment associated with the given store trace.
Type	Overlapping.
Syntax	TRACe:STORe[1...n]:NOTE?
Parameter(s)	None.
Response Syntax	<comment>
Response(s)	*comment:* Comment associated with the trace, in upper case and enclosed in double quotes.
Example(s)	TRAC:STOR3:NOTE my comment on the trace TRAC:STOR3:NOTE? returns "MY COMMENT ON THE TRACE"

TRACe:STORe[1...n]:SAVE

Description	This command saves a store trace data into a file in the current directory. This command can only be executed if the CTP10 is in idle state (STAT:OPER:COND? returns 0).
Type	Overlapped, no query. When the system executes this command, the bit 12 "Loading/Saving" is set in the Operational Status Condition Register (see *STATus:OPERation:CONDition?* on page 517 and *Operational / Questionable Status Reporting* on page 211).
Syntax	TRACe:STORe[1...n]:SAVE<wsp><filename>
Parameter(s)	*filename:* Name of the file in which you want to save trace data, with or without quotes. Possible extensions are .tra (binary file) and .csv (csv file). Default extension (if not specified): .tra
Example(s)	TRAC:STOR2:SAVE "mytrace.tra"

TRIGger Commands and Queries

Quick Reference

Command Overview			Parameter(s)	Section
TRIGger	IN	[INPUt]	<input>	see *p. 550*
		[INPUt]?		see *p. 550*
		SLOPe	<slope>	see *p. 551*
		SLOPe?		see *p. 551*
	OUT	[OUTPut]	<output>	see *p. 552*
		[OUTPut]?		see *p. 552*
		INVerted	<state>	see *p. 553*
		INVerted?		see *p. 553*
		LLOG?	<format>[,<SOP>]	see *p. 554*
		TYPE	<type>	see *p. 555*
		TYPE?		see *p. 555*

Commands and Queries

TRIGger:IN[:INPUt]

Description	This command defines the input trigger to use for the triggered optical acquisition. The corresponding GUI setting is **Source** (see **Scan start on page 125**).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	TRIGger:IN[:INPUt]<wsp><input>
Parameter(s)	*input:* TRIG IN port that provides the trigger signal for the optical acquisition, in the range 0 to 8. The allowed values are: 0: no TRIG IN port selected 1: TRIG IN 1 port 2: TRIG IN 2 port 3: TRIG IN 3 port 4: TRIG IN 4 port 5: TRIG IN 5 port 6: TRIG IN 6 port 7: TRIG IN 7 port 8: TRIG IN 8 port
Example(s)	TRIG:IN 1

TRIGger:IN[:INPUt]?

Description	This query returns the input trigger used for the triggered optical acquisition.
Type	Overlapping.
Syntax	TRIGger:IN[:INPUt]?
Parameter(s)	None.
Response Syntax	<input>
Response(s)	*input:* TRIG IN port number that provides the trigger signal for the optical acquisition. 0 means that no TRIG IN port is selected.
Example(s)	TRIG:IN 1 TRIG:IN? returns 1

TRIGger:IN:SLOPe

Description	This command defines the slope of the signal that triggers the scan. The corresponding GUI setting is **Slope** (see **Scan start on page 125**).
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	TRIGger:IN:SLOPe<wsp><slope>
Parameter(s)	*slope:* Slope of the signal that triggers the scan. The allowed values are: POSitive|0: the scan is performed when the received signal rises. NEGative|1: the scan is performed when the received signal falls.
Example(s)	TRIG:IN:SLOP 0

TRIGger:IN:SLOPe?

Description	This query returns the slope of the signal that triggers the scan.
Type	Overlapping.
Syntax	TRIGger:IN:SLOPe?
Parameter(s)	None.
Response Syntax	<slope>
Response(s)	*slope:* Slope of the signal that triggers the scan: 0: the scan is performed when the received signal rises. 1: the scan is performed when the received signal falls.
Example(s)	TRIG:IN:SLOP NEG TRIG:IN:SLOP? returns 1

TRIGger:OUT[:OUTPut]

Description	This command defines the output trigger to use. The corresponding GUI setting is **Destination** (see *Generating Output Trigger Signals* on page 140).
Type	Sequential.
Syntax	TRIGger:OUT[:OUTPut]<wsp><output>
Parameter(s)	*output:* TRIG OUT port that outputs the signal from the CTP10 when it scans, in the range 1 to 4. The allowed values are: 0: no TRIG OUT port is selected 1: TRIG OUT 1 port 2: TRIG OUT 2 port 3: TRIG OUT 3 port 4: TRIG OUT 4 port
Example(s)	TRIG:OUT:OUTP 4

TRIGger:OUT[:OUTPut]?

Description	This query returns the output trigger port used to output the signal from the CTP10 when it scans.
Type	Overlapping.
Syntax	TRIGger:OUT[:OUTPut]?
Parameter(s)	None.
Response Syntax	<output>
Response(s)	*output:* TRIG OUT port number that outputs the signal. 0 means that no TRIG OUT port is selected.
Example(s)	TRIG:OUT:OUTP 2 TRIG:OUT:OUTP? returns 2

TRIGger:OUT:INVerted

Description	This command sets the state of the inverted logic of the output trigger signal. The corresponding GUI setting is **Inverted logic** (see *Generating Output Trigger Signals* on page 140).
Applicability	This command is only available if *TRIGger:OUT:TYPE* on page 555 is set to WINdow. If *TRIGger:OUT:TYPE* on page 555 is set to PULse, this command is forced to OFF.
Type	Sequential.
Syntax	TRIGger:OUT:INVerted<wsp><state>
Parameter(s)	*state:* State of the inverted logic setting for the output trigger. The allowed values are: OFF|0: the CTP10 outputs a high level signal during the time of the scan. ON|1: the CTP10 outputs a low level signal during the time of the scan.
Example(s)	TRIG:OUT:INV ON

TRIGger:OUT:INVerted?

Description	This query returns the state of the inverted logic of the output trigger signal.
Type	Overlapping.
Syntax	TRIGger:OUT:INVerted?
Parameter(s)	None.
Response Syntax	<state>
Response(s)	*state:* State of the **Inverted logic** setting for the output trigger: 0: the CTP10 outputs a high level signal during the time of the scan. 1: the CTP10 outputs a low level signal during the time of the scan.
Example(s)	TRIG:OUT:INVerted ON TRIG:OUT:INVerted? returns 1

TRIGger:OUT:LLOG?

Description	This query returns the wavelength array corresponding to pulse triggers that have been generated during the sweep.
Type	Sequential.
Syntax	TRIGger:OUT:LLOG?<wsp><format>[,<SOP>]
Parameter(s)	➤ *format* Format of the wavelength array. The allowed values are: 0|ASCii: wavelength array is formatted as ASCII values, such as <value1>,<value2>,<value3>, ... 1|BINary: wavelength data is formatted as binary blocks such as: #<length><Nb of bytes><blocks> where: <length>: number of subsequent bytes that you have to check to know the total length. <Nb of bytes>: size of <blocks> in bytes. <blocks>: float data bytes (packet of 4 bytes, big endian). For example, data containing 12 data points will results in the header "#248<blocks>" as 48 bytes are needed to define the data and "48" length is 2. ➤ *SOP* (only used in case of PDL measurement) Integer representing the state of polarization from which you want to retrieve the wavelength array. The allowed values on the IL PDL module are: 1: LVP Linearly vertical polarized. 2: LHP Linearly horizontal polarized. 3: L-45 Linear -45° polarized. 4: RCP Right circularly polarized. The allowed values on the IL PDL OPM2 module are: 1: state of polarization #1 2: state of polarization #2 3: state of polarization #3 4: state of polarization #4
Response Syntax	<wavelength array>
Response(s)	*wavelength array:* Wavelength values in meters corresponding to the pulse triggers that have been generated during the sweep. If a trigger is a parasitic trigger (at the start or end of the sweep), the wavelength value is set to 0 in the array, which enables you to reject the parasitic data points. ➤ If the <format> parameter is ASCii, the response data syntax is formatted as follows: <value 1>,<value 2>, ... ➤ If the <format> parameter is BINary, the response data syntax is formatted as binary blocks, as explained above.
Example(s)	TRIG:OUT:LLOG? ASCii returns +1.54999251E-006,+1.55000010E-006,+1.55000766E-006,… TRIG:OUT:LLOG? ASCii,1 returns +1.54999251E-006,+1.55000010E-006,+1.55000766E-006,…

TRIGger:OUT:TYPE

Description	This command sets the type of the output trigger signal. The corresponding GUI setting is **Type** (see *Generating Output Trigger Signals* on page 140).
Type	Sequential.
Syntax	TRIGger:OUT:TYPE<wsp><type>
Parameter(s)	*type:* Type of the output trigger. The allowed values are: WINdow|0: the CTP10 outputs a window trigger. PULse|1: the CTP10 outputs pulse triggers. You can retrieve the corresponding wavelength array by using *TRIGger:OUT:LLOG?* on page 554.
Example(s)	TRIG:OUT:TYPE PUL

TRIGger:OUT:TYPE?

Description	This query returns the type of the output trigger signal.
Type	Overlapping.
Syntax	TRIGger:OUT:TYPE?
Parameter(s)	None.
Response Syntax	<type>
Response(s)	*type:* Type of the output trigger: 0: the CTP10 outputs a window trigger. 1: the CTP10 outputs pulse triggers.
Example(s)	TRIG:OUT:TYPE PUL TRIG:OUT:TYPE? returns 1

UNIT Commands and Queries

Quick Reference

Command Overview		Parameter(s)	Section
UNIT	X	<unit>	see *p. 556*
	X?		see *p. 556*
	Y	<unit>	see *p. 557*
	Y?		see *p. 557*

Commands and Queries

UNIT:X

Description	This command sets the spectral unit of the subsystem.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	UNIT:X<wsp><unit>
Parameter(s)	*unit:* Spectral unit of the entire subsystem. The allowed values are: WAVelength|0: sets the spectral unit to nm. FREQuency|1: sets the spectral unit to THz.
Example(s)	UNIT:X WAV

UNIT:X?

Description	This query returns the spectral unit of the subsystem.
Type	Overlapping.
Syntax	UNIT:X?
Parameter(s)	None.
Response Syntax	<unit>
Response(s)	*unit:* Spectral unit used in the subsystem: 0: the spectral unit is set to nm. 1: the spectral unit is set to THz.
Example(s)	UNIT:X WAV UNIT:X? returns 0

UNIT:Y

Description	This command sets the power unit of the subsystem.
Applicability	In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *CTP:LSHARing:STATus?* on page 425).
Type	Sequential.
Syntax	UNIT:Y<wsp><unit>
Parameter(s)	*unit:* Power unit of the entire subsystem. The allowed values are: DB|0: sets the power unit to dB. RATIO|1: sets the power unit to ratio.
Example(s)	UNIT:Y DB

UNIT:Y?

Description	This query returns the power unit of the subsystem.
Type	Overlapping.
Syntax	UNIT:Y?
Parameter(s)	None.
Response Syntax	<unit>
Response(s)	*unit:* Power unit used in the subsystem: 0: the power unit is set to dB. 1: the power unit is set to ratio.
Example(s)	UNIT:Y DB UNIT:Y? returns 0

B SCPI-Based Errors

This section describes:

➤ the instrument specific errors (-399 to -300 and -1999 to -1000),

➤ the instrument specific warnings (positive numbers).

All other command errors (range -199 to -100) and execution errors (range -299 to -200) are described in the Standard Commands for Programmable Instruments (SCPI) document available at www.ivifoundation.org/docs/scpi-99.pdf

Error number	Description	Probable cause
14	"Power accuracy warning"	The power accuracy of the signal coming from the TLS is of questionable quality.
13	"Infinite values warning"	One or more infinite value were detected in traces during the acquisition scan. The acquisition is retried.
12	"Remote ip address dns related problem daisy chaining"	A problem occurred with the IP address used for Daisy chaining, which may be related to a DNS issue.
11	"Remote ip address dns related problem laser sharing"	A problem occurred with the IP address used for Laser sharing, which may be related to a DNS issue.
10	"Mode hop warning"	A mode hop occurred during a sweep. This warning can occur during scanning operation.
–300	"CTP10-specific error"	This is the generic device-dependent error for devices that cannot detect more specific errors.
–301	"CTP10 Scan State Busy"	The CTP10 is still scanning, stopping or aborting and is not in an idle state.
–302	"CTP10 Internal Timeout"	The command did not execute in the allowed period of time. This error appears if you have launched an analysis (*CALCulate[:IMMediate]* on page 261) that takes more than 30 seconds: in this case, you should not take this error into account.
–303	"Identifier does not match any trace"	There is no trace associated with this identifier.
–304	"No data availaible"	There is no data available for this trace.
–305	"File save error"	An error occurred while saving the file.
–306	"Subsystem settings error"	The settings are inadequate, or there is no trace to acquire.
–307	"Subsystem reference error"	The reference is inadequate or is not compatible with the settings, or an attempt to perform a quick reference without having performed a reference first has been detected.

Error number	Description	Probable cause
–308	"Subsystem laser error"	A laser is missing, not connected or locked, or not supported in this subsystem setup.
–309	"Laser identifier error"	There is no laser for the given identifier.
-310	"Zeroing error"	An error occurred during the zeroing of the detector. Maybe too much light on the input.
-311	"Cannot do zeroing"	There is no module or the module is initializing or there is no detector to zero.
-312	"Cannot switch"	There is no module or the module is initializing or this is not an FBC module.
-313	"Cannot set averaging time"	There is no module or the module is initializing or this is not a module with a detector.
-314	"Command not available for this module"	The module does not offer the functionality.
-315	"Module not ready"	There is no module in the given slot, the module is not locked or the module is initializing.
-316	"File load error"	The file does not exist or the file format is not good.
-317	"Wavelength referencing error"	The gas cell or the expected peaks are not properly detected, or the detector is not properly configured.
-318	"Cannot read switch"	There is no module or the module is initializing or the module is not an FBC module.
-319	"Cannot do selftest"	There is no module or the module is initializing.
-320	"Laser unavalaible"	There is no laser connected or the laser does not exist.
-321	"Laser already connected"	The laser is already linked to another input in the subsystem.
-322	"Cannot add the trace"	The maximum number of traces has been reached, or the trace type you want to activate is not available with the measurement module used in the subsystem.
-323	"Not available in this laser sharing mode"	The command cannot be executed in laser sharing mode.
-324	"Laser sharing communication error"	An error occurred while trying to connect to a remote CTP10 in laser sharing mode.
-325	"Invalid port number"	The Controller or Distributed port is not valid for laser sharing configuration.
-326	"Invalid IP address"	The specified IP address is not valid for laser sharing configuration.
-327	"Remote CTP10 is already in use"	The remote CTP10 is already used in laser sharing mode (Controller or Distributed)
-328	"Remote CTP10 is busy"	Cannot connect to the remote CTP10 in laser sharing mode because the CTP10 is scanning or analyzing.

Error number	Description	Probable cause
-330	"Incompatible laser sharing protocol version"	Cannot connect to the remote CTP10 because the version of its protocol is not compatible.
-331	"Not available in this daisy chaining mode"	The command cannot be executed in Daisy chaining mode.
-332	"Daisy chaining communication error"	An error occurred while trying to connect to a remote CTP10 in daisy chaining mode.
-333	"Incompatible daisy chaining protocol version"	Cannot connect to the remote CTP10 because the version of its protocol is not compatible.
-334	"Detector not selected in subsystem"	The module position or detector number required is not selected in the subsystem.
-335	"No laser light detected on TLS IN"	The fiber is not connected to the TLS IN port of the IL RL OPM2, IL PDL, IL PDL OPM2 or SCAN SYNC module, or a shutter is not in the right state.
-336	"Laser referencing error"	The internal wavelength referencing of the laser has failed.
-337	"Laser connection error"	The connection to the connected laser cannot be open.
-338	"Traces compute error"	A problem was detected on the laser signal in the SCAN SYNC module, viable traces cannot be computed.
-339	"Settings for wavelength reference error"	The scan range of the TLS does not contain the range of the gas cell selected for wavelength reference.
-340	"Controller settings for wavelength reference error"	The scan range of the Controller CTP10 does not contain the range of the gas cell selected for wavelength reference.
-341	"Command not allowed in laser sharing distributed mode"	The requested settings can not be changed on a Distributed CTP10 in laser sharing mode.
-342	"IL PDL OPM2 module internal error"	The polarization state generator of the IL PDL OPM2 cannot reach the desired position, IL and PDL results may not be within specifications.
-343	"Trace acquisition error"	The laser signal acquisition on the SCAN SYNC module shows problems, viable traces can not be computed.
-344	"SCAN_SYNC calibration data problem"	The calibration file of the SCAN SYNC module is not correct.
-345	"Subsystem TLS settings incompatible with Pulse trigger out or High res. sampling"	Pulse trigger output and High res. sampling are not supported in a setup with multiple lasers.

Error number	Description	Probable cause
-346	"Subsystem speed incompatible with Pulse trigger out or High res. sampling"	Scanning with Pulse trigger output is not possible if the sweep speed is less than 10 nm/s. Scanning with High res. sampling is not possible if the sweep speed is less than 20 nm/s.
-347	"Subsystem Daisy chaining settings incompatible with Pulse trigger out or High res. sampling"	Pulse trigger output and High res. sampling are not supported in daisy chaining mode.
-348	"Subsystem Subsystem Laser sharing settings incompatible with Pulse trigger out or High res. sampling"	Pulse trigger output and High res. sampling are not supported in laser sharing mode.
-349	"Cannot open connection while scanning with an electrical trig out pulse"	Scanning with Pulse trigger output is not supported in laser sharing mode.
–350	"Error queue overflow"	A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.
-351	"Subsystem settings error: TLS trigger link is required as Pulse trigger out or High res. sampling is activated"	The trigger link between the TLS and the CTP10 (for Pulse trigger output or High resolution sampling) is missing in the 'Subsystem setup' menu.
-352	"Subsystem settings error: TLS model incompatible with Pulse trigger out or High res. sampling"	The selected TLS is not compatible with the Pulse trigger output or High resolution sampling.
-353	"Command not supported by this laser type"	The command is not compatible with the selected laser type.
-354	"Command forbidden while connecting or connected to laser"	The command is only applicable if the specified laser is disconnected.
-355	"Cannot change laser type while connecting or connected to laser"	The command is only applicable if the specified laser is disconnected, or if the parameter is set to 0.
-356	"Cannot execute function because there is no active detector"	The selected logging or stability function cannot be executed because there is no active detector to acquire data from. You must first activate a detector with the command *CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate* on page 441.

Error number	Description	Probable cause
-357	"Cannot open the laser connection because a laser with the same connection parameters is already connected"	The connection is unavailable because the system is already connected to a laser using the same connection parameters.
-358	"Subsystem settings error: Pulse trigger is not supported with High res. sampling mode"	Pulse trigger output cannot be used with High resolution sampling.
-359	"Cannot analyze: High res. trace selected for analysis"	Cannot run analysis because at least one high resolution trace is selected for analysis. Analysis on traces acquired with high resolution sampling is not supported.
-360	"Cannot scan: the limit of 20 traces measured with High res. sampling has been reached"	Cannot scan because you cannot perform a High res. sampling scan with more than 20 traces activated.
-1000 to -1999	"CTP10-specific error"	Generic device-dependent error.

Chinese Regulation on Restriction of Hazardous Substances (RoHS)

中国关于危害物质限制的规定

NAMES AND CONTENTS OF THE TOXIC OR HAZARDOUS SUBSTANCES OR ELEMENTS CONTAINED IN THIS EXFO PRODUCT

包含在本 EXFO 产品中的有毒有害物质或元素的名称及含量

Part Name 部件名称	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 (Cr(VI))	Polybrominated biphenyls 多溴联苯 (PBB)	Polybrominated diphenyl ethers 多溴二苯醚 (PBDE)
Enclosure 外壳	O	O	O	O	O	O
Electronic and electrical sub-assembly 电子和电气组件	X	O	X	O	X	X
Optical sub-assembly[a] 光学组件[a]	X	O	O	O	O	O
Mechanical sub-assembly[a] 机械组件[a]	O	O	O	O	O	O

Note:

注:

This table is prepared in accordance with the provisions of SJ/T 11364.

本表依据SJ/T 11364 的规定编制。

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

O:表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572 标准规定的限量要求以下。

X: indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572. Due to the limitations in current technologies, parts with the “X” mark cannot eliminate hazardous substances.

X:表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 标准规定的限量要求。

标记“X”的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。

a. If applicable.

如果适用。

MARKING REQUIREMENTS

标注要求

Product 产品	Environmental protection uses period (years) 环境保护使用期限（年）	Logo 标志
This EXFO product 本 EXFO 产品	10	
Battery[a] 电池[a]	5	

a. If applicable.

如果适用。

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