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

Version number: 5.0.0.1

Information in this document applies to the CTP10 embedded software package version 1.6.x.
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Regulatory Information

Canada and 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 and from ICES-003 compliance in Canada. 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.

European 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 compliant with industrial electromagnetic environments.

European Declaration of Conformity

The full text of the EU declaration of conformity is available at the following Internet address: www.exfo.com/en/resources/legal-documentation.
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 6.

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 27.

➢ The CTP10 modules

All CTP10 modules are of the same physical dimension and size. The following modules are available:

➢ IL RL OPM2: insertion loss and return loss measurement system with two optical detectors.

➢ SCAN SYNC: optical sampling of swept wavelength lasers.

➢ OPMx: optical detectors (x = 2; 4 or 6 detectors 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 test setup using the CTP10 platform with T100S-HP 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.
# Technical Specifications

## Important

The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product’s most recent technical specifications, visit the EXFO Web site at www.exfo.com.

## Optical Measurement\(^{a}\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength</td>
<td>1240–1680 nm</td>
</tr>
<tr>
<td>Absolute wavelength uncertainty (typ.)</td>
<td>± 5 pm</td>
</tr>
<tr>
<td>Wavelength repeatability (typ.)(^{b})</td>
<td>± 1 pm</td>
</tr>
<tr>
<td>Wavelength display resolution</td>
<td>1 pm to 2000 pm</td>
</tr>
</tbody>
</table>

## Optical Detectors

| Sensor type | InGaAs |
| Compatible fiber type | SMF28 |
| Compatible optical adapters | FC or SC connectors |
| Maximum safe power | +11 dBm |
| Optical power acquisition resolution | < 0.0001 dB |
| Averaging time | Manual: 1 μs to 1 s / Automatic |
| Return loss (typical) | > 56 dB |

## Optical Interfaces

<table>
<thead>
<tr>
<th>Interface</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical connectors</td>
<td>FC type</td>
</tr>
<tr>
<td>Maximum safe power</td>
<td>TLS IN: +17 dBm</td>
</tr>
<tr>
<td></td>
<td>SCAN SYNC: +14 dBm</td>
</tr>
</tbody>
</table>

## Insertion Loss\(^{c}\)

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic range (typical at 10 nm/s)</td>
<td>&gt; 80 dB</td>
</tr>
<tr>
<td>Dynamic range (typical at 100 nm/s)</td>
<td>&gt; 70 dB</td>
</tr>
<tr>
<td>Insertion loss uncertainty (typical at 10 nm/s)(^{d})</td>
<td>± 0.005 dB</td>
</tr>
<tr>
<td>Noise 2 (\sigma) (typical at 10 nm/s)</td>
<td>0 dB to 20 dB: ± 0.005 dB</td>
</tr>
<tr>
<td></td>
<td>20 dB to 40 dB: ± 0.005 dB</td>
</tr>
<tr>
<td></td>
<td>40 dB to 50 dB: ± 0.010 dB</td>
</tr>
<tr>
<td></td>
<td>50 dB to 60 dB: ± 0.035 dB</td>
</tr>
<tr>
<td>Noise 2 (\sigma) (typical at 100 nm/s)</td>
<td>0 dB to 20 dB: ± 0.005 dB</td>
</tr>
<tr>
<td></td>
<td>20 dB to 40 dB: ± 0.01 dB</td>
</tr>
<tr>
<td></td>
<td>40 dB to 50 dB: ± 0.05 dB</td>
</tr>
<tr>
<td></td>
<td>50 dB to 60 dB: ± 0.400 dB</td>
</tr>
</tbody>
</table>

## Return Loss\(^{e}\)

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic range (typical at 10 nm/s)</td>
<td>&gt; 55 dB (typical)</td>
</tr>
<tr>
<td>Return loss uncertainty (typical)(^{f})</td>
<td>± 0.5 dB</td>
</tr>
</tbody>
</table>

## Swept Measurement

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurable power variation (typical)(^{g})</td>
<td>&gt; 10,000 dB/nm at 100 nm/s</td>
</tr>
<tr>
<td>Optimum tunable laser sweep speed range(^{h})</td>
<td>10 nm/s to 100 nm/s</td>
</tr>
</tbody>
</table>

\(^{a}\) For constant temperature 23 °C +/- 1 °C, wavelength range: 1250 nm–1650 nm, with SMF28 patchcord, FC/APC connector, unless otherwise specified.

\(^{b}\) Over one minute, within optimum tunable laser sweep speed range and with laser optical power +10 dBm.

\(^{c}\) Over one minute, with laser optical power +10 dBm.

\(^{d}\) Over one minute.

\(^{e}\) Over one minute.

\(^{f}\) Manual: 1 μs to 1 s / Automatic

\(^{g}\) Dynamic range (typical at 10 nm/s): > 80 dB

\(^{h}\) Dynamic range (typical at 10 nm/s): > 55 dB (typical)
Introducing the CTP10

Technical Specifications

c. Wavelength range: 1250 nm–1630 nm, tunable laser power +10 dBm, after zeroing of optical detector, averaging time set to Automatic.
d. For IL < 20 dB, after power referencing, not including connector uncertainty, degree of polarization < 5%.
e. Wavelength range: 1250 nm–1630 nm, tunable laser power +10 dBm.
f. For RL < 40 dB, degree of polarization < 5%.
g. For IL < 45 dB, tunable laser power +10 dBm.
h. Compatible tunable laser sweep speed range: >500 nm/s.

---

### Hardware

<table>
<thead>
<tr>
<th>Interfaces for External Devices</th>
<th>Screen (2 active at a time) to display the CTP10 GUI. GUI optimized for 1920x1080 (16:9 ratio) screen resolution (recommended resolution)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDMI + Displayport (x2)</td>
<td>Devices such as mouse, keyboard, hard disk, GPIB-USB converter...</td>
</tr>
<tr>
<td>USB-A 2.0 (x5)</td>
<td></td>
</tr>
<tr>
<td>USB-A 3.0 (x2)</td>
<td></td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>3 m (9.8 ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remote Interfaces</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet RJ45 (x1)</td>
<td>1 Gbit/s (max.)</td>
</tr>
<tr>
<td>GPIB (optional)</td>
<td>7.2 Mbit/s (max.)</td>
</tr>
<tr>
<td>USB</td>
<td>300 Mbit/s (max.)</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>3 m (9.8 ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Storage</th>
<th>Internal hard drive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HDD, 1.75 TB available</td>
</tr>
</tbody>
</table>

### Electrical Interfaces

<table>
<thead>
<tr>
<th>In (BNC)</th>
<th>5 V TTL (1 MHz max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg in (x8)</td>
<td>➤ High level: &gt;2 V</td>
</tr>
<tr>
<td></td>
<td>➤ Low level: &lt;0.8 V</td>
</tr>
<tr>
<td></td>
<td>➤ Input maximum range: 0–5.5 V</td>
</tr>
<tr>
<td></td>
<td>➤ Hold function (actual state held when unplugged)</td>
</tr>
<tr>
<td>Sync in (x1)</td>
<td>5 V TTL (10 MHz typ.) (hardware ready, reserved for future use).</td>
</tr>
<tr>
<td>Interlock (x1)</td>
<td>5 V TTL (hardware ready, reserved for future use)</td>
</tr>
<tr>
<td>Out (BNC)</td>
<td>5 V TTL (1 MHz max.)</td>
</tr>
<tr>
<td>Trg out (x4)</td>
<td>➤ High level: 4 V typ. on high-impedance load (&gt; 10 kΩ)</td>
</tr>
<tr>
<td></td>
<td>➤ Low level: 0 to 0.5 V on high-impedance load (&gt;10 kΩ)</td>
</tr>
<tr>
<td></td>
<td>➤ Source resistance: 50 Ω</td>
</tr>
<tr>
<td>Sync out (x1)</td>
<td>5 V TTL (10 MHz typ.) (hardware ready, reserved for future use).</td>
</tr>
<tr>
<td>Analog out (x2)</td>
<td>0–5 V</td>
</tr>
<tr>
<td></td>
<td>Source resistance: 450 Ω</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>10 m (32.8 ft)</td>
</tr>
</tbody>
</table>
Introducing the CTP10
Technical Specifications

## TLS Requirements

Supported TLS are:

- EXFO T100S-HP
- VIAVI mSWS-A1SLS
- New Focus TLB-6600
- Keysight 8164A measurement system (tested on v. 5.25 with the 81640A laser)
- Keysight 8164B measurement system (tested on v. 5.25 with the 81606A laser)

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.

### Hardware

<table>
<thead>
<tr>
<th>Electrical Specifications</th>
<th>Input power</th>
<th>see Electrical Safety Information on page 35.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuses (x2)</td>
<td>T4AH250V</td>
<td></td>
</tr>
<tr>
<td>Maximum power consumption</td>
<td>300 W</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Specifications</th>
<th>Dimensions (H x W x D)</th>
<th>178 mm x 482 mm x 435 mm (7 in x 19 in x 17 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4U full rack with rackmount fixtures</td>
</tr>
<tr>
<td>Weight</td>
<td>Mainframe</td>
<td>8.5 kg (18.7 lb)</td>
</tr>
<tr>
<td></td>
<td>Module</td>
<td>Between 1 and 1.2 kg (2.2 lb to 2.6 lb)</td>
</tr>
</tbody>
</table>
Introducing the CTP10

CTP10 Mainframe Overview

The CTP10 is delivered with the following accessories:

- 1 power supply cable
- 10 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 39 and Turning off the CTP10 on page 43).

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 an external device (laser) directly or 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 193.

**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 28).
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 34.

BNC Connectors

The BNC connectors enable you to synchronize scans or measurements (see *Hardware* on page 4 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:**
  The signal coming out of a laser with electrical triggering initiates data sampling (for lasers with optical triggering use, the SCAN SYNC module generates data sampling). For more details, see *Installing Your Test Setup* on page 49 and *Defining Your Subsystem* on page 101.

- **Event trigger:**
  The external signal triggers an event such as the scan start (see *Triggering the Acquisition* on page 117) or data acquisition (see *Triggering Power Level Data Acquisition* on page 68).

- **Window trigger:**
  The external signal triggers the sampling of data for a specified time window. This mode applies if you use a New Focus TLB-6600 laser: see *Test setup using optical sampling with electrical BNC connection* on page 54.

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 118.
- **TRIG OUT (x4):** BNC connector for outputting a trigger signal during scan. For more details, see *Generating Output Trigger Signals* on page 118.
- **INTERLOCK:** reserved for future use.

### USB-A Ports

The \[\text{USB-A 3.0 ports}\] label identifies the USB-A 3.0 ports, the \[\text{USB-A 2.0 ports}\] 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 an external device (laser) directly or through an adapter (GPIB, RS232...).**
  The CTP10 is compatible with National Instrument USB-GPIB adapters.
  For more details, see *Adding and Connecting a Laser* on page 74.

For more details on USB connections, see *Connecting a Mouse and Keyboard to the CTP10* on page 38 and *Connecting/Disconnecting USB Storage Devices* on page 173.
**Introducing the CTP10**

*CTP10 Mainframe Overview*

---

**Ethernet Port**

The Ethernet port 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 47.
- Control a laser from the CTP10. For more details, see *Adding and Connecting a Laser* on page 74.
- Perform remote control operations on the CTP10. For more details, see *Remotely Controlling the CTP10* on page 179.

**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 179.

**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 179.

**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 187.
## Labels and Markings

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Label Image" /></td>
<td>Identification of the product Indicates serial number, model, options (if any), hardware version (if any) and date of manufacture.</td>
</tr>
<tr>
<td><img src="image2" alt="Manufacturer Identification" /></td>
<td>Manufacturer identification Contact information of the manufacturer.</td>
</tr>
<tr>
<td>2x T4AH250V</td>
<td>Fuse type (x2)</td>
</tr>
<tr>
<td><img src="image3" alt="Input Power Requirements" /></td>
<td>Input power requirements: alternating current; input voltage range; frequency range; input current range</td>
</tr>
<tr>
<td><img src="image4" alt="WEEE Symbol" /></td>
<td>WEEE symbol for recycling: See Recycling and Disposal on page 188.</td>
</tr>
<tr>
<td><img src="image5" alt="Safety Certification Label" /></td>
<td>Safety certification label.</td>
</tr>
<tr>
<td><img src="image6" alt="EFUP Label" /></td>
<td>EFUP label (RoHS China) The CTP10 has an environment friendly use period of 10 years.</td>
</tr>
<tr>
<td><img src="image7" alt="Windows License Label" /></td>
<td>Windows license label The CTP10 embeds Windows 10.</td>
</tr>
<tr>
<td><img src="image8" alt="Warranty Seal" /></td>
<td>Warranty seal The CTP10 cover must not be open, otherwise the warranty is not valid anymore.</td>
</tr>
</tbody>
</table>
CTP10 Modules Overview

The CTP10 available modules are:
- *IL RL OPM2 Module* on page 14
- *SCAN SYNC Module* on page 18
- *OPMx Modules* on page 21
- *FBC Module* on page 24

**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.

**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 wavelength referencing equipment (for more details, see *Installing Your Test Setup* on page 49).

➤ **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 28.
SCAN SYNC Module

The SCAN SYNC module is a wavelength scan synchronization 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 module for optical sampling. For more details, see Installing Your Test Setup on page 49.

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 28.
**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 49.

**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 28.
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.

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.

▶ Output port

FBC OUT is the signal output port to connect to the TLS IN port of the IL RL OPM2 module for measurements (for more details, see Installing Your Test Setup on page 49).

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 28.
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 27.
- The Subsystem window for dynamic measurement: scanning of transfer function (TF) and back reflection (BR): see Subsystem Window on page 29.

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 57.

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 73.
**Subsystem Window**

The **Subsystem** window enables you to perform dynamic TF and BR 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 99.
- Display and handle the scan traces: for more details, see *Configuring and Displaying Traces* on page 119.
- Analyze measurement traces: for more details, see *Analyzing Traces* on page 129.
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

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>alternating current</td>
</tr>
<tr>
<td>APC</td>
<td>angled physical contact</td>
</tr>
<tr>
<td>BR</td>
<td>back reflection</td>
</tr>
<tr>
<td>CPU</td>
<td>central processing unit</td>
</tr>
<tr>
<td>CTP</td>
<td>component test platform</td>
</tr>
<tr>
<td>CW</td>
<td>continuous wave</td>
</tr>
<tr>
<td>DP</td>
<td>DisplayPort</td>
</tr>
<tr>
<td>DUT</td>
<td>device under test</td>
</tr>
<tr>
<td>FOA</td>
<td>fiber optic adapter</td>
</tr>
<tr>
<td>GPIB</td>
<td>general purpose interface bus</td>
</tr>
<tr>
<td>GUI</td>
<td>graphical user interface</td>
</tr>
<tr>
<td>IL</td>
<td>insertion loss</td>
</tr>
<tr>
<td>LAN</td>
<td>local area network</td>
</tr>
<tr>
<td>PC</td>
<td>physical contact</td>
</tr>
<tr>
<td>RL</td>
<td>return loss</td>
</tr>
<tr>
<td>RMS</td>
<td>root mean square</td>
</tr>
<tr>
<td>SCPI</td>
<td>standard commands for programmable instruments</td>
</tr>
<tr>
<td>SELV</td>
<td>safety extra-low voltage</td>
</tr>
<tr>
<td>TF</td>
<td>transfer function</td>
</tr>
<tr>
<td>WEEE</td>
<td>waste electrical and electronic equipment</td>
</tr>
</tbody>
</table>
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.
Other Safety Symbols on Your Unit

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Direct current</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Alternating current</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>The unit is equipped with an earth (ground) terminal.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>The unit is equipped with a protective conductor terminal.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>The unit is equipped with a frame or chassis terminal.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>On (Power)</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Off (Power)</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>On/off (Power)</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Fuse</td>
</tr>
</tbody>
</table>

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

### Equipment Ratings

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

\(^a\) 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.

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).
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
- install the CTP10 modules
- connect the CTP10 to external instruments
- start/stop the CTP10
- update the CTP10 system version

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.

Unpacking and Installing the CTP10

1. Open the package with care and remove the protective foam.
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 To Install the CTP10 in a 19-inch rack: on page 26.
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 8), 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.
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 28
➤ To install a module, see Installing a Module Into the CTP10 Mainframe on page 30
➤ To remove a module, see Removing a Module From the CTP10 Mainframe on page 32

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 another 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.

Before starting:

➤ 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 41.

➤ Make sure you have a slot head or Phillips head (recommended) screwdriver (size #1).

To insert a module into the CTP10 mainframe:

1. 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.

2. 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 28 or Removing a Module From the CTP10 Mainframe on page 32.

3. 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.
4. 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.

5. Push the module into the slot until the black handle touches the mainframe.

6. 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.

7. 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.

**Before starting:**
Make sure you have a slot head or Phillips head (recommended) screwdriver (size #1).

**To remove a module from the CTP10 mainframe:**
1. On the CTP10 mainframe front panel, loosen the captive screws of the module using the appropriate screwdriver.
2. Put your thumb on the grey button and press it while you lower the black handle.
3. 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.
4. Hold the module with both hands by its top and bottom edges and put it in its original container.

5. Cover the empty slots with the supplied cover plates as explained in Removing/Installing a Cover Plate on page 28.

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 8.

**Before starting:**

- Make sure the screens you want to connect to the CTP10 meet the requirements detailed in Interfaces for External Devices on page 4.
- 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 8) with the appropriate cable.
2. Turn on the CTP10 as explained in Turning on the CTP10 and Accessing the GUI on page 39.
3. In the CTP10 task bar, click the button to display the Settings window.
   The Display area enables you to set the screen resolution.

   ![Settings Window]

   - **Display 1 resolution:** 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 with the appropriate cable.

2. In the CTP10 task bar, click the ![Settings](image) button to display the **Settings** window.

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

   ![Settings](image)

   - **Brightness**: 100%
   - **Dark theme**: Off
   - **Display mode**: Extend
   - **Screen 1 resolution**: 1920 x 1080
   - **Screen 2 resolution**: 1920 x 1080
   - **Screen 2 position**: Left

3. Click the **Identify screens** button to clearly identify Screen 1 and Screen 2, with their corresponding set resolution.

4. In the **Screen 2 resolution** list, set your second screen resolution. The recommended value is the screen native resolution.
5. In the **Display mode** list, select the wanted mode for your screen(s):
   - **Screen 1 only**: all windows of the CTP10 GUI are displayed on the same screen 1, which is the screen identified as "Screen 1" using the **Identify screens** button.
   - **Screen 2 only**: all windows of the CTP10 GUI are displayed on the same screen 2, which is the screen identified as "Screen 2" using the **Identify screens** button.
   - **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.

6. In the Screen 2 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. 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.

3. Click the Touchscreen setup... button and follow the instructions displayed on screen to clearly identify the touchscreen display.

4. 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 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 6).

To connect 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 39.
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 25.
2. On the CTP10 front panel, press the on/off button (see Front panel on page 6).
   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:
## Turning on the CTP10 and Accessing the GUI

<table>
<thead>
<tr>
<th>Task Bar Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Power Button" /></td>
<td>Turns off the CTP10. For more details, see <em>Turning off the CTP10</em> on page 43.</td>
</tr>
<tr>
<td><img src="image" alt="Modules and Lasers" /></td>
<td>Displays the <strong>Modules and Lasers</strong> window, to perform static measurement and control the CTP10 modules and connected lasers. For more details, see <em>Operating CTP10 Modules</em> on page 57 and <em>Defining and Controlling Your Laser(s)</em> on page 73.</td>
</tr>
<tr>
<td><img src="image" alt="Subsystem" /></td>
<td>Displays the <strong>Subsystem</strong> window, which allows you to perform dynamic measurement: transfer function (TF) and back reflection (BR) scanning. For more details, see <em>Defining Your Subsystem</em> on page 89.</td>
</tr>
<tr>
<td><img src="image" alt="Laser sharing" /></td>
<td>Displays the <strong>Laser sharing</strong> menu, which allows 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 <em>Sharing the Lasers with Several CTP10s</em> on page 82.</td>
</tr>
<tr>
<td><img src="image" alt="Analog outputs" /></td>
<td>Enables you to output internal measurements as analog signals. For more details, see <em>Generating Output Analog Signals</em> on page 118.</td>
</tr>
<tr>
<td><img src="image" alt="File Explorer" /></td>
<td>Displays the <strong>File Explorer</strong> window, to access the drives available from the CTP10 and handle corresponding files. For more details, see <em>Handling Files and User Data</em> on page 173.</td>
</tr>
<tr>
<td><img src="image" alt="Settings" /></td>
<td>Displays the <strong>Settings</strong> window, to define the CTP10 general parameters, connect the CTP10 or manage CTP10 data.</td>
</tr>
<tr>
<td><img src="image" alt="Errors and Warnings" /></td>
<td>Displays the last 100 main errors and/or warnings that occurred on the CTP10. For more details, see <em>Displaying the List of Errors and Warnings</em> on page 203.</td>
</tr>
<tr>
<td><img src="image" alt="Help" /></td>
<td>➤ The <strong>Help</strong> command displays the <em>CTP10 User Guide</em> (remote control excepted). ➤ The <strong>About</strong> command displays information about the CTP10, the license agreement and a customer support contact list.</td>
</tr>
</tbody>
</table>
Updating the CTP10 System Version

The CTP10 embedded software package is a .pkg file available on the EXFO website.

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 72

Updating the CTP10 system version does not affect referencing data nor user data. It takes less than 10 minutes.

**To update the CTP10 system version**

1. From the EXFO website (EXFO.com/en/exfo-apps), download the last CTP10 update package (compressed into a *.zip file) and unzip it to a USB device, so that the necessary *.pkg file is located at the USB device root.
2. Connect the USB device to one of the available USB ports.
3. Turn off the CTP10 (see *Turning off the CTP10* on page 43).
4. On the front panel, press the button to turn on the CTP10.
   The CTP10 automatically detects the *.pkg file on the USB device and starts the update wizard (if several *.pkg files are detected at the USB device root, the last copied on the device is taken into account).
5. Follow the instructions displayed on screen to update the system version.
   Once the update is finished, the CTP10 starts normally.
6. Safely remove the USB device as explained in *Connecting/Disconnecting USB Storage Devices* on page 173.

**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.
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. In the CTP10 task bar, click the **Settings** button to display the **Settings** window. The **Operating System** area enables you to update the operating system.

3. 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.

4. Click the **Download, install and restart** button to install the update(s).

   The CTP10 downloads and installs the updates, and then restarts automatically.

5. 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.
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.
Setting Up Your CTP10

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
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.

   ![Date & Time Settings](image)

   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.

2. 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 179.

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 external device is not established.
   - : 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 external equipments for remote control.
   Default value: 5025 (SCPI-RAW)
   The value is automatically taken into account.

   ![Connection Status Icons]

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Connected" /></td>
<td>Connection is established and displays connection speed.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Not Connected" /></td>
<td>Connection to external device is not established.</td>
</tr>
<tr>
<td><img src="image3.png" alt="No Connection" /></td>
<td>Port is not connected to any external device.</td>
</tr>
</tbody>
</table>

3. To manually set the connection parameters:

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

   **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 82).
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

By default, the instrument name (as it is seen on the network) is “CTP10”. The following procedure explains how to change this name, so that you can distinguish it from another on the network.

**To change the instrument name:**

1. In the CTP10 task bar, click the ![Settings](image) button to display the **Settings** window.

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

   ![PC name](image)

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 (see Overview Diagram on page 49), and gives examples of typical subsystem setups:

- Typical Test Setups Using Optical Sampling on page 51
- Typical Test Setup Using Electrical Sampling on page 55

Overview Diagram

The following diagram gives an overview of the DUT characterization procedure using the CTP10.
**Setting Up Your CTP10**

**Installing Your Test Setup**

---

**Connect your laser(s) to the CTP10**

1. Connect laser(s) to CTP10
2. Configure laser connection from GUI

**Related section:**

*Defining and Controlling Your Laser(s)* on page 73

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**Configure your test setup**

Configure test setup from the subsystem setup menu

**Related section:**

*Setting up Your Subsystem* on page 103

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**Reference the subsystem**

- TF and BR referencing
- Wavelength referencing
- Dark current referencing

**Related sections:**

- *Defining the Scan Parameters* on page 99
- *Referencing the Subsystem* on page 109

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**Test your DUT**

- Scan
- Trace display
- Analysis
- Data management

**Related sections:**

- *Performing Acquisition Scans* on page 115
- *Configuring and Displaying Traces* on page 119
- *Analyzing Traces* on page 139
- *Handling Subsystem Data* on page 109
Typical Test Setups Using Optical Sampling

Typical test setup with one laser

The following figure illustrates an example of test setup with one T100S-HP laser. For this type of laser without electrical trigger, the use of the SCAN SYNC module is mandatory to create a trigger for optical measurement.

The CTP10 controls the laser via GPIB with a USB-GPIB adapter. The laser output is directly connected to the IL RL OPM2 module TLS IN input connector. 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 test setup with multiple lasers (full-band characterization)

The following figure illustrates a test setup with four T100S-HP lasers.

The CTP10 controls the lasers via GPIB with a USB-GPIB adapter. The four 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 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 GPIB or RS-232 with an USB adapter. The four 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 82.
Test setup using optical sampling with electrical BNC connection

The following figure illustrates a typical test setup using the New Focus TLB-6600 laser: in this case, data sampling is made through the SCAN SYNC module, and you must also connect the a BNC connector from the TRIG OUT port to the laser to control the laser sweep range window.
Typical Test Setup Using Electrical Sampling

The following figure illustrates an example of test setup using a laser with electrical trigger (such as the Keysight 8164A or 8164B).

The CTP10 controls the laser via GPIB with a USB-GPIB adapter.

The CTP10 uses the laser electrical trigger for data acquisition: in this case, the sampling accuracy depends on the laser speed and trigger signal based on the lambda table (for more details on lambda table, see *Lambda Table* on page 101).
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 and BR 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 subsystem, see Defining Your Subsystem on page 89).

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 58
   - Controlling IL RL OPM2 Modules on page 59
   - Controlling SCAN SYNC Modules on page 64
   - Controlling OPMx Modules on page 65

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.

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.
Operating CTP10 Modules

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 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:

<table>
<thead>
<tr>
<th><strong>Button</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Update...</td>
<td>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 <em>Updating a Module System Version</em> on page 72.</td>
</tr>
<tr>
<td>Restore factory settings</td>
<td>Deletes all the user customized settings on the module (units, parameters, dark current zeroing). For more details on the restore procedure, see <em>Restoring the Factory Settings of a Module</em> on page 71.</td>
</tr>
<tr>
<td>Run self-test</td>
<td>Enables you to detect possible errors on the module (for remote assistance). If an error occurs, the module becomes unavailable. For more details, see <em>Performing a Self-test</em> on page 202.</td>
</tr>
</tbody>
</table>
Controlling IL RL OPM2 Modules

IL RL OPM2 modules enable you to measure the insertion loss and the return loss of connected devices. The modules plugged into the CTP10 mainframe are represented in the top part of the Modules and Lasers window.

Each 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 control the module version (see Displaying Information on Modules on page 58) 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 modules 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 wanted 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.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Spectral units</td>
<td>Select the unit to use for the defined wavelength/frequency.</td>
</tr>
<tr>
<td>Parameters</td>
<td>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 power signal to be averaged; increasing the averaging time reduces noise level on the measured power. 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 power. 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 Connectors on page 70.</td>
</tr>
</tbody>
</table>
Controlling the TLS Input Port

The laser input port of the IL RL OPM2 modules 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 wanted 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.

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

The output ports of the IL RL OPM2 modules 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 wanted 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.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Spectral units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Parameters</td>
<td></td>
</tr>
<tr>
<td>Wavelength/Frequency</td>
<td>Enter the wavelength/frequency value of the signal received by the module input connector. The value set also applies to the module &quot;TLS IN&quot; and &quot;Out to DUT&quot; connectors, and to all detectors used in the subsystem.</td>
</tr>
<tr>
<td>Averaging Time</td>
<td>Period of time during which you want the power signal to be averaged; increasing the averaging time reduces noise level on the measured power. The value set also applies to the module &quot;TLS IN&quot; and &quot;Out to DUT&quot; connectors, and to all detectors used in the subsystem.</td>
</tr>
<tr>
<td>Power Offset</td>
<td>Compensation value you want to apply to the detected power. The value set also applies to the module &quot;TLS IN&quot; and &quot;Out to DUT&quot; connectors, and to all detectors used in the subsystem.</td>
</tr>
<tr>
<td>Output power</td>
<td>Output optical power measured on the port.</td>
</tr>
</tbody>
</table>
To define the Out to DUT output parameters:
1. In the Modules and Lasers window, click the wanted 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Spectral units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Parameters</td>
<td>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.</td>
</tr>
<tr>
<td>Averaging Time</td>
<td>Period of time during which you want the power signal to be averaged; increasing the averaging time reduces noise level on the measured power. The value set also applies to the TLS input and Out to SCAN SYNC connectors.</td>
</tr>
<tr>
<td>Power Offset</td>
<td>Compensation value you want to apply to the detected power. The value set also applies to the TLS input and Out to SCAN SYNC connectors.</td>
</tr>
<tr>
<td>Output power</td>
<td>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.</td>
</tr>
<tr>
<td>Back Reflection</td>
<td>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.</td>
</tr>
<tr>
<td>Reference zeroing button</td>
<td>Performs dark current zeroing of the monitoring detector used for TF and BR measurements: see Zeronoing the Dark Current on Connectors on page 70.</td>
</tr>
<tr>
<td>BR zeroing</td>
<td>Performs dark current zeroing on the connector for BR measurements: see Zeronoing the Dark Current on Connectors on page 70.</td>
</tr>
</tbody>
</table>
Controlling SCAN SYNC Modules

The SCAN SYNC modules plugged into the CTP10 mainframe are 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 restore factory settings or run a self test as explained in Restoring the Factory Settings of a Module on page 71 and Performing a Self-test on page 202.

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 control 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 control the module version (see Displaying Information on Modules on page 58) 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.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power units</td>
<td>Select the unit to use for the measured input power.</td>
</tr>
<tr>
<td>Spectral units</td>
<td>Select the unit to use for the defined wavelength/frequency.</td>
</tr>
<tr>
<td><strong>Parameters</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Wavelength/Frequency</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Averaging Time</strong></td>
<td>Period of time during which you want the power signal to be averaged; increasing the averaging time reduces noise level on the measured power. If the module connector is used in a subsystem, the value is applied to all the connectors used in that same subsystem.</td>
</tr>
<tr>
<td><strong>Power Offset</strong></td>
<td>Compensation value you want to apply to the detected power.</td>
</tr>
<tr>
<td><strong>Input power</strong></td>
<td>Instant input power measured on the port, according to the parameters set in the <strong>Parameters</strong> area.</td>
</tr>
<tr>
<td><strong>Zeroing button</strong></td>
<td>Performs dark current zeroing on the connector: see Zeroing the Dark Current on Connectors on page 70.</td>
</tr>
</tbody>
</table>
Controlling FBC Modules

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.
Triggering Power Level Data Acquisition

The **logging** and **stability** functions enable you to acquire a definite number of power level samples from the wanted detector ports, upon receipt of an electrical or software trigger. These two 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.

  ![Diagram of logging measurement](image)

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

  If an external trigger is selected, the acquisition starts when the CTP10 receives a rising edge pulse (the function must has previously been armed 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.

  ![Diagram of stability measurement](image)

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 or stability function is updated to the last system version (see *Updating a Module System Version* on page 72).
   - The CTP10 is in idle state.

2. Select the detector(s) on which you want to activate the logging or stability function by using the command `:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCTION:ACTivate` on page 240.
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 241.

   This command does not apply to the stability function, which can only be triggered by command (see `:CTP:FUNCTION:STATe` on page 260).

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

4. If you want to use a physical trigger (for the logging function only), 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 stability):
   - To configure the logging function, use the command `:CTP:FUNCTION:PARameter:LOGGing` on page 263.
   - To configure the stability function, use the command `:CTP:FUNCTION:PARameter:STABility` on page 261.

6. Start the data acquisition by using the command `:CTP:FUNCTION:STATe` on page 260.

   - If you have selected an external trigger (`:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCTION:TRIGger` on page 241), the function waits for the trigger to start the acquisition.
   - If you have selected a software trigger or no trigger (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 242.

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 243.

9. Deactivate the function on the detector by using the command `:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCTION:ACTivate` on page 240.
Zeroing the Dark Current on Connectors

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

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 27).
   - Connect a fiber with absolutely no light source.

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 and BR measurements (OUT TO DUT or Out2 on IL RL OPM2 modules), click the following buttons:

     **Reference Zeroing** button to zero the dark current of the monitoring detector used during TF and BR measurements. The correction will apply to the TLS and OUT TO SCAN SYNC (or Out1) power measurements.

     **BR Zeroing** button 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 113.

**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.

   ![Module Information](image)

   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 41), 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.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Apply update</em></td>
<td>Select the check boxes corresponding to the modules you want to update.</td>
</tr>
<tr>
<td><em>Update all</em></td>
<td>Select this check box to automatically select all the available module updates.</td>
</tr>
<tr>
<td><em>Check update integrity</em></td>
<td>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.</td>
</tr>
<tr>
<td><em>Update now</em></td>
<td>The button indicates the approximate update time.  Click this button to start the update process.</td>
</tr>
</tbody>
</table>

4. Click the **Update now** button.

   A confirmation window appears.

5. Click **Start update**.
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).

The CTP10 can connect to the following lasers:

- Lasers without electrical trigger:
  - EXFO T100S-HP
  - VIAVI mSW-A1SL
  - New Focus TLB-6600: for this laser, the electrical trigger must also be connected to control the sweep range.

- Lasers with an electrical trigger:
  - Keysight 8164A
  - Keysight 8164B

For more details on TLS requirements, see Technical Specifications on page 3

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 a Laser on page 74
- Configuring the Lasers on page 78
- Controlling the Laser Output on page 81

Once created, you can select the lasers to setup a subsystem (for more details, see Defining Your Subsystem on page 87).

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 82.
Adding and Connecting a Laser

To properly configure 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 191).

➤ 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.

**Laser Sharing**

In laser sharing mode (see Sharing the Lasers with Several CTP10s on page 82), 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:

   ➤ Connection of one 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.
   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.

   RS232, using a USB-RS232 adapter.

1b. Connect the optical output of the laser(s) to the **TLS IN** port of the IL RL OPM2 module, or to the **TLS IN** ports of the FBC module, depending on your setup.

   In case of multiple TLS, the CTP10 will sweep all lasers selected for the scan (see *Defining the Scanning Lasers* on page 98) 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 module.

1d. For data sampling, do one of the following:

   To use the electrical trigger of the laser (if any) for data sampling, connect the **Trig Out** port of the laser to one of the **TRIG IN** port of the CTP10 rear panel.

   OR

   To use the optical trigger (for lasers without electrical trigger), connect the **OUT TO SCAN SYNC** (or **OUT1**) port of the IL RL OPM2 module to the **TLS IN** port of the SCAN SYNC module for data sampling.

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.

<table>
<thead>
<tr>
<th>Communication Type</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPIB</td>
<td>Interface</td>
<td>GPIB interface ID of the laser GPIB controller.</td>
</tr>
<tr>
<td></td>
<td>Address</td>
<td>GPIB address of the laser.</td>
</tr>
<tr>
<td>Ethernet</td>
<td>Port</td>
<td>TCP destination port to be used by the socket to allow data transmission between the CTP10 and the external laser.</td>
</tr>
<tr>
<td></td>
<td>IP</td>
<td>IP address used by the connected laser.</td>
</tr>
<tr>
<td>USB</td>
<td>Port</td>
<td>COM port on which the laser is connected.</td>
</tr>
<tr>
<td></td>
<td>Parity</td>
<td>Configure the USB (serial port) settings according to the instructions given in your laser’s user guide.</td>
</tr>
<tr>
<td></td>
<td>Flow control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stop bit</td>
<td></td>
</tr>
</tbody>
</table>

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 Connection status of the laser is set to **Connected**.

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.
Configuring the Lasers

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

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.

   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.

2. Connect the optical output of the laser to the TLS IN port of the IL RL OPM2 module.
3. Configure and control your lasers.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power/Spectral units</td>
<td>Power and wavelength units to use in the laser settings.</td>
</tr>
</tbody>
</table>
| Mode                       | ☐ Fixed wavelength: sets the laser emission wavelength/frequency to a fixed value defined in the Parameters area (see Parameters below).  
                            | ☐ Sweep continuous: sets the laser to perform continuous wavelength/frequency sweep according to the parameters set in the Parameters area (see Parameters below).  
                            | ☐ Sweep stepped (Keysight lasers only): sets the laser to perform step-by-step scanning according to the parameters set in the Parameters area (see Parameters below).  |
| Parameters                 | The laser parameters depend on the selected sweep mode.                     |
| Wavelength/Frequency       | Fixed wavelength mode only. Click the value to enter the wanted fixed laser emission wavelength/frequency. |
| Start wav./freq.           | Sweep continuous and stepped modes only. Click the value to enter the wanted lower wavelength/frequency sweep limit. |
| Stop wav./freq.            | Sweep continuous and stepped modes only. Click the value to enter the wanted upper wavelength/frequency sweep limit. |
| Speed                      | Sweep continuous mode only. Click the value to enter the wanted sweep speed of the laser. |
| Step                       | Sweep stepped mode only. Click the value to enter the wanted wavelength/frequency increment step. |
| Pause Timer                | Sweep stepped mode only. Click the value to enter the wanted duration between two scan steps. The wavelength/frequency remains constant during the pause timer. |
| Output power               | Click the value to enter the wanted output power.                          |
| Coherence control          | T100S-HP and mSWS-A1SLS lasers only. For more details on these functions, refer to the user manual delivered with the laser. |
## Defining and Controlling Your Laser(s)

### Configuring the Lasers

#### Repeat Mode
- **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.
- **One-way/Two-way**: Keysight lasers only. Sweeping direction of the laser.

#### Soft Lock
- **Password**: enter the laser unlocking/locking password. The default password is 1234. Click the button to display the password.
- **Unlock** button: unlocks the laser output with the entered password, the Enable button is available for use.
- **Lock** button: locks the laser optical output to Disable. The Enable button is not available.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat Mode</td>
<td>Sweep continuous and sweep stepped modes only.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Cycles</strong>: number of sweep cycles in case of continuous sweep. Enter 0 for limitless sweep (if supported by the connected laser).</td>
</tr>
<tr>
<td></td>
<td>- <strong>Delay</strong>: 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>
<tr>
<td></td>
<td>- <strong>One-way/Two-way</strong>: Keysight lasers only. Sweeping direction of the laser.</td>
</tr>
<tr>
<td>Soft Lock</td>
<td>Lock of the laser optical output.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Password</strong>: enter the laser unlocking/locking password. The default password is 1234. Click the button to display the password.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Unlock</strong> button: unlocks the laser output with the entered password, the Enable button is available for use.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Lock</strong> button: locks the laser optical output to Disable. The Enable button is not available.</td>
</tr>
</tbody>
</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.

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 *Configuring the Lasers* on page 78).

**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 is selected, the laser sweeps according to the parameters set in the laser menu.

- If the **Sweep** button 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:**

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.

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:**

- Laser sharing is only compatible with lasers without electrical trigger: EXFO T100S-HP and VIAVI mSWS-A1SLS
- All CTP10 must be connected to the LAN network.
- All CTP10 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 and an IL RL OPM2 module for IL and RL measurements.

**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 are immediately set to Distributed.

Before starting, make sure that all the CTP10 you want to use are connected by LAN.

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

   The lower part of the menu enables you to connect to remote CTP10s.
2. 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.

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

4. 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.

5. 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 enables the Controller CTP10 to set the communication with the Distributed CTP10s.

You should 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).

**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 standard mode (without laser sharing), as illustrated in *Overview Diagram* on page 49. 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 73.

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

2. Define your subsystems as explained in *Setting up Your Subsystem* on page 89.

   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.

3. Define the scan parameters as explained in *Defining the Scan Parameters* on page 97.

   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 107.

   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 113. 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 *Configuring and Displaying Traces* on page 119, *Analyzing Traces* on page 137 and *Handling Subsystem Data* on page 95. You can configure, display and analyze traces on Controller and Distributed CTP10s as you would do in standard 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 module to perform measurements,
- One SCAN SYNC module for optical sampling (if needed).
- OPMx modules providing additional detectors for measurements (if needed).

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 **Subsystem** button.

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

2. Configure your subsystem as follows:

   a. Graphically configure your test setup using the **Subsystem setup** menu as explained in *Setting up Your Subsystem* on page 103.
   
   Define the scan measurement parameters and reference your subsystem: see *Defining the Scan Parameters* on page 99 and *Referencing the Subsystem* on page 109.
   
   b. Configure the wanted trace settings: see *Setting-up Traces* on page 119.
   
   c. Test your DUT: see *Performing Acquisition Scans* on page 115.
   
   d. Adapt the graph display to your needs: see *Adjusting the Graph Display* on page 128.
   
   e. Analyze the traces: *Analyzing Traces* on page 129.

3. Handle traces and subsystem data: see *Handling Subsystem Data* on page 109 and *Handling Trace Data* on page 125.
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 other.

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

The following figure gives an example of a subsystem setup with four lasers using electrical sampling connected to an FBC module.
Defining Your Subsystem

Setting up Your Subsystem

The following figure gives an example of a subsystem setup with four lasers using optical and electrical sampling connected to an FBC module.
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 99).

Laser Sharing

In laser sharing mode (see Sharing the Lasers with Several CTP10s on page 82), 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 Configuring the Lasers on page 78).
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 a Laser on page 74).

If a laser is already selected, the trigger method 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 100) 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 99).

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 100 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.

To define the DUT of your subsystem:

1. In the Subsystem window, click the button.

2. In the DUT rectangle, click the button and define your DUT as explained in the following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Click the field to modify the DUT name in the Subsystem setup menu.</td>
</tr>
<tr>
<td>Number of outputs</td>
<td>Number of output ports of you DUT.</td>
</tr>
<tr>
<td></td>
<td>Click the value to modify it.</td>
</tr>
<tr>
<td></td>
<td>You can also use the and buttons at the left of the DUT output ports to increase/decrease the number of ports.</td>
</tr>
<tr>
<td>Outputs per line</td>
<td>Display setting: number of output ports you want to display in the visible line of the DUT panel.</td>
</tr>
<tr>
<td></td>
<td>Click the value to modify it.</td>
</tr>
<tr>
<td>Automatic output links</td>
<td>Automatically links all the output ports of the DUT to the available detectors of the modules plugged into the CTP10.</td>
</tr>
<tr>
<td>Disconnect output links</td>
<td>Automatically disconnect all the existing links between the output ports of the DUT and the CTP10 connectors.</td>
</tr>
</tbody>
</table>
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 99) 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. Trace groups appear in the order in which you create the links.

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 82), you define the links between the TLS, the FBC (if any) and the IL RL OPM2 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).

You can define any other link (between the IL RL OPM2 module, the SCAN SYNC module and the DUT) independently on the Controller and on Distributed CTP10s.

**Before starting:**

Physically connect your instruments to each others: see Installing Your Test Setup on page 49.

**To define links between instruments:**

1. In the Subsystem window, click the Subsystem setup button.

2. Link the instruments by drag & drop according to your physical test setup: press 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.

Impossible connections are greyed and the color of the links depend 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 the CTP10, the link is green.
- If the link source is a laser trigger, the link is grey.
- A selected link is red.

The connection between the two instruments is created and automatically configured.

For lasers with electrical triggering, a Trig Out port is available in the laser rectangle. To use the electrical trigger of the laser, you must link this Trig Out connector to the TRIG IN port of the CTP10 on which you have physically connected the laser.
Defining Your Subsystem
Setting up Your Subsystem

To display the sampling trigger method used for a laser:
The trigger method used for a laser is defined by the links set in the Subsystem setup menu.

1. In the Subsystem window, click the Subsystem setup button.
2. In the TLS rectangle, click the button.

The Trigger area displays the trigger method used for the laser; it is automatically selected depending on the links set for the laser.

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.

➢ Press 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.
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 109
- Loading an Existing Subsystem on page 110

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.
Defining Your Subsystem

Defining Subsystem Spectral and Power Units

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 115).
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 Units

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

In laser sharing mode (see Sharing the Lasers with Several CTP10s on page 82), 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 unit.
- Select nm/THz to modify the spectral unit.
Performing Measurement Scans

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

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 TF/BR referencing measurements.

Laser Sharing

In laser sharing mode (see Sharing the Lasers with Several CTP10s on page 82), the following scan parameters defined on the Controller CTP10 are applied to all the Distributed CTP10s: TLS parameters, Sweep parameters (range, span, center, power and sampling), Scan start, Sweep interval 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 49).
- 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 your measurement according to the instructions given in the following sections:
   - Defining the Scanning Lasers on page 98
   - Defining the Sweep Parameters on page 101
   - Defining the General Scan Settings on page 103
3. Reference your subsystem using the parameters selected for measurement: see Referencing the Subsystem on page 105.
4. Click the button or anywhere on the screen outside the menu to exit.
Performing Measurement Scans

Defining the Scan Parameters

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 will sweep 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 82), 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 lasers 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:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low wav./freq.</td>
<td>Wavelength/Frequency sweeping range 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).</td>
</tr>
<tr>
<td>High wav./freq.</td>
<td>Laser sweeping speed. The value set here replaces the speed value set in the laser configuration menu (see <em>Configuring the Lasers</em> on page 78). If you use multiple TLS, you can set a different speed value for each laser. For setups using the electrical trigger sampling of the laser, the speed set here must be compatible with the possible laser sampling resolution (see setting <em>Sampling</em> on page 102): all combinations of speed and sampling are not authorized, please refer to your laser specifications for details. If the resolution set is outside the laser specifications, the scan cannot be launched.</td>
</tr>
<tr>
<td>Speed</td>
<td>Laser sweeping speed. The value set here replaces the speed value set in the laser configuration menu (see <em>Configuring the Lasers</em> on page 78). If you use multiple TLS, you can set a different speed value for each laser. For setups using the electrical trigger sampling of the laser, the speed set here must be compatible with the possible laser sampling resolution (see setting <em>Sampling</em> on page 102): all combinations of speed and sampling are not authorized, please refer to your laser specifications for details. If the resolution set is outside the laser specifications, the scan cannot be launched.</td>
</tr>
</tbody>
</table>
| 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 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. |
| Lambda Table     | Only available for laser with electrical trigger.  
  - ✔️: the CTP10 acquires wavelength/frequency data from the laser electrical trigger signal and also retrieves from the laser the exact wavelength/frequency values corresponding to the laser sampling resolution. This refines the wavelength accuracy displayed on graph.  
  - ✗ (default): the CTP10 only uses the laser electrical trigger signal to acquire wavelength/frequency data. |
### Defining the Scan Parameters

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

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stabilization Time</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
| **Keep enabled after scan stop** | • ☑: 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.  
• ☐ (default): 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, power 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 82), 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.
Performing Measurement Scans

Defining the Scan Parameters

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

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start/Stop</strong></td>
<td>Wavelength/frequency overall sweeping range. The max/min wavelength or frequency range is defined in <em>Technical Specifications</em> 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.</td>
</tr>
<tr>
<td><strong>Span/Center</strong></td>
<td>Wavelength/frequency sweeping span. Sets the sweeping range to the maximum possible wavelength range (see <em>Technical Specifications</em> 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 <em>Performing Manual Measurements With Markers</em> on page 132).</td>
</tr>
<tr>
<td><strong>O/E/S/C/L/U buttons</strong></td>
<td>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 <strong>Sweep</strong> area of the scan menu. Selecting a band modifies the values defined in the <strong>Sweep</strong> area.</td>
</tr>
</tbody>
</table>

3. Define the power and sampling parameters using the instructions given in the following table.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>Optical output power of the lasers used for the scan. The value set here replaces the power set in the laser configuration menu (see <em>Configuring the Lasers</em> on page 78).</td>
</tr>
<tr>
<td><strong>Sampling</strong></td>
<td>Spectral sampling resolution: the value sets the sampling resolution of the SCAN SYNC module. For setups using optical sampling through the SCAN SYNC module, the value sets the sampling resolution of the SCAN SYNC module. For setups using the electrical trigger sampling of the laser, the sampling set here must be compatible with the laser speed settings (see setting <strong>Speed</strong> on page 99): all combinations of speed and sampling resolutions are not authorized, please refer to your laser specifications for details. If the resolution set is outside the laser specifications, the scan cannot be launched.</td>
</tr>
</tbody>
</table>
Performing Measurement Scans

Defining the Scan Parameters

You can define the scan mode and sweep interval in case of continuous mode, as explained in the following procedure.

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**.

On the Distributed CTP10, the **Scan start** can only be manual. You can select the **Scan mode** independently from the Controller but you cannot set the **Sweep Interval** in continuous scan mode (the interval set on the Controller CTP10 automatically applies to the Distributed CTP10s). You can also set the **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.
Performing Measurement Scans

Defining the Scan Parameters

2. In the **Scan** menu, set the scan mode and sweep interval by using the parameters described in the following table.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Scan start**     | **Manual**<br>You perform the acquisition manually, by following the procedure detailed in *Performing Acquisition Scans* on page 111.  
                     **Triggered**<br>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 82), 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**<br>The CTP10 performs a single sweep of the transfer function (according to the defined measurement traces) and then stops.  
                     **Continuous**<br>The CTP10 performs a continuous series of sweeps in accordance with the interval set in the **Sweep Interval** parameter, until you click the **Stop** button. |
| **Scan trigger output** | The CTP10 can output a trigger signal when it scans.  
                         **Destination**<br>Select the TRIG OUT port that outputs the signal.  
                         **Inverted Logic**<br>- **✓**: 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. |
| **Sweep interval** | **Off**<br>The CTP10 performs all scans successively with minimum pause between scans.  
                     **On**<br>The CTP10 observes the period of time specified in the **I** field before starting the next successive scan.  
                     **I**: period of time between the beginning of two successive scans.  
                     - If the interval set is greater than the scan time, the CTP10 waits before the next scan.  
                     - If the period of time is lower than the scan time, the CTP10 immediately performs the next scan. |
Performing Measurement Scans

Referencing the Subsystem

**CAUTION**

- To achieve optimum system performance, keep fiber-optic connectors clean at all times (see *Cleaning Optical Connectors* on page 191).
- 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.

**Laser Sharing**

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 82), 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 TF/BR 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.

**Performing TF and BR 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 or BR of the tested device. Referencing the subsystem is required before performing test scans, and must be performed in less than four hours, using the following functions:

- **Reference**: enables you to perform a TF reference measurement on each detector used in the subsystem. The BR reference is automatically performed on the first detector (from the left) of the subsystem.
  
  You must perform a new TF 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.
  
  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 and BR 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.

   ![Image showing detector connection](image)

   - TLS: Transmission Loss Signal
   - CTP10

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 TF reference window.

6. Click Run reference.

   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 green 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 Stop button to abort the referencing scan.

7. Perform steps 4 and 5 for all detectors of the subsystem.

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

To perform quick referencing:

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

   The Quick reference window displays all the referenced connectors 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 **Stop** button to abort the referencing scan.
Performing Wavelength Referencing

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

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.

In laser sharing mode (see *Sharing the Lasers with Several CTP10s* on page 82), you can perform the wavelength 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 (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 TF/BR 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$_2$H$_2$ 50 Torr (1512–1543 nm)
   - Acetylene $^{12}$C$_2$H$_2$ 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.** Electrically connect your tunable laser source(s) to the CTP10 (see *Defining and Controlling Your Laser(s)* on page 73). Make sure that the wavelength limits of the connected laser(s) cover the sweep range of the selected gas cell.
   - **2b.** Connect the TLS IN port of the IL RL 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 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 module.
   - **2e.** Connect the output port of the gas cell to one of the available detector port in the subsystem.
Performing Measurement Scans
Referencing 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 Wavelength reference... 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 detector you want to use and connect it (physically) 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 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 Stop 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) and back reflection (BR) acquisition is performed according to the scanning parameters defined in Defining the Sweep Parameters on page 101, on traces that are available for scan.

See the following sections for details:

- Manually Starting/Stopping the Acquisition on page 111.
- Triggering the Acquisition on page 113.

Manually Starting/Stopping the Acquisition

Laser sharing

In laser sharing mode (see Sharing the Lasers with Several CTP10s on page 82), 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 detectors you intend to use are properly referenced, with the same scan parameters than the one you intend to use for DUT test measurement.
Performing Measurement Scans

Performing Acquisition Scans

2. Connect your DUT to the CTP10 as illustrated in the following figure (example with one laser source):

2a. Connect the input port of the DUT to the OUT TO DUT (or OUT2) port of the IL RL OPM2 module.

2b. Connect the output port(s) of the DUT to the referenced detector ports of the IL RL OPM2 or OPMx modules.

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. In the Scan menu, set the Scan Start parameter to Manual.

6. Click the Scan button.

The Scan button label displays Stop and the acquisition starts using the selected parameters (see Defining the Scan Parameters on page 97).

In laser sharing mode, the Distributed CTP10 waits for the next sweep performed on the Controller CTP10 to perform the scan.

In the scan parameters area above the graph, you can follow the scan progress (in percent) and number of scans.

If the Single scan mode is selected, the acquisition stops automatically.
Performing Measurement Scans

Performing Acquisition Scans

To stop the acquisition:

- To stop the acquisition at the end of the sweep in progress, click the **Stop** button. The button label switches to **Abort** until the acquisition stops (at the end of the current sweep).

  If you click the **Abort** button while the acquisition is stopping, the acquisition does not finish the scan and stops as quickly as possible.

  In laser sharing mode:

  - Stopping a scan on the Controller stops the scan on all Distributed CTP10s at the end of their sweep in progress.

    If the scan mode was set to Continuous on a Distributed CTP10, the Distributed enters the waiting state and waits for the next scans from the Controller.

  - 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 8) 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 82), 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 97).

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.
Generating Output Signals

You can output trigger signal and analog signals, as explained in the following sections:

- Generating Output Trigger Signals on page 114.
- Generating Output Analog Signals on page 114.

Generating Output Trigger Signals

The TRIG OUT BNC connectors (see Rear panel on page 8) allow you to output trigger signals when the CTP10 performs a scan, as explained in the following procedure.

**To output 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 Scan menu, in the Scan trigger output area, select the destination trigger connector and logic. For more details, see Defining the Scan Parameters on page 97).

The scanning operation will trigger an output signal (during the time of the scan) according to the selected parameters.

Generating Output Analog Signals

The ANLG OUT BNC connectors (see Rear panel on page 8) allow you to output internal measurements as analog signals 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.

![Analog outputs settings]

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 V_a and V_b is: \[ \Delta P_{dB} = \alpha \cdot (V_a - V_b) \] (applicable if \( V_1 \leq V_a, V_b \leq V_2 \)).

To get the best homogeneity over an extended range, the recommended values are \( P_1 = 0 \text{ dBm} \) and \( P_2 = -50 \text{ dBm} \).
Configuring and Displaying Traces

For each optical detector and OUT TO DUT (or OUT2) connector used in the subsystem, a trace group is created in the Trace setup pane. In this pane, module connectors appear in the order of their link creation in the Subsystem setup menu.

All traces are displayed in the graph area.

Setting-up Traces

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 125).

For each connector, you can display several trace types corresponding to various measurements.

- For each optical detector, a trace group is created for insertion loss measurements.
- For each OUT TO DUT (or OUT2) connector, a trace group is created for return loss measurements.

Trace setup Pane Description
Setting-up Traces

For each connector used in the subsystem, you can select the trace types you want to display in the trace list. You can display a maximum of 350 traces in a subsystem.

To specify the trace types to measure:

1. Make sure your subsystem is properly configured in the Subsystem setup menu (see Defining Your Subsystem on page 87) 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 Trace setup button corresponding to the connector you want to configure.

The available parameters depend on the selected connector.

---

### Defining Trace Types

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Open] Trace handling buttons. For more details, see Handling Trace Data on page 125.</td>
<td></td>
</tr>
<tr>
<td>![Trace] Trace configuration button. For more details, see Defining Trace Types on page 120.</td>
<td></td>
</tr>
<tr>
<td>![Comment] Trace comment button. For more details, see Adding a Comment to a Trace on page 123.</td>
<td></td>
</tr>
<tr>
<td>![Analysis] Trace analysis selection button in PCT analysis mode. For more details, see Analyzing Traces on page 137.</td>
<td></td>
</tr>
<tr>
<td>![Analysis] Trace analysis selection button in PCT WDM analysis mode. For more details, see Analyzing Traces on page 137.</td>
<td></td>
</tr>
<tr>
<td>![Color] Trace color and thickness. For more details, see Defining Trace Layout on page 123.</td>
<td></td>
</tr>
<tr>
<td>![Visible] Trace display/hide check box. For more details, see Displaying/Hiding Traces on page 123.</td>
<td></td>
</tr>
</tbody>
</table>
4. Select the traces you want to display on graph, as explained in the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF/BR Measured traces</td>
<td>Trace type you want to display on graph. The measured value depends on the selected connector (TF or BR):</td>
</tr>
<tr>
<td></td>
<td>▶ live: the trace represents the TF/BR of the last measurement.</td>
</tr>
<tr>
<td></td>
<td>▶ max: the trace represents all the maximum scanned values point to point from the first scan.</td>
</tr>
<tr>
<td></td>
<td>▶ min: the trace represents all the minimum scanned values point to point from the first scan.</td>
</tr>
<tr>
<td></td>
<td>▶ 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.</td>
</tr>
<tr>
<td></td>
<td>▶ 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</td>
</tr>
<tr>
<td></td>
<td>For average trace types, make sure the scan mode parameter is set to Continuous (see Defining the Scan Parameters on page 97).</td>
</tr>
<tr>
<td>Apply to all detectors of this subsystem button</td>
<td>Detector connectors only. Click this button to apply the settings defined for the connector to all connectors of the same type.</td>
</tr>
</tbody>
</table>
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.
Defining Trace Layout

You can define the color and stroke weight of each available trace, as explained in the following procedure. You can also use multiple selection to apply the same layout on several traces.

**To modify the trace layout:**

1. In the Trace setup pane, select the traces you want to configure (see Selecting Traces on page 124).
2. Click the Style menu corresponding to the trace (or one of the traces, for multiple selection) you want to configure.
3. Select the wanted color and thickness for the trace.
   The appearance of the selected traces automatically changes on graph.
4. Click anywhere on the screen outside the menu to exit.

Adding a Comment to a 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 Traces

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 Traces

Selecting a trace on the graph automatically selects it in the Trace setup pane.

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 power level scale is highlighted with the trace color and 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.
➤ Ctrl + a: selects all traces.

To unselect traces:
Click anywhere on the graph.
Handling Trace Data

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.

To store a trace:
1. 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.
2. To add a description on the stored trace, click the button and type your comment in the field.
   At the next scan, traces of type Store won’t be modified.
   If you save a stored trace, the comment is saved with the trace.

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 174).

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 95.

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 trace file:
   
   EXFO CTP10
   Format,3.4
   SystemPackageVersion,1.4.3
   S/N,EO190310246
   Time,17:15:24.742 17/07/2019
   Module,1
   Detector,1
   Start,1540.0000,nm
Configuring and Displaying Traces

Handling Trace Data

Stop, 1550.0000, nm
Sampling, 2.0000, nm
Type, TF live
Unit, nm, ratio
Length, 6
WithGap, 0
GapBounds,
SweepSpeed, 50.000000, nm/s
AveragingTime, 0.020000, ms
LaserPower, 0.000000, dBm
LaserOptions, CavityControl PowerControl
AveragingCount, 1
Reference, EO182310147 17/07/2019
Note,

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1540</td>
<td>1.000039577</td>
</tr>
<tr>
<td>1542</td>
<td>0.999882758...</td>
</tr>
</tbody>
</table>

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).

Deleting Traces

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

To delete traces, two command buttons are available as explained in the following procedure.

To delete traces:

- To delete all traces from the graph and all analysis results (except for the Store traces), click the Clear button.
- 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.
Configuring and Displaying Traces

Adjusting the Graph Display

The graph displays the visible traces. You can customize the graph layout, adjust the scale and perform measurements directly on the graph, as explained in the following sections:

- **Defining the Graph Layout** on page 128
- **Adjusting the Scale** on page 129
- **Displaying Coordinates of Sampling Points** on page 131
- **Performing Manual Measurements With Markers** on page 132

**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:

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To zoom in or out, pinch two fingers together or move them apart.</td>
</tr>
<tr>
<td></td>
<td>Maximum vertical zoom: 0.02 dB</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>➤ To browse a scale, drag your finger across the horizontal or vertical scale.</td>
</tr>
<tr>
<td></td>
<td>➤ To zoom in or out on an axis, pinch two fingers together or move them apart on the horizontal or vertical scale.</td>
</tr>
<tr>
<td>1 Hold</td>
<td>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).</td>
</tr>
<tr>
<td>2 Draw a rectangle</td>
<td>If you draw a rectangle from right to left, it cancels the last rectangle selection you have made.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Command Button</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Button](image) | Opens a menu that enables you to specify the minimum and maximum values of the following scales:  
- **Horizontal wavelength/frequency scale**: used for spectral measurements.  
- **Vertical transfer function scale**: used for TF and BR measurements. |
| ![Button](image) | Enables you to select the exact region of the graph that you want to display:  
Click the button to activate the rectangle zoom and 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. |
| ![Button](image) | Automatically sets the display to the maximum wavelength and power range (defined in the technical specifications, see *Technical Specifications* on page 3). |
| ![Button](image) | Fits the wavelength/frequency and power 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. |
| ![Button](image) | Fits the wavelength/frequency range to the total range covered by all displayed traces. |
| ![Button](image) | Fits the power range to the total range covered by all displayed traces. |
| ![Button](image) | Undoes the last zoom action. |
| ![Button](image) | Disables/Enables all multi-touch screen gestures and move clicks on the graph. |
| ![Button](image) | Disables/Enables markers: for more details, see *Performing Manual Measurements With Markers* on page 132. |
**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 your 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.

**To display the coordinates of a sampling point:**

On the graph, drag your mouse on a trace until it reaches a measured point.

A point appears on graph with its corresponding coordinates.
Performing Manual Measurements With Markers

Four markers are available:

- Two vertical markers (A and B): associated with the selected trace, to indicate the detected power at the wavelength/frequency on which they are positioned.
- Two horizontal markers (C and D) to indicate the optical power.

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 and the power scale is highlighted with the same color, indicating 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:

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Left Arrow](left-arrow.png) ![Right Arrow](right-arrow.png) | 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 press 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 press on the right or left arrow button speeds up the move by multiplying it by 10. |
| ![Double Left Arrow](double-left-arrow.png) ![Double Right Arrow](double-right-arrow.png) | 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 press 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 press on the right or left arrow button speeds up the move by multiplying the trace sampling resolution by 1000. |
| ![Down Arrow](down-arrow.png) ![Up Arrow](up-arrow.png) | C and D markers only. Moves the selected marker 0.0001 dB (or 0.0001 e-6 ratio) to the top or bottom direction (independently of the selected trace).  
  - A long press on the arrow button speeds up the move to 0.001 dB (or 0.001 e-6 ratio). |
| ![Double Down Arrow](double-down-arrow.png) ![Double Up Arrow](double-up-arrow.png) | C and D markers only. Moves the selected marker 0.01 dB (or 0.01 e-6 ratio) to the top or bottom direction (independently of the selected trace).  
  - A long press on the arrow button speeds up the move to 0.1 dB (or 0.1 e-6 ratio). |
Configuring and Displaying Traces

Retrieving Raw TF Data from a Detector

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.

Retrieving Raw TF Data from a Detector

You can retrieve the traces corresponding to the unreferenced transfer function received on the OPM detector during the scan. This function is only available by using remote commands.

The following traces are available:

- "Raw Live" trace, which is the unreferenced "TF live" trace (trace type #11).
- "Raw Reference" trace, which is the reference trace of the "TF live" trace (trace type #12).
- "Raw Quick Reference" trace, which is the quick reference trace of the "TF live" trace (trace type #13).

To retrieve raw data from a trace:

1. Configure your test setup (see Defining Your Subsystem on page 87).
2. Configure the scan parameters and reference the subsystem (see Performing Measurement Scans on page 97).
3. Perform a scan to acquire the wanted "TF 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...10]:CHANnel[1...6]:TYPE[1...13]:DATA [:Y]:IMMediate? on page 312.
   - :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA :STARt? on page 310.
   - :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA :LENGth? on page 310.
   - :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA :SAMPling? on page 311.
   - :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13] :SAVE on page 309 (only in .csv format).
**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.
- PCT WDM mode: provides a series of tools for multi-channel analysis on one or several traces.

The analysis setup consists of tools aimed at studying special aspects of the displayed traces.
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.

**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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>➤ PCT: provides a series of tools for single channel analysis on a single trace.</td>
</tr>
<tr>
<td></td>
<td>➤ PCT WDM: provides a series of tools for multi-channel analysis on one or several traces.</td>
</tr>
<tr>
<td><strong>Auto analyze</strong></td>
<td>➤ ✓: the analysis is automatically performed at the end of each scan and after the change of an analysis parameter.</td>
</tr>
<tr>
<td></td>
<td>If the <strong>Between Markers Only</strong> parameter is activated and you have moved a marker, the analysis is also automatically performed.</td>
</tr>
<tr>
<td></td>
<td>➤ ◐: the analysis is performed when you click the <strong>Analyze</strong> button and if you change the power and/or spectral unit of the whole subsystem (see <em>Defining Subsystem Spectral and Power Units</em> on page 96).</td>
</tr>
<tr>
<td><strong>Noise level @ 1575 nm</strong></td>
<td>Detection threshold of the analysis tools.</td>
</tr>
<tr>
<td></td>
<td>Sets the level at 1575 nm of the noise detection curve (displayed as a dotted yellow line on the graph if the <strong>Noise level visible</strong> 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).</td>
</tr>
<tr>
<td><strong>Noise level visible</strong></td>
<td>Only available in PCT analysis mode.</td>
</tr>
<tr>
<td></td>
<td>➤ ✓: the noise detection curve is displayed on graph as a dotted yellow line.</td>
</tr>
<tr>
<td></td>
<td>➤ ◐: the noise detection curve is not displayed on graph, but is taken into account for analysis.</td>
</tr>
<tr>
<td><strong>Between markers only</strong></td>
<td>Two specific markers are available for the analysis (different from the A and B markers), colored in blue:</td>
</tr>
<tr>
<td></td>
<td>➤ ✓: the analysis is only performed on the part of the trace located between the two blue markers.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>The area outside the analysis area is greyed.</td>
</tr>
<tr>
<td></td>
<td>The <strong>+</strong> button automatically places the markers at the center of the graph, so that you can see them.</td>
</tr>
<tr>
<td></td>
<td>➤ ◐: 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.</td>
</tr>
</tbody>
</table>
Analyzing Traces
Configuring and Starting the Trace Analysis

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.

4. If the Auto Analysis check box is cleared (or if the Between Markers Only parameter is activated and you have moved a marker), 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 141.

3. Select the component under test in the Component Selector analysis tool (see Selecting the Component Under Test (Component Selector) on page 143).

4. In PCT WDM analysis mode, select the channel detection method you want to use as described in Setting Up Channel Detection on page 144.

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 Spectral Width 1/2/3 Analysis on page 149
   - Setting up Notch Width 1/2/3 Analysis on page 155
   - Setting Up Pass Band Test Analysis on page 158
   - Setting Up Stop Band Test Analysis on page 164
   - Setting Up WDM Filter Test Analysis on page 170
   - Setting Up Loss Measurement Analysis on page 172
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 yellow line of Noise Level @ 1575 nm defined in the Analysis menu (see Configuring and Starting the Trace Analysis on page 138).

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
Analyzing Traces

Setting up Peak Trough Search Analysis

- **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 139).

The Component Selector tool makes available the analysis tools adapted to the selected component.

<table>
<thead>
<tr>
<th></th>
<th>PCT Analysis Mode</th>
<th>PCT WDM Analysis Mode</th>
<th>Related Section</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pass Band Filter</td>
<td>Stop Band Filter</td>
<td>Isolator</td>
</tr>
<tr>
<td>PT Search</td>
<td>🌻</td>
<td>🌻</td>
<td>🌻</td>
</tr>
<tr>
<td>Channel Detection</td>
<td>🌻</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectral Width 1 Spectral Width 2 Spectral Width 3</td>
<td>🌻</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notch Width 1 Notch Width 2 Notch Width 3</td>
<td></td>
<td>🌻</td>
<td>🌻</td>
</tr>
<tr>
<td>Pass Band Test</td>
<td>🌻</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop Band Test</td>
<td></td>
<td>🌻</td>
<td></td>
</tr>
<tr>
<td>WDM Filter Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss Measurement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 144
➤ Analyzing Channel Detection Results on page 148

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 145 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 141) 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 146). 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.
Analyzing Traces

Setting Up Channel Detection

- **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 $\lambda^-$ and $\lambda^+$ with Power $P = P_{\text{peak}} - \text{Bandwidth Threshold}$. For correct identification of channels, it is recommended that this threshold be less than **PT Threshold** (see *PT Threshold* on page 141).

  Central wavelength/frequency $= (\lambda^+ + \lambda^-)/2$

  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:

  $f(\text{channel number } N) = f(\text{reference}) + N \times \text{Grid Spacing}$

  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 Units* on page 96) 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 Units* on page 96) 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 $\lambda^-$ and $\lambda^+$ with Power $P = P_{peak} - \text{Bandwidth Threshold}$.
  For correct identification of channels, it is recommended that this threshold be less than PT Threshold (see PT Threshold on page 141).
  Central wavelength/frequency $= (\lambda^+ + \lambda^-)/2$
  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 $\lambda^-$ and $\lambda^+$ with Power $P = P_{peak} - \text{Bandwidth Threshold}$.
  For correct identification of channels, it is recommended that this threshold be less than PT Threshold (see PT Threshold on page 141).
  Central wavelength/frequency $= (\lambda^+ + \lambda^-)/2$
  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 grey (brown and grey 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**

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch</td>
<td>Channel number, according to the grid channel numbering (even if <strong>Empty Channels</strong> is set to <strong>Hide</strong>).</td>
</tr>
<tr>
<td>Trace #</td>
<td>Trace number as displayed in the Trace setup pane.</td>
</tr>
<tr>
<td>$\lambda_{\text{Grid}}$ (nm) / $\nu_{\text{Grid}}$ (THz)</td>
<td>Wavelength/Frequency of the channel of the grid.</td>
</tr>
<tr>
<td>$\lambda_{\text{Chan}}$ (nm) / $\nu_{\text{Chan}}$ (THz)</td>
<td>Central wavelength/frequency of the trace channel, calculated from the selected <strong>Bandwidth Threshold</strong>.</td>
</tr>
<tr>
<td>$\Delta\lambda$ (nm) / $\Delta\nu$ (GHz)</td>
<td>Wavelength/Frequency offset of the channel compared to the nearest grid channel.</td>
</tr>
<tr>
<td>IL_{Grid} (dB)</td>
<td>Measured IL at central wavelength/frequency of the grid channel.</td>
</tr>
<tr>
<td>IL_{Chan} (dB)</td>
<td>Measured IL at central wavelength/frequency of the trace channel.</td>
</tr>
</tbody>
</table>
**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 149
- Analyzing Spectral Width Results on page 154

**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 155.

- 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 150 below.
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 $\lambda^-$ and $\lambda^+$ at which the power level falls below $[\text{Peak Power level}] - [\text{Width Threshold}]$. Several options are available for this algorithm (see **Fitting Options** on page 153), 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.
Analyzing Traces

Setting up Spectral Width 1/2/3 Analysis

► RMS/RMS Peak

The RMS and RMS Peak algorithms calculate the root mean square value $\sigma$ 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.

![Diagram of RMS/RMS Peak](image)

► 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 153), 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**.

![Diagram of Gaussian Fit/Lorentzian Fit](image)

► Multiplier

Factor to scale the measured width.

Default value: 1
Analyzing Traces

Setting up Spectral Width 1/2/3 Analysis

- Width Threshold
  Threshold level used in the calculation of the width. It defines two wavelengths $\lambda^-$ and $\lambda^+$ with Power $P = P_{\text{peak}} - \text{Width Threshold}$.
  
  Default value: 3 dB

- Mode Threshold (only for Envelope, Gaussian Fit and Lorentzian Fit algorithms).
  Retains peaks with power level $P > P_{\text{peak}} - \text{Mode Threshold}$.
  
  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 150).

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 $\lambda^-$ and $\lambda^+$ with Power $P = P_{\text{peak}} - \text{Width Threshold}$.
    
    Default value: 3 dB
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 $\lambda^+$ and $\lambda^-$. 
- ■ is displayed between $\lambda^-$ and $\lambda^+$.

**To analyze the PCT analysis results displayed in the Analysis pane:**

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda_{\text{mean}}/\nu_{\text{mean}}$</td>
<td>Calculated central wavelength/frequency and its associated power level.</td>
</tr>
<tr>
<td>$\text{Level}_{\text{mean}}$</td>
<td>For RMS, RMS Peak and Gaussian algorithms, the central wavelength is the mean wavelength.</td>
</tr>
<tr>
<td>$\lambda_{\text{peak}}/\nu_{\text{peak}}$</td>
<td>Calculated peak wavelength/frequency and its associated power level.</td>
</tr>
<tr>
<td>$\text{Level}_{\text{peak}}$</td>
<td></td>
</tr>
<tr>
<td>$\Delta \lambda@\text{xxdB}/\Delta \nu@\text{xxdB}$</td>
<td>Width at <strong>Width Threshold</strong> using the selected algorithm method. For RMS and RMS Peak algorithms, the width is the standard deviation ($\sigma$).</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Only for RMS and RMS Peak algorithms. Standard deviation value of the measured peak.</td>
</tr>
</tbody>
</table>

**To analyze the PCT WDM results displayed in the Analysis pane:**

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \lambda1@\text{xxdB (nm)}/\Delta \nu1@\text{xxdB (GHz)}$</td>
<td>Spectral width at <strong>Width Threshold</strong> using the selected calculation method.</td>
</tr>
<tr>
<td>$\Delta \lambda2@\text{xxdB (nm)}/\Delta \nu2@\text{xxdB (GHz)}$</td>
<td></td>
</tr>
<tr>
<td>$\Delta \lambda3@\text{xxdB (nm)}/\Delta \nu3@\text{xxdB (GHz)}$</td>
<td></td>
</tr>
</tbody>
</table>
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 155
- Analyzing Notch Width Results on page 157

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 157) or below the surrounding peaks (see "Top" in Width Reference on page 157).

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 156 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 $\lambda^-$ and $\lambda^+$ with Power $P = P_{\text{peak}} - \text{Width Threshold}$. The curve is fitted to the main trough.
  - Default value: 3 dB

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.
Analyzing Traces

Setting up Notch Width 1/2/3 Analysis

► 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 138).

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda_{\text{notch}}/\nu_{\text{mean}} )</td>
<td>Calculated central wavelength/frequency and its associated power level.</td>
</tr>
<tr>
<td>Level_{\text{notch}}</td>
<td></td>
</tr>
<tr>
<td>( \lambda_{\text{trough}}/\nu_{\text{trough}} )</td>
<td>Notch Width 1/2/3 tool only.</td>
</tr>
<tr>
<td>Level_{\text{trough}}</td>
<td>Calculated trough wavelength/frequency and its associated power level.</td>
</tr>
<tr>
<td>( \Delta \lambda_{\text{notch}}/\Delta \nu_{\text{notch}} )</td>
<td>Spectral notch width at Width Threshold using the selected algorithm method.</td>
</tr>
</tbody>
</table>
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 158
- **Analyzing Pass Band Test Results** on page 163

**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 159 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 154).
  - **Center λ**: center wavelength found in the Spectral Width 1 tool results (see Analyzing Spectral Width Results on page 154).

- **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 154).
  - **Set Distance**: enables you to set the spacing via the In/Out Band Distance parameter.
Analyzing Traces
Setting Up Pass Band Test Analysis

- **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 161).

- **% 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 154).
**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 159). 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 159).

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 159).

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

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Loss</td>
<td>Average loss in dB measured across Averaging Range around the in-band reference point.</td>
</tr>
<tr>
<td>Ripple</td>
<td>Uniformity in dB as the min/max level difference measured within Averaging Range around the In-Band reference point.</td>
</tr>
<tr>
<td>Slope</td>
<td>Linear fit slope calculated within Averaging Range around the In-Band reference point.</td>
</tr>
</tbody>
</table>

### Out-Band Side 1 Results and Out-Band Side 2 Results

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Loss</td>
<td>Average loss in dB measured across Averaging Range around the Out-Band reference point.</td>
</tr>
<tr>
<td>Ripple</td>
<td>Uniformity in dB as the min/max level difference measured within Averaging Range around the Out-Band reference point.</td>
</tr>
<tr>
<td>CrossTalk</td>
<td>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.</td>
</tr>
<tr>
<td>RollOff@XdB[1]</td>
<td>Roll off in dB/nm (or dB/THz) measured at XdB (set by the Spectral Width 1 tool) from the Transition Reference point.</td>
</tr>
<tr>
<td>RollOffmax[1]</td>
<td>Maximum roll off in dB/nm (or dB/THz), within the transition band.</td>
</tr>
<tr>
<td>λ@RollOffmax</td>
<td>Wavelength of maximum roll off in nm.</td>
</tr>
</tbody>
</table>

---

1: This result is calculated between the two reference points set in CrossTalk Settings on page 159.
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 164
- Analyzing Stop Band Test Results on page 169

**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 165 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 $\lambda$** (default): peak wavelength found in the Notch Width 1 tool results (see Analyzing Notch Width Results on page 157).
  - **Center $\lambda$**: center wavelength found in the Notch Width 1 tool results (see Analyzing Notch Width Results on page 157).

- **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 157).
  - **Set Distance**: enables you to set the spacing via the In/Out Band Distance parameter.
Analyzing Traces
Setting Up Stop Band Test Analysis

- **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 161).

- **% Bandwidth**: sets the range to a fraction of the bandwidth measured from the Notch Width 1 tool (see Analyzing Notch Width Results on page 157).
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.

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

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Loss</td>
<td>Average loss in dB measured across Averaging Range around the in-band reference point.</td>
</tr>
<tr>
<td>Ripple</td>
<td>Uniformity in dB as the min/max level difference measured within Averaging Range around the In-Band reference point.</td>
</tr>
<tr>
<td>Slope</td>
<td>Linear fit slope calculated within Averaging Range around the In-Band reference point.</td>
</tr>
</tbody>
</table>

▶ Out-Band Side 1 Results and Out-Band Side 2 Results

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Loss</td>
<td>Average loss in dB measured across Averaging Range around the Out-Band reference point.</td>
</tr>
<tr>
<td>Ripple</td>
<td>Uniformity in dB as the min/max level difference measured within Averaging Range around the Out-Band reference point.</td>
</tr>
<tr>
<td>Isolation Depth</td>
<td>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.</td>
</tr>
<tr>
<td>RollOff@XdB</td>
<td>Roll off in dB/nm (or dB/THz) measured at X dB (set by the Notch Width 1 tool) from the Transition Reference point.</td>
</tr>
<tr>
<td>RollOffmax</td>
<td>Maximum roll off in dB/nm (or dB/THz), within the transition band.</td>
</tr>
<tr>
<td>λ@RollOffmax</td>
<td>Wavelength of maximum roll off in nm.</td>
</tr>
<tr>
<td>Transition Band</td>
<td>Wavelength region between Transition Reference +/- Minimum Threshold and Reference point +/- Maximum Threshold.</td>
</tr>
</tbody>
</table>
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 170
- Analyzing WDM Filter Test Results on page 171

Defining WDM Filter Test Parameters

The **WDM Filter Test** tool allows 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 170 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 defined 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 148).

  - **% 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 148).
Analyzing WDM Filter Test Analysis

% 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.

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope (dB/nm or db/THz)</td>
<td>Linear fit slope calculated within the defined calculation range.</td>
</tr>
<tr>
<td>Ripple (dB)</td>
<td>Uniformity as the as the difference between IL min and IL max measured within the defined calculation range.</td>
</tr>
<tr>
<td>Adj. Iso. (dB)</td>
<td>Minimum (worst case) of the two isolation measurements performed on either side of the filter on the adjacent channels.</td>
</tr>
<tr>
<td>Non-adj. Iso. (dB)</td>
<td>Minimum (worst case) of the isolation measurements performed on either side of the filter on any channels except the adjacent channels.</td>
</tr>
<tr>
<td>Total Xtalk (dB)</td>
<td>Cumulated isolation measurement performed on all channels on either side of the filter.</td>
</tr>
</tbody>
</table>
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.

   - **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.

<table>
<thead>
<tr>
<th>Result</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Loss</strong></td>
<td>Measured fiber attenuation, in dB.</td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>Difference between minimum and maximum loss within the analysis range, in dB.</td>
</tr>
</tbody>
</table>

**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.
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 connect external storage devices, see Connecting/Disconnecting USB Storage Devices on page 173).
- 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 174).

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 6).

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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folder</td>
<td>Click the field to enter the server folder pathname.</td>
</tr>
<tr>
<td>Drive</td>
<td>Select the wanted drive letter.</td>
</tr>
</tbody>
</table>
| Reconnect this drive at CTP10 startup  | > ☑: the mapped network drive will 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 to open the menu.
2. In the Network drive to remove list, select the wanted network drive or All network drives.
3. Click the button.
   A confirmation window appears.
4. Click Yes.

To delete all saved credentials:
1. In the File Explorer window, click the to open the menu.
2. In the Network drive to remove list, select the wanted network drive and click the 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.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Up]</td>
<td>Browses the folder one step up in the folder hierarchy.</td>
</tr>
<tr>
<td>![New folder]</td>
<td>Opens a window to enter the name of the new folder.</td>
</tr>
<tr>
<td>![Rename]</td>
<td>Opens a window to enter the new name of the selected folder or file.</td>
</tr>
<tr>
<td>![Copy]</td>
<td>Copies the selected folder or file.</td>
</tr>
<tr>
<td>![Cut]</td>
<td>Cuts the selected folder or file.</td>
</tr>
<tr>
<td>![Paste]</td>
<td>Pastes the selected folder or file.</td>
</tr>
<tr>
<td>![Delete]</td>
<td>Deletes the selected folder or file.</td>
</tr>
<tr>
<td>![Refresh]</td>
<td>Refreshes the content of the displayed folder.</td>
</tr>
</tbody>
</table>
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.

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.
**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 8).

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 Ports

#### Setting the CTP10 Ethernet Port

You can remotely control the CTP10 from a computer connected to the CTP10 directly 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:*

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)

3. Connect an RJ45 cable from your computer to the CTP10 Ethernet port.

4. In the *Settings* window, clear the *Obtain an IP address automatically* check box and define a static IP address (e.g. 192.168.64.10), subnet mask (e.g. 255.255.255.0) and gateway to identify your CTP10.

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

6. On your computer:
   - Define a static IP address (e.g. 192.168.64.5, the three first number must be identical to the ones set for the CTP10), subnet mask (e.g. 255.255.255.0) and gateway to identify your computer.
   - Use the Ethernet parameters defined in the CTP10 Settings window to set the communication with your CTP10 in your application.
Remotely Controlling the CTP10
Setting the Communication Ports

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 47).
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 operating system Windows 7 to Windows 10.

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.
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 179.
   • For USB-B: see Setting the CTP10 USB-B Port on page 180.
   • For GPIB: see Setting the CTP10 GPIB Port on page 181.
3. Send a command from the remote controller. All available commands are described in IEEE 488.2 and SCPI Command Reference on page 209.

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.
Remotely Controlling the CTP10

Communication Principle

Legend
ERR: Error Queue Bit
ESB: Event Status Bit
MAV: Message Available
MSS: Master Summary Status
OSB: Operational Status Register Bit
QSB: Questionable Status Bit

Standard Event Status Register (*ESR?)
Standard Event Enable Register (*ESE?, ESE <NRf>)
Service Request Generation

Output Message Queue
Error Queue

Read by Serial Pol
Status Byte Register
Read by *STB?

Service Request Enable Register (*SRE <NRf>, *SRE?)
Operational / Questionable Status Reporting

The following diagram shows 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.

Legend
OSB: Operational Status Register Byte
QSB: Questionable Status Byte
The following table shows the content of the Operational Status Register:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>32768</td>
<td>Not used</td>
</tr>
<tr>
<td>14</td>
<td>16384</td>
<td>Not used</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>Not used</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>Not used</td>
</tr>
<tr>
<td>11</td>
<td>2048</td>
<td>Not used</td>
</tr>
<tr>
<td>10</td>
<td>1024</td>
<td>Not used</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
<td>Updating setup from Controller CTP10</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
<td>Waiting for Controller CTP10</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>Quick referencing</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>Referencing</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Armed</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>Aborting</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Analyzing</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Scanning</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Calibrating</td>
</tr>
<tr>
<td>0 (LSB)</td>
<td>1</td>
<td>Zeroing</td>
</tr>
</tbody>
</table>
SCPI Command Structure and Syntax

The information presented in this section provides an overview of SCPI programming. If you need detailed information, refer to:


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:

```
SOUR:POW[:STAT]<wsp><Boolean Program Data>
```

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| [ ]          | 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: :SENSe2: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. |
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? [ ] Short form (small words represented by the capital letters of the long form)
:syst:err? _______ Also used to separate responses when multiple queries were sent in a single program message.

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.
Remotely Controlling the CTP10

Writing Remote Control Code

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 465.

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 209.

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.
13 **Maintenance**

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, 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.

**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 43) 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 fan grid 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 43) 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.

**Before starting:**

Make sure you have a replacement filter: contact the EXFO support service (see *Contacting the Technical Support Group* on page 195).

*To replace the air filter:*

1. Turn the CTP10 off (see *Turning off the CTP10* on page 43) and unplug the power supply cable from the wall socket.
2. Lift the instrument to make visible the air filter.
3. 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.
4. Remove the dusty filter from the filter grid and replace it by the new one.
5. 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 183
- Cleaning TLS Input and Output Connectors on page 185

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 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:

  - Clean compressed air
  - Fiberscope or similar

**IMPORTANT**

Use only high quality cleaning supplies that are non-abrasive and leave no residue.
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 Optical 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.

![Fuse holder](image)

3. Check and replace the fuses if necessary.
4. Insert the new fuse into the fuse holder.

![Fuse](image)

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 43).
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

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 interval of this particular EXFO unit.

Under normal use, the recommended interval for your SCAN SYNC module is: 1 year.

For newly delivered units, EXFO has determined that the storage of this product for up to 3 months between calibration and shipment does not affect its performance.

To ensure that your unit conforms to the published specifications, calibration may be carried out at an EXFO service center or, depending on the product, at one of EXFO’s certified service centers. Calibrations at EXFO are performed using standards traceable to national metrology institutes.

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.
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.

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Possible cause</th>
<th>Possible resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The CTP10 is stuck at &quot;Initializing Hardware&quot; or &quot;Loading&quot;.</td>
<td>The CTP10 cannot load the user configuration.</td>
<td>See Restoring Factory Settings at Startup on page 190</td>
</tr>
<tr>
<td>The GUI is frozen.</td>
<td>The system has encountered a problem.</td>
<td>See Forcing the CTP10 to Shutdown &amp; Restart on page 191.</td>
</tr>
<tr>
<td>A part of the GUI window is not visible on screen.</td>
<td>Your screen resolution is too low for the CTP10 GUI.</td>
<td>See Changing Your Screen Resolution on page 191.</td>
</tr>
<tr>
<td></td>
<td>The highest possible resolution of your screen is too low to display the CTP10 GUI.</td>
<td>Use a screen with a better resolution. The recommended screen resolution for the CTP10 GUI is given in Technical Specifications on page 3.</td>
</tr>
<tr>
<td>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 &amp; Lasers window.</td>
<td>The module has not been fully initialized at startup.</td>
<td>Remove the module from the CTP10 mainframe (see Removing a Module From the CTP10 Mainframe on page 32) and insert it again (see Installing a Module Into the CTP10 Mainframe on page 30).</td>
</tr>
<tr>
<td>After the correction of a mismatch between the physical connection to a laser electrical trigger (8164A or 8134B) and the subsystem setup corresponding link, the Scan button does not work.</td>
<td>A trigger connection problem occurred.</td>
<td>1. From the CTP10 Modules &amp; Lasers window, close the connection to the laser.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. On the laser, perform a Preset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. From the CTP10 Modules &amp; Lasers pane, open the connection to the laser.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. In the Subsystem window, click the Scan button.</td>
</tr>
<tr>
<td>No trace appear on the graph after the start of a scan using a laser with an electrical sampling trigger.</td>
<td>The CTP10 does not receive the expected trigger on the selected TRIG IN port</td>
<td>➤ In the Subsystem setup window, verify that the laser is linked to the TRIG IN port number to which it is physically connected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➤ On your laser, verify that the electrical trigger is in correct operating condition.</td>
</tr>
</tbody>
</table>
**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 39.

**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 43.
   
   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 39.

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 43.

**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 8).
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 192
- Performing a Self-test on page 192
- Displaying the List of Errors and Warnings on page 193

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 195).

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 195).

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.

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.
Warranty

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 200). 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 200).
EXFO Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center
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

EXFO Europe Service Center
Winchester House, School Lane
Chandlers Ford, Hampshire S053 4DG
ENGLAND
Tel.: +44 2380 246800
Fax: +44 2380 246801
support.europe@exfo.com

EXFO Telecom Equipment (Shenzhen) Ltd.
3rd Floor, Building C,
FuNing Hi-Tech Industrial Park, No. 71-3,
Xintian Avenue,
Fuhai, Bao‘An District,
Shenzhen, China, 518103
Tel: +86 (755) 2955 3100
Fax: +86 (755) 2955 3101
support.asia@exfo.com

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:
IEEE 488.2 and SCPI Command Reference

This section presents detailed information about the command and queries supplied with your CTP10.

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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CLS</td>
<td>Clear status command</td>
<td>*CLS on page 209</td>
</tr>
<tr>
<td>*ESE</td>
<td>Standard event status enable command</td>
<td>*ESE on page 210</td>
</tr>
<tr>
<td>*ESE?</td>
<td>Standard event status enable query</td>
<td>*ESE? on page 211</td>
</tr>
<tr>
<td>*ESR?</td>
<td>Standard event status register query</td>
<td>*ESR? on page 212</td>
</tr>
<tr>
<td>*IDN?</td>
<td>Identification query</td>
<td>*IDN? on page 213</td>
</tr>
<tr>
<td>*OPC</td>
<td>Operation complete command</td>
<td>*OPC on page 214</td>
</tr>
<tr>
<td>*OPC?</td>
<td>Operation complete query</td>
<td>*OPC? on page 214</td>
</tr>
<tr>
<td>*RST</td>
<td>Reset command</td>
<td>*RST on page 215</td>
</tr>
<tr>
<td>*SRE</td>
<td>Service request enable command</td>
<td>*SRE on page 216</td>
</tr>
<tr>
<td>*SRE?</td>
<td>Service request enable query</td>
<td>*SRE? on page 217</td>
</tr>
<tr>
<td>*STB?</td>
<td>Read status byte query</td>
<td>*STB? on page 218</td>
</tr>
<tr>
<td>*TST?</td>
<td>Self-test query</td>
<td>*TST? on page 219</td>
</tr>
<tr>
<td>*WAI</td>
<td>Wait for pending operations to be completed</td>
<td>*WAI on page 219</td>
</tr>
</tbody>
</table>

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.
IEEE 488.2 and SCPI Command Reference

IEEE 488.2 Commands

**ESE**

**Description**

The *ESE command sets the Standard Event Status Enable Register bits, as defined in the table below. This register contains a mask value for the bits to be enabled in the Standard Event Status Register.

**Type**

Overlapping.

**Syntax**

*CSE*<wsp>*<register value>*

**Parameter(s)**

*register value:*

The *<register value>*<wsp>, expressed in base 2 (binary), represents the bit values of the Standard Event Status Enable Register, in the range of 0 through 255.

The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PON</td>
<td>128</td>
<td>Power ON Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>64</td>
<td>Not used</td>
</tr>
<tr>
<td>CMD</td>
<td>32</td>
<td>Command Error Enable</td>
</tr>
<tr>
<td>EXE</td>
<td>16</td>
<td>Execution Error Enable</td>
</tr>
<tr>
<td>DDE</td>
<td>8</td>
<td>Device Dependent Error</td>
</tr>
<tr>
<td>QRY</td>
<td>4</td>
<td>Query Error Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>OPC</td>
<td>1</td>
<td>Operation Complete Enable</td>
</tr>
</tbody>
</table>

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?
**Description**  
The *ESE? query returns the current contents of the Standard Event Status Enable Register, as defined in the table below.

**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.

The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PON</td>
<td>128</td>
<td>Power ON Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>64</td>
<td>Not used</td>
</tr>
<tr>
<td>CMD</td>
<td>32</td>
<td>Command Error Enable</td>
</tr>
<tr>
<td>EXE</td>
<td>16</td>
<td>Execution Error Enable</td>
</tr>
<tr>
<td>DDE</td>
<td>8</td>
<td>Device Dependent Error Enable</td>
</tr>
<tr>
<td>QRY</td>
<td>4</td>
<td>Query Error Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>OPC</td>
<td>1</td>
<td>Operation Complete Enable</td>
</tr>
</tbody>
</table>

**Example(s)**  
*ESE? returns 133  
where 133 = (bit PON, bit QYE and bit OPC)

**See Also**  
*ESE  
*ESR?
The *ESR? query returns the current contents of the Standard Event Status Register, as defined in the table below. Reading the Standard Event Status Register clears it.

**Type**
Overlapping, query only.

**Syntax**
*ESR?

**Parameter(s)**
None.

**Response Syntax**
<register value>

**Response(s)**

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.

The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PON</td>
<td>128</td>
<td>Power ON Enable</td>
</tr>
<tr>
<td>N.U</td>
<td>64</td>
<td>Not used</td>
</tr>
<tr>
<td>CMD</td>
<td>32</td>
<td>CoMmanD Error Enable</td>
</tr>
<tr>
<td>EXE</td>
<td>16</td>
<td>Execution Error Enable</td>
</tr>
<tr>
<td>DDE</td>
<td>8</td>
<td>Device Dependent Error Enable</td>
</tr>
<tr>
<td>QRY</td>
<td>4</td>
<td>QueRy Error Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>OPC</td>
<td>1</td>
<td>Operation Complete Enable</td>
</tr>
</tbody>
</table>

**Example(s)**

*ESR? returns 33
where 33 = (bit CME and bit OPC)

**See Also**

*ESE
*ESE?
<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>The *IDN? query returns the unique identification of the device over the system interface.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>*IDN?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;Identification&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td><strong>Identification:</strong></td>
</tr>
<tr>
<td></td>
<td>The response is organized into four fields separated by commas.</td>
</tr>
<tr>
<td></td>
<td>The field definitions are as follows:</td>
</tr>
<tr>
<td></td>
<td>Field 1 (Manufacturer): EXFO</td>
</tr>
<tr>
<td></td>
<td>Field 2 (Model): Instrument model</td>
</tr>
<tr>
<td></td>
<td>Field 3 (Serial number): ASCII character (0 if not available)</td>
</tr>
<tr>
<td></td>
<td>Field 4 (Firmware level): ASCII character (0 if not available)</td>
</tr>
<tr>
<td></td>
<td>ASCII character 0 represents a single ASCII-encoded byte with a value of 30 (48 decimal).</td>
</tr>
<tr>
<td></td>
<td>The presence of data in all fields is mandatory. If either field 3 or 4 is not available, the</td>
</tr>
<tr>
<td></td>
<td>ASCII character 0 shall be returned for that field.</td>
</tr>
<tr>
<td></td>
<td>A field may contain any 7-bit ASCII-encoded bytes in the range of 20 through 7E (32 through 126</td>
</tr>
<tr>
<td></td>
<td>decimal) except commas (2C, 44 decimal) and semicolons (3B, 59 decimal).</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>*IDN? returns EXFO, CTP10, EO182110146, 1.0.0</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>The overall length of the *IDN? response is less than or equal to 72 characters.</td>
</tr>
</tbody>
</table>
**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

---

**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

<table>
<thead>
<tr>
<th>Description</th>
<th>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 clears the error queue, status byte and event register. The command does not affect the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➤ the state and address of the communication interfaces of the device</td>
</tr>
<tr>
<td></td>
<td>➤ the calibration data</td>
</tr>
<tr>
<td></td>
<td>➤ the module settings</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>*RST</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
</tbody>
</table>
**Description**  
The *SRE command sets the Service Request Enable Register bits, as defined in the table below.

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.

The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSB</td>
<td>128</td>
<td>Operational Status Register Bit Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>64</td>
<td>Not used</td>
</tr>
<tr>
<td>ESB</td>
<td>32</td>
<td>Event Summary Bit Enable</td>
</tr>
<tr>
<td>MAV</td>
<td>16</td>
<td>Message Available Enable</td>
</tr>
<tr>
<td>QSB</td>
<td>8</td>
<td>Questionable Status Bit Enable</td>
</tr>
<tr>
<td>ERR</td>
<td>4</td>
<td>Error Message in Queue Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>N.U.</td>
<td>1</td>
<td>Not used</td>
</tr>
</tbody>
</table>

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?
**Description**

The *SRE? query returns the current contents of the Service Request Enable Register.

The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSB</td>
<td>128</td>
<td>Operational Status Register Bit Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>64</td>
<td>Not used</td>
</tr>
<tr>
<td>ESB</td>
<td>32</td>
<td>Event Summary Bit Enable</td>
</tr>
<tr>
<td>MAV</td>
<td>16</td>
<td>Message Available Enable</td>
</tr>
<tr>
<td>QSB</td>
<td>8</td>
<td>Questionable Status Bit Enable</td>
</tr>
<tr>
<td>ERR</td>
<td>4</td>
<td>Error Message in Queue Enable</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>N.U.</td>
<td>1</td>
<td>Not used</td>
</tr>
</tbody>
</table>

**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?
IEEE 488.2 and SCPI Command Reference

IEEE 488.2 Commands

*STB?

Description
The *STB? query reads the status byte and Master Summary Status bit, as defined in the table below.

Type
Overlapping, query only.

Syntax
*STB?

Parameter(s)
None.

Response Syntax
<register value>

Response(s)

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.
The following table shows the contents of this register.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Weight</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSB</td>
<td>128</td>
<td>Not used</td>
</tr>
<tr>
<td>MSS</td>
<td>64</td>
<td>Master Summary Status</td>
</tr>
<tr>
<td>ESB</td>
<td>32</td>
<td>Event Status Byte Enable</td>
</tr>
<tr>
<td>MAV</td>
<td>16</td>
<td>Message Available Enable</td>
</tr>
<tr>
<td>QSB</td>
<td>8</td>
<td>Questionable Status Byte</td>
</tr>
<tr>
<td>ERR</td>
<td>4</td>
<td>Error Message in Queue</td>
</tr>
<tr>
<td>N.U.</td>
<td>2</td>
<td>Not used</td>
</tr>
<tr>
<td>N.U.</td>
<td>1</td>
<td>Not used</td>
</tr>
</tbody>
</table>

Example(s)
*STB? returns 68
where 68 = (bit MSS and bit ERR)

See Also
*SRE
*SRE?
### *TST?*

**Description**
The *TST?* query causes an internal 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**

**Response(s)**

- **result:**
  - The <result> value ranges from -32767 through +32767.
  - A <result> with a value of zero indicates that the self-test has been completed without errors detected.
  - A <result> with a value not equal to zero indicates that the self-test was not completed or was completed with errors detected.

**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?*
Specific Commands

Quick Reference

The table below contains a summary of the CTP10 specific commands. These commands are fully explained on the following pages.

<table>
<thead>
<tr>
<th>Command/Query category</th>
<th>Corresponding section</th>
</tr>
</thead>
<tbody>
<tr>
<td>:SYSTem</td>
<td>SYSTem Commands and Queries on page 222</td>
</tr>
<tr>
<td>:STATus</td>
<td>STATus Commands and Queries on page 225</td>
</tr>
<tr>
<td>:CTP</td>
<td>Root Layer Commands and Queries on page 228</td>
</tr>
<tr>
<td>:STOP</td>
<td>Root Layer Commands and Queries on page 228</td>
</tr>
<tr>
<td>:ABORI</td>
<td>Root Layer Commands and Queries on page 228</td>
</tr>
<tr>
<td>:CLEar</td>
<td>Root Layer Commands and Queries on page 228</td>
</tr>
<tr>
<td>:INITiate</td>
<td>INITiate Commands and Queries on page 271</td>
</tr>
<tr>
<td>:REFERENCE</td>
<td>REFERENCE Commands and Queries on page 297</td>
</tr>
<tr>
<td>:TRACe</td>
<td>TRACe Commands and Queries on page 302</td>
</tr>
<tr>
<td>:MMEMory</td>
<td>MMEMory Commands and Queries on page 321</td>
</tr>
<tr>
<td>:UNIT</td>
<td>UNIT Commands and Queries on page 330</td>
</tr>
<tr>
<td>:TRIGger</td>
<td>TRIGger Commands and Queries on page 332</td>
</tr>
<tr>
<td>:DISPlay</td>
<td>DISPlay Commands and Queries on page 337</td>
</tr>
<tr>
<td>:CALCulate</td>
<td>CALCulate Commands and Queries on page 340</td>
</tr>
<tr>
<td>:CALCulate:PARameters</td>
<td>CALCulate:PARameters Commands and Queries on page 364</td>
</tr>
<tr>
<td>:CALCulate:DATA?</td>
<td>CALCulate:DATA? Queries on page 444</td>
</tr>
</tbody>
</table>

The following 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 246.
   - :CTP:RLASer[1...10]:CPARameters on page 248.
   - :CTP:RLASer[1...10]:LINK on page 250.
2. Configure laser parameters with commands :CTP:RLASER[1...10] (see p. 228).

Configure your test setup

1. Define the location and connections of your modules and lasers in the subsystem:
   - :INITiate:TLS[1...4]: (see p. 271).
   - :INITiate:FBC: (if any, see p. 271).
   - :INITiate:ILRL:TLSin (see p. 282)
   - :INITiate:SCANsync[:SENSe] (see p. 284).
2. Define the detectors connections to the DUT and the wanted traces:
   - :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:ACTIVE on page 316.

Configure the scan parameters and reference the subsystem

1. Configure the scan parameters:
   - :INITiate Commands and Queries on page 271.
   - UNIT Commands and Queries on page 330.
   - TRIGger Commands and Queries on page 332.
2. Reference the subsystem:
   - TF, BR and wavelength referencing: REFerence Commands and Queries on page 297.
   - Dark current referencing: :CTP:SENSe[1...10]:CHANnel[1...6]:ZEROing on page 234.

Test your DUT

1. Perform scan:
2. Manage traces:
   - TRACe Commands and Queries on page 302.
3. Perform analysis:
   - CALCulate Commands and Queries on page 340.
   - CALCulate-DATA? Queries on page 444.
4. Manage data files:
   - MMEMory Commands and Queries on page 321.
### SYSTem Commands and Queries

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<th>Parameter(s)</th>
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<tr>
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<td></td>
<td>see p. 223</td>
</tr>
<tr>
<td>COMMunicate GPIB [:ADDRess]</td>
<td>&lt;value&gt;</td>
<td>see p. 223</td>
</tr>
<tr>
<td></td>
<td>[:ADDRess?]</td>
<td>see p. 223</td>
</tr>
<tr>
<td>ANLG OUT[1</td>
<td>2] SOURce</td>
<td>&lt;module&gt;&lt;detector&gt;</td>
</tr>
<tr>
<td>ANLG OUT[1</td>
<td>2] SOURce?</td>
<td></td>
</tr>
</tbody>
</table>

#### :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 465.
  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 465.

**Example(s)**
SYST:ERR:NEXT? returns -222,"Data out of range"
### :SYSTem:VERSion?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the SCPI revision to which the instrument complies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:SYSTem:VERSion?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;version&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>version: The year followed by the revision number of the SCPI standard to which the instrument complies.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>SYST:VER? returns 1999.0</td>
</tr>
</tbody>
</table>

### :SYSTem:COMMunicate:GPIB[:ADDRess]

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the address of the GPIB port.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:SYSTem:COMMunicate:GPIB[:ADDRess]&lt;wsp&gt;&lt;value&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>value: Unique integer in the range 0 to 30, which sets the GPIB address of the CTP10.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>SYSTem:COMMunicate:GPIB 10</td>
</tr>
</tbody>
</table>

### :SYSTem:COMMunicate:GPIB[:ADDRess]?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the GPIB address of the CTP10.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
</tbody>
</table>
| 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:ANLG:OUT[1|2]:SOURce

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the OPM source for the given electrical analog output.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:SYSTem:ANLG:OUT[1</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>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 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.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>SYST:ANLG:OUT1:SOUR 5,2</td>
</tr>
</tbody>
</table>

### :SYSTem:ANLG:OUT[1|2]:SOURce?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the OPM source selected for the given electrical analog output.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:SYSTem:ANLG:OUT[1</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;module&gt;,&lt;detector&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>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 source is attached to the given analog output, the return value is &quot;0,0&quot;</td>
</tr>
<tr>
<td>Example(s)</td>
<td>SYST:ANLG:OUT1:SOUR? returns 5,2</td>
</tr>
</tbody>
</table>
STATus Commands and Queries

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter(s)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATus OPERation [EVENt]?</td>
<td>see p. 225</td>
<td></td>
</tr>
<tr>
<td>CONDition?</td>
<td>see p. 226</td>
<td></td>
</tr>
<tr>
<td>ENABle &lt;value&gt;</td>
<td>see p. 226</td>
<td></td>
</tr>
<tr>
<td>ENABle?</td>
<td>see p. 227</td>
<td></td>
</tr>
<tr>
<td>PRESet</td>
<td>see p. 227</td>
<td></td>
</tr>
</tbody>
</table>

: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 184.
The zero value is used to indicate the idle state.

**Example(s)**
:STAT:OPER? returns 4
where 4 = Scanning
Specific Commands

### :STATus:OPERation:CONDition?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the value of the Operational Status Condition Register for the current subsystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:STATus:OPERation:CONDition?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;value&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td><strong>value:</strong> Unique integer in the range 0 to 65535, which represents the bit values of the Operational Status Condition Register.</td>
</tr>
<tr>
<td></td>
<td>See the content of this register in <em>Operational / Questionable Status Reporting</em> on page 184.</td>
</tr>
<tr>
<td></td>
<td>The zero value is used to indicate the idle state.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>:STAT:OPER:COND? returns 4</td>
</tr>
<tr>
<td></td>
<td>where 4 = Scanning</td>
</tr>
</tbody>
</table>

### :STATus:OPERation:-enable

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the value of the Operational Status Enable Register.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:STATus:OPERation:ENABLE&lt;wsp&gt; &lt;value&gt;</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td><strong>value:</strong> Unique integer in the range 0 to 65535, which sets the value of the Operational Status Enable Register bit. Setting a bit in the register enables the corresponding bit in the Operational Status Event Register.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>:STAT:OPER:ENAB 4</td>
</tr>
<tr>
<td></td>
<td>where 4 = scanning.</td>
</tr>
<tr>
<td>Description</td>
<td>This query returns the value of the Operational Status Enable Register bits.</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:STATus:OPERation:ENABle?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>value:</td>
</tr>
<tr>
<td></td>
<td>Unique integer in the range 0 to 65535, which represents the value of the Operational Status Enable Register bit.</td>
</tr>
<tr>
<td></td>
<td>A bit set in the register enables the corresponding bit in the Operational Status Event Register.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:STAT:OPER:ENAB? returns 12</td>
</tr>
<tr>
<td></td>
<td>where 12 = scanning and analyzing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>This command clears the Event and Condition register and sets all bits of the Enable register. The command does not affect the instrument settings.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:STATus:PRESet</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:STAT:PRE</td>
</tr>
</tbody>
</table>
# Specific Commands

## Root Layer Commands and Queries

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<tr>
<td>WAVelength?</td>
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<tr>
<td>UNIT</td>
<td>X</td>
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<td>X?</td>
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<td>Y</td>
<td>&lt;unit&gt;</td>
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<tr>
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<td>&lt;offset&gt;</td>
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<td>TRIGGer</td>
<td>&lt;trigger&gt;</td>
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<td>TRIGGer?</td>
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<td>STATE?</td>
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<tr>
<td>RESULT?</td>
<td>&lt;format&gt;</td>
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<tr>
<td>FBC</td>
<td>&lt;input&gt;</td>
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<td>FBC?</td>
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<tr>
<td>TYPE</td>
<td>&lt;model&gt;</td>
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</tr>
<tr>
<td>TYPE?</td>
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</tr>
<tr>
<td>CPARameters</td>
<td>&lt;type&gt;,&lt;parameters&gt;</td>
<td>p. 248</td>
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<tr>
<td>CPARameters?</td>
<td></td>
<td>p. 249</td>
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<tr>
<td>LINK</td>
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<td>LINK?</td>
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<tr>
<td>LOCK</td>
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<tr>
<td>LOCK?</td>
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</tr>
<tr>
<td>POWer</td>
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<td>p. 252</td>
</tr>
<tr>
<td>POWer?</td>
<td></td>
<td>p. 252</td>
</tr>
<tr>
<td>STATE</td>
<td>&lt;state&gt;</td>
<td>p. 253</td>
</tr>
<tr>
<td>STATE?</td>
<td></td>
<td>p. 253</td>
</tr>
<tr>
<td>UNIT</td>
<td>&lt;unit&gt;</td>
<td>p. 254</td>
</tr>
<tr>
<td>UNIT?</td>
<td></td>
<td>p. 254</td>
</tr>
<tr>
<td>WAVelength</td>
<td>&lt;value&gt;[&lt;unit&gt;]</td>
<td>p. 255</td>
</tr>
<tr>
<td>Command</td>
<td>Parameter(s)</td>
<td>Section</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>WAVelength?</td>
<td></td>
<td>see p. 255</td>
</tr>
<tr>
<td>SPEeed</td>
<td>&lt;speed&gt;</td>
<td>see p. 256</td>
</tr>
<tr>
<td>SPEeed?</td>
<td></td>
<td>see p. 256</td>
</tr>
<tr>
<td>ACTRL</td>
<td>&lt;state&gt;</td>
<td>see p. 257</td>
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<tr>
<td>ACTRL?</td>
<td></td>
<td>see p. 257</td>
</tr>
<tr>
<td>BSUPPR</td>
<td>&lt;state&gt;</td>
<td>see p. 258</td>
</tr>
<tr>
<td>BSUPPR?</td>
<td></td>
<td>see p. 258</td>
</tr>
<tr>
<td>COHEZeence</td>
<td>&lt;state&gt;</td>
<td>see p. 259</td>
</tr>
<tr>
<td>COHEZeence?</td>
<td></td>
<td>see p. 259</td>
</tr>
<tr>
<td>FUNCTION STASe</td>
<td>[function],&lt;state&gt;</td>
<td>see p. 260</td>
</tr>
<tr>
<td>PARameter STAbility</td>
<td>&lt;total time&gt;,&lt;period time&gt;,&lt;averaging time&gt;[&lt;unit&gt;],&lt;wavelength/frequency&gt;[&lt;unit&gt;]</td>
<td>see p. 261</td>
</tr>
<tr>
<td>STAbility?</td>
<td></td>
<td>see p. 262</td>
</tr>
<tr>
<td>LOGGing</td>
<td>&lt;points&gt;,&lt;averaging time&gt;[&lt;unit&gt;],&lt;wavelength/frequency&gt;[&lt;unit&gt;]</td>
<td>see p. 263</td>
</tr>
<tr>
<td>LOGGing?</td>
<td></td>
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</tr>
<tr>
<td>LSHARing CPORt</td>
<td>&lt;port&gt;</td>
<td>see p. 265</td>
</tr>
<tr>
<td>CPORt</td>
<td>[MIN</td>
<td>MAX]</td>
</tr>
<tr>
<td>DPORt</td>
<td>&lt;port&gt;</td>
<td>see p. 266</td>
</tr>
<tr>
<td>DPORt?</td>
<td>[MIN</td>
<td>MAX]</td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>STATias?</td>
<td></td>
<td>see p. 267</td>
</tr>
<tr>
<td>ID[1...7] CPARameters</td>
<td>&lt;IP address&gt;:&lt;Distributed port&gt;</td>
<td>see p. 268</td>
</tr>
<tr>
<td>CPARameters?</td>
<td></td>
<td>see p. 268</td>
</tr>
<tr>
<td>LINK</td>
<td>&lt;connection state&gt;</td>
<td>see p. 269</td>
</tr>
<tr>
<td>LINK?</td>
<td></td>
<td>see p. 269</td>
</tr>
<tr>
<td>STOP</td>
<td></td>
<td>see p. 270</td>
</tr>
<tr>
<td>ABORt</td>
<td></td>
<td>see p. 270</td>
</tr>
<tr>
<td>CLEar</td>
<td></td>
<td>see p. 270</td>
</tr>
</tbody>
</table>

➤ In CTP:SENSe[1...10]:CHANnel[1...6]:

➤ [1...10] designates the module identification number, which is the position of the module in the mainframe from left to right.

➤ [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 246 (in the GUI, it corresponds to the position of the laser in the Modules & Lasers window from left to right).
### :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:SENSe[1...10]:IDN?

**Description**
This query returns the identification of the module.

**Type**
Overlapping, query only.

**Syntax**
:CTP:SENSe[1...10]: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]:OPTion?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the option of the module.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:SENSe[1...10]:OPTion?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;option&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>option:</td>
</tr>
<tr>
<td></td>
<td>String corresponding to the module option.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:SENSe[1...10]:OPT? returns SC (SC type FOA)</td>
</tr>
</tbody>
</table>

### :CTP:SENSe[1...10]:TYPE?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the module type.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:SENSe[1...10]:TYPE?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;type&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>type:</td>
</tr>
<tr>
<td></td>
<td>Integer corresponding to the module type.</td>
</tr>
<tr>
<td></td>
<td>0: no module in the slot.</td>
</tr>
<tr>
<td></td>
<td>1: OPM2 module.</td>
</tr>
<tr>
<td></td>
<td>2: OPM4 module.</td>
</tr>
<tr>
<td></td>
<td>3: OPM6 module.</td>
</tr>
<tr>
<td></td>
<td>4: IL RL OPM2 module.</td>
</tr>
<tr>
<td></td>
<td>5: reserved for future use.</td>
</tr>
<tr>
<td></td>
<td>6: SCAN SYNC module.</td>
</tr>
<tr>
<td></td>
<td>7: FBC module.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:SENSe9:TYPE? returns 2 (OPM4 module)</td>
</tr>
</tbody>
</table>
**:CTP:SENSe[1...10]: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 71).

**Type**
Sequential, no query.

**Syntax**
:CTP:SENSe[1...10]:RST

**Parameter(s)**
None.

**Example(s)**
:CTP:SENS8:RST

**:CTP:SENSe[1...10]:TST?**

**Description**
This query performs the module self-test and returns the test result.

**Type**
Sequential.

**Syntax**
:CTP:SENSe[1...10]:TST?

**Parameter(s)**
None.

**Response Syntax**

\[<\text{result}>\]

**Response(s)**

result:
Result of the self-test. The allowed values are:
0: no error was found.
<error code>: an error occurred, see the error code meaning in section *SCPI-Based Errors* on page 465.

**Example(s)**

:CTP:SENS8:TST? returns 0
(self-test was completed with success)
### :CTP:SENSe[1...10]:CHANnel[1...6]:POWer?

**Description**: This query returns the power measured on the given detector.

**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 IL RL OPM2 modules, 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.

**Example(s)**:  
>:CTP:SENS2:CHAN2:POW? returns -3.1
### `:CTP:SENSe[1...10]:CHANnel[1...6]:ZEROing`

**Description**  
This command performs a dark current zeroing on the given detector.

**Type**  
Sequential if the detector is scanning, overlapping if the detector is not scanning.

**Syntax**  
`:CTP:SENSe[1...10]:CHANnel[1...6]:ZEROing`

**Parameter(s)**  
None.

**Example(s)**  
`:CTP:SENS2:CHAN2:ZERO`

### `:CTP:SENSe[1...10]: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...10]: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...10]:CHANnel[1...6]:AVG

**Description**
This command sets the averaging time on the given detector (static control).

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**
Sequential if the detector is scanning, overlapping if the detector is not scanning.

**Syntax**
:CTP:SENSe[1...10]:CHANnel[1...6]:AVG <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**

**Response(s)**
- **value**: Averaging time applied on the detector in millisecond (ms).

**Example(s)**
:CTP:SENS6:CHAN3:AVG 0.002
: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).

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.

Type
Sequential if the detector is scanning, overlapping if the detector is not scanning.

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 330).

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)

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 237).

Example(s)
:CTP:SENS6:CHAN2:WAV 1550NM
### :CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X

**Description**
This command sets the spectral unit of the given detector.

**Type**
Sequential if the detector is scanning, overlapping if the detector is not scanning.

**Syntax**
:CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:X <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.

**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 unit of the given detector.

**Type**
Sequential if the detector is scanning, overlapping if the detector is not scanning.

**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: sets the unit to dBm.
  1 | MW: sets the unit to mW.

  The default unit is DBM.

**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**

**:CTP:SENSe[1...10]:CHANnel[1...6]:UNIT:Y? <unit>**

**Response(s)**

- *unit:*
  
  Integer corresponding to the power unit set for the detector:
  
  0: the unit is set to dBm.
  1: the unit is set to mW.

**Example(s)**
**:CTP:SENS1:CHAN2:UNIT:Y MW**

**:CTP:SENS1:CHAN2:UNIT:Y? returns 1**
### :CTP:SENSe[1...10]:CHANnel[1...6]:OFFset

**Description**  
This command sets the power offset of the given detector (static control).

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**  
Sequential if the detector is scanning, overlapping if the detector is not scanning.

**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]:FUNCtion:ACTivate

**Description**
This command sets the activation state of the logging or stability function for the given detector.

For more details on these functions, see *Triggering Power Level Data Acquisition* on page 68.

**Type**
Sequential.

**Syntax**
:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:ACTivate  
<state>

**Parameter(s)**
- **state:**
  Activation state of the 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 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 or stability function on the given detector:
  - 0: the function is disabled.
  - 1: the function is enabled.

**Example(s)**
### :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 *Triggering Power Level Data Acquisition* on page 68.

**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 260.
  - 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 260), the detectors waits for the trigger signal coming from this port to start the acquisition.

**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)**
This query returns the measurement mode in use on the given detector and the progress status of the data acquisition on the detector.

**Syntax**

:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:STATe?

**Parameter(s)**

None.

**Response Syntax**

<function>,<status>

**Response(s)**

- **function:**
  - 0: the stability function is in use on the detector.
  - 1: the 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
Specific Commands

:CTP:SENSe[1...10]:CHANnel[1...6]:FUNCtion:RESult?

Description
This query returns the results of the last 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 result 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)
returns -8.94719849E+001,-8.94894485E+001, ...
returns #280::V::q:::V::::::::V::v ::V::::::::
: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
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 267).

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
### Description
This command adds or removes the given laser and sets its model. If you connect several lasers to the CTP10, you must set the laser models one after the other, from 1 to 10 (you cannot set :CTP:RLASer2:TYPE if :CTP:RLASer1:TYPE is not set).

If you remove a laser (using the 0 parameter), all the following lasers set are shifted: for example, if you have set 4 lasers and then remove RLASer2 (:CTP:RLASer2:TYPE 0), RLASer4 becomes RLASer3 and RLASer3 becomes RLASer2.

### Applicability
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

### Type
Sequential.

### Syntax
:CTP:RLASer[1...10]:TYPE<wsp><model>

### Parameter(s)
- **model:**
  - 0: None (removes an existing laser).
  - 1: adds a Keysight 8164A laser model.
  - 2: adds a Keysight 8164B laser model.
  - 3: adds a New Focus TLB-6600 laser model.
  - 4: reserved.
  - 5: adds a T100S-HP laser model.
  - 6: adds a mSWS-A1SLS laser model.
  - 7: reserved.

### Example(s)
:CTP:RLASer2:TYPE 3
**:CTP:RLASer[1...10]:TYPE?**

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the given laser model.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicability</strong></td>
<td>In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CTP:RLASer[1...10]:TYPE?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td><code>&lt;model&gt;</code></td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td><em>model:</em> Integer corresponding to the model of the selected laser:</td>
</tr>
<tr>
<td></td>
<td>0: None.</td>
</tr>
<tr>
<td></td>
<td>1: Keysight 8164A model.</td>
</tr>
<tr>
<td></td>
<td>2: Keysight 8164B model.</td>
</tr>
<tr>
<td></td>
<td>3: New Focus TLB-6600 model.</td>
</tr>
<tr>
<td></td>
<td>4: reserved.</td>
</tr>
<tr>
<td></td>
<td>5: T100S-HP model.</td>
</tr>
<tr>
<td></td>
<td>6: mSWS-A1SLS model.</td>
</tr>
<tr>
<td></td>
<td>7: reserved.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>:CTP:RLASer2:TYPE 3</td>
</tr>
<tr>
<td></td>
<td>:CTP:RLASer2:TYPE? returns 3</td>
</tr>
</tbody>
</table>
:CTP:RLASer[1...10]:CPARameters

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the laser communication parameters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:CPARameters[type],&lt;parameters&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>type: Integer corresponding to the type of connection to the laser: 1: GPIB, 2: Ethernet, 3: USB Serial</td>
</tr>
<tr>
<td></td>
<td>parameters: Connection type specific parameters, in the following format: GPIB: &lt;GPIB Interface ID&gt;_&lt;GPIB address&gt; Ethernet: &lt;IP1.IP2.IP3.IP4&gt;:&lt;Port&gt; USB: &lt;port&gt;,&lt;speed&gt;,&lt;parity (0: none</td>
</tr>
<tr>
<td>Example(s)</td>
<td>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</td>
</tr>
</tbody>
</table>
### :CTP:RLASer[1...10]:CPARameters?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the laser communication parameters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARING:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:CPARameters?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;type&gt;,&lt;parameters&gt;</td>
</tr>
</tbody>
</table>
| Response(s)       | ➤ type:                                                                                             
<p>|                   | Integer corresponding to the connection type:                                                        |
|                   | 1: GPIB                                                                                              |
|                   | 2: Ethernet                                                                                            |
|                   | 3: USB Serial                                                                                         |
|                   | ➤ parameters:                                                                                         |
|                   | Connection type specific parameters, in the following format:                                        |
|                   | GPIB: &lt;GPIB Interface ID&gt;_&lt;GPIB address&gt;                                                              |
|                   | Ethernet: &lt;IP1.IP2.IP3.IP4&gt;:&lt;Port&gt;                                                                    |
|                   | USB: &lt;port&gt;,&lt;speed&gt;,&lt;parity (0: none | 1: odd | 2: even)&gt;,                                               |
|                   | &lt;bit stop count (1|1.5|2)&gt;,                                                                   |
|                   | &lt;flux control (0: none | 2: rts/cts | 4: dtr/dsr)&gt;                                                                                   |
| Example(s)        | :CTP:RLASer2:CPARameters 1,GPIB0_16                                                                 |
|                   | :CTP:RLASer2:CPARameters? returns 1,GPIB0_16                                                            |</p>
<table>
<thead>
<tr>
<th><strong>:CTP:RLASer[1...10]:LINK</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>:CTP:RLASer[1...10]:LINK?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### :CTP:RLASer[1...10]:LOCK

<table>
<thead>
<tr>
<th>Description</th>
<th>This command only applies to lasers equipped with the lock/unlock function. This command sets the optical output lock of the given laser (if the function is available).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:LOCK&lt;wsp&gt;&lt;state&gt;[[,&lt;password&gt;]]</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>➤ <strong>state</strong>: State of the laser optical output lock: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:RLASer2:LOCK 1,1234</td>
</tr>
</tbody>
</table>

### :CTP:RLASer[1...10]:LOCK?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the state of the optical output lock of the given laser.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:LOCK?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>➤ <strong>state</strong>: State of the laser optical output lock: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:RLASer2:LOCK 0,1234 :CTP:RLASer2:LOCK? returns 0</td>
</tr>
</tbody>
</table>
### :CTP:RLASer[1...10]:POWer

**Description**

This command sets the laser output power value.

**Applicability**

In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**

Sequential.

**Syntax**

:CTP:RLASer[1...10]:POWer<wsp><power><wsp>[<unit>]}

**Parameter(s)**

- **power:**
  Output power of the given laser as a float value.
- **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 output power value 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 267).

**Type**

Overlapping.

**Syntax**

:CTP:RLASer[1...10]:POWer?

**Parameter(s)**

None.

**Response Syntax**

<power>

**Response(s)**

- **power:**
  Output power in dBm as float value.

**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 267).

#### Type
- Sequential.

#### Syntax
- :CTP:RLASer[1...10]:POWER:STATe <state>

#### Parameter(s)
- **state**: State of the laser output power:
  - 0|OFF: disables the laser output.
  - 1|ON: enables the laser output.

#### 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 267).

#### 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]:UNIT

**Description**
This command sets the laser output power unit for static control.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Sequential.

**Syntax**
:CTP:RLASer[1...10]:UNIT <unit>

**Parameter(s)**
unit:
Power unit to use for the static control of the given laser.
The allowed values are: DBM (dBm) or MW (mW).

**Example(s)**
:CTP:RLASer2:UNIT DBM

### :CTP:RLASer[1...10]:UNIT?

**Description**
This query returns the unit defined for the output power 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 267).

**Type**
Overlapping.

**Syntax**
:CTP:RLASer[1...10]:UNIT?

**Parameter(s)**
None.

**Response Syntax**
<unit>

**Response(s)**
unit:
Power unit set for the static control of the given laser.
DBM: the unit is set to dBm.
MW: the unit is set to mW.

**Example(s)**
:CTP:RLASer2:UNIT MW
:CTP:RLASer2:UNIT? returns MW
### :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 267).

**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 current emission wavelength or frequency.

**Applicability**
In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Overlapping.

**Syntax**
:CTP:RLASer[1...10]:WAVelength?

**Parameter(s)**
None.

**Response Syntax**
<value>

**Response(s)**
- **value:**
  Current emission wavelength of the given laser in meters.

**Example(s)**
:CTP:RLASer2:WAV 1500NM
:CTP:RLASer2:WAV? returns +1.50000000E-006
**:CTP:RLASer[1...10]:SPEed**

**Description**
This command sets the laser sweep speed (static control).
The corresponding GUI setting is Speed (see Speed on page 79).

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Sequential.

**Syntax**
:CTP:RLASer[1...10]:SPE<ws><speed>

**Parameter(s)**

speed:
Sets the laser sweep speed as float value in nm/s.
- 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-A1LS: 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 17; 18; 20; 22; 25; 29; 33; 40; 50; 67; 100
- Keysight 8164A: 0.5; 5; 10; 20; 40
- Keysight 8164B: 0.5; 1; 2; 5; 10; 20; 40; 50; 80; 100; 150; 160; 200
- New Focus TLB-6600: any value in the range 5 to 1000

**Example(s)**
:CTP:RLASer2:SPE 100

**:CTP:RLASer[1...10]:SPEed?**

**Description**
This query returns the laser current sweep speed.

**Applicability**
In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Overlapping.

**Syntax**
:CTP:RLASer[1...10]:SPEed?

**Parameter(s)**
None.

**Response Syntax**

<speed>

**Response(s)**

speed:
Speed set for the given laser in nm/s as float value.

**Example(s)**
:CTP:RLASer1:SPE 100
:CTP:RLASer1:SPE? returns +1.00000000E+002
Specific Commands

:CTP:RLASer[1...10]:ACTRL

**Description**
This command only applies to T100S-HP and mSWS-A1SLS lasers. 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 79).

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**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 only applies to T100S-HP and mSWS-A1SLS lasers. This query returns the state of the "active cavity control" mode 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 267).

**Type**
Overlapping.

**Syntax**
:CTP:RLASer[1...10]:ACTRL?

**Parameter(s)**
None.

**Response Syntax**

**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

<table>
<thead>
<tr>
<th>Description</th>
<th>This command only applies to T100S-HP and mSWS-A1SLS lasers. 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 79).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:BSUPpr&lt;state&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>state: Sets the state of the backlash suppression control for the given laser. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:RLASer2:BSUP ON</td>
</tr>
</tbody>
</table>

### :CTP:RLASer[1...10]:BSUPpr?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query only applies to T100S-HP and mSWS-A1SLS lasers. This query returns the state of the backlash suppression control for the given laser.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:RLASer[1...10]:BSUPpr?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>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.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CTP:RLASer2:BSUP OFF :CTP:RLASer2:BSUP? returns 0</td>
</tr>
</tbody>
</table>
:CTP:RLASer[1...10]:COHErence

**Description**
This command only applies to T100S-HP and mSWS-A1SLS lasers. This command enables/disables the coherence control for the given laser. The corresponding GUI setting is **Coherence control** (see Coherence control on page 79).

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**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 only applies to T100S-HP and mSWS-A1SLS lasers. This query returns the state of the coherence 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 267).

**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:FUNCtion:STATE

| Description | This command starts/stops the logging or stability measurement function.  
For more details on these functions, see Triggering Power Level Data Acquisition on page 68. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:FUNCtion:STATE &lt;wsp&gt; &lt;function&gt;, &lt;state&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
</tbody>
</table>
  | 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.  
  | 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 240 is set to ACTive.  
  | For the 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 241. |
| Example(s)  | :CTP:FUNC:STATE LOGG,STAR                                                                       |
### :CTP:FUNCtion:PARameter:STABility

**Description**
This command sets the parameters for the stability function.
For more details on this function, see *Triggering Power Level Data Acquisition* on page 68.

**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) or MS (millisecond).
The default unit is microsecond (US).
- **wavelength/frequency:**
  Wavelength or frequency value of the signal received by the module input connector.
- **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)**
<table>
<thead>
<tr>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This query returns the parameters set for the stability function.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Syntax</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>:CTP:FUNCtion:PARameter:STABility?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Parameter(s)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Response Syntax</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;total time&gt;,&lt;period time&gt;,&lt;averaging time&gt;,&lt;wavelength&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Response(s)</strong></th>
</tr>
</thead>
</table>
| **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 module input connector as float value in meters. |

<table>
<thead>
<tr>
<th><strong>Example(s)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>:CTP:FUNCtion:PARameter:STABility 30,1,25us</td>
</tr>
<tr>
<td>:CTP:FUNC:PAR:STAB? returns</td>
</tr>
<tr>
<td>30.000000,1.000000,+2.50000000E-005,+1.55000000E-006</td>
</tr>
</tbody>
</table>
### :CTP:FUNCtion:PARameter:LOGGing

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the parameters for the logging function. For more details on this function, see <em>Triggering Power Level Data Acquisition</em> on page 68.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CTP:FUNCtion:PARameter:LOGGing&lt;wsp&gt;&lt;points&gt;, &lt;averaging time&gt;[&lt;unit avg&gt;], &lt;wavelength/frequency&gt;[&lt;unit wavelength/frequency&gt;]</td>
</tr>
</tbody>
</table>

#### 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) or MS (millisecond). The default unit is microsecond (US).
- **wavelength/frequency**: Wavelength or frequency value of the signal received by the module input connector.
- **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 module input connector as float value in meters.

**Example(s)**
:CTP:FUNCTION:PARAMETER:LOGGING 1000,10us,1550nm

:CTP:FUNCTION:PARAMETER:LOGGING? returns
1000,+1.00000000E-005,+1.55000000E-006
Specific Commands

: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 82.

Applicability
This command is only available if the CTP10 has not entered the laser sharing mode (response 0 to :CTP:LSHARing:STATus? on page 267).

Type
Sequential.

Syntax
:CTP:LSHARing:CPORt <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 82.

**Applicability**  This command is only available if the CTP10 has not entered the laser sharing mode (response 0 to :CTP:LSHARing:STATus? on page 267).

**Type**  Sequential.

**Syntax**  
```
:CTP:LSHARing:DPORt <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:LSHRing: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 82.

**Applicability**
This command is only available if the current CTP10 laser sharing status is Distributed (response 2 to :CTP:LSHRing:STATus? on page 267).

**Type**
Sequential.

**Syntax**
:CTP:LSHRing:CLOSE

**Parameter(s)**
None.

**Example(s)**
:CTP:LSHR:CLOSE

---

### :CTP:LSHRing:STATus?

**Description**
This query returns the laser sharing status of the current CTP10.

**Type**
Overlapping, query only.

**Syntax**
:CTP:LSHRing: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:LSHR:STAT? returns 2,172.31.5.10:5025,4
### :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 82.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARING:STATUS? on page 267).

**Type**
Sequential.

**Syntax**
:CTP:LSHARING:ID[1...7]:CPARameters

**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:LSHARING: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 267).

**Type**
Overlapping.

**Syntax**
:CTP:LSHARING:ID[1...7]:CPARameters?

**Parameter(s)**
None.

**Response Syntax**

**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 82. The connection parameters are available using the following command: :CTP:LSHARing:ID[1...7]:CPARameters? on page 268.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Sequential.

**Syntax**
:CTP:LSHARing:ID[1...7]:LINK<space><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 267).

**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|CLOSE: the connection to the given CTP10 is closed.
1|OPEN: the connection to the given CTP10 is open.

**Example(s)**
:CTP:LSHARing:ID1:LINK? returns 1
### :STOP

**Description**  
This command stops a scan that is currently in progress. The scan stops when the wavelength stop is reached. 
This command is useful when scanning in continuous mode.

**Type**  
Overlapping, no query.

**Syntax**  
:STOP

**Parameter(s)**  
None.

**Example(s)**  
:STOP

### :ABORt

**Description**  
This command immediately aborts a scan that is currently in progress.

**Type**  
Overlapping, no query.

**Syntax**  
:ABORt

**Parameter(s)**  
None.

**Example(s)**  
:ABOR

### :CLEar

**Description**  
This command definitely clears all trace content and analysis results (except Store traces).

**Type**  
Sequential, no query.

**Syntax**  
:CLEar

**Parameter(s)**  
None.

**Example(s)**  
:CLE
## INITiate Commands and Queries

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<tr>
<td>[IDENTifier]?</td>
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<tr>
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<td>&lt;start&gt;[&lt;unit&gt;]</td>
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<tr>
<td>START?</td>
<td></td>
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<tr>
<td>STOP</td>
<td>&lt;stop&gt;[&lt;unit&gt;]</td>
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<tr>
<td>STOP?</td>
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<td>SPEed?</td>
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</tr>
<tr>
<td>TRIGin?</td>
<td></td>
<td>see p. 296</td>
</tr>
</tbody>
</table>

In INITiate:TLS[1...4]:

[1...4] designates the laser in use in the subsystem (TLS1 to TLS4) to which you want to apply the command or query.
**:INITiate[:IMMediate]**

<table>
<thead>
<tr>
<th>Description</th>
<th>This command performs a scan with the current parameters. You can stop the scan with the :STOP command. You can abort the scan with the :ABORt command.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate[:IMMediate]</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT</td>
</tr>
</tbody>
</table>

**:INITiate:SMODe**

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the acquisition scanning mode. The corresponding GUI setting is Scan mode (see Scan mode on page 104).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:SMODe&lt;mode&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>mode: Scanning mode. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:SMOD SING</td>
</tr>
</tbody>
</table>

**:INITiate:SMODe?**

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the acquisition scanning mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:SMODe?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;mode&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>mode: Scanning mode: 0: single scan mode. 1: continuous scan mode.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:SMOD CONT  :INIT:SMOD? returns 1</td>
</tr>
</tbody>
</table>
Specific Commands

:INITiate:TMODe

Description
This command sets the acquisition scanning start mode.
The corresponding GUI setting is Scan start (see Scan start on page 104).

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 267).

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:SINterval

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the sweep interval for continuous scans. The corresponding GUI setting is <strong>Sweep interval</strong> (see <strong>Sweep interval</strong> on page 104).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:SINterval&lt;wsp&gt;&lt;interval&gt;[,&lt;duration&gt;]</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td><strong>interval:</strong> Activation state of the sweep interval. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:SINT ON,6.9</td>
</tr>
</tbody>
</table>

### :INITiate:SINterval?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the sweep interval set for continuous scans.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:SINterval?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;interval&gt;,&lt;duration&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td><strong>interval:</strong> 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 &lt;duration&gt; value (see below).  <strong>duration:</strong> Period of time between the beginning of two successive scans.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:SINT OFF,5.3 :INIT:SINT? returns 0,5,3</td>
</tr>
</tbody>
</table>
### :INITiate:STABilization

**Description**
This command sets the output settings of the lasers used for the scan.

**Type**
Sequential.

**Syntax**
`:INITiate:STABilization <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: 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 267).
  The corresponding GUI setting is **Keep enabled after scan stop** (see *Keep enabled after scan stop* on page 100).
- **duration**:
  Period of time during which you want the laser to stabilize before starting the acquisition, in the range 0 to 60 seconds.
  The corresponding GUI setting is **Stabilization Time** (see *Stabilization Time* on page 100).

**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: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: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: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
### Specific Commands

#### :INITiate:LASer:POWer

**Description**
This command sets the laser power for the sweep. The corresponding GUI setting is *Power* on page 102.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to *:CTP:LSHARing:STATus?* on page 267).

**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?

**Description**
This query returns the laser power 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 331).

**Example(s)**
```
:INIT:LAS:POW 1DBM
:INIT:LAS:POW? returns +1.00000000E+000
```
**:INITiate:WAVelength:STARt**

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the scan start wavelength or frequency. The corresponding GUI setting is <strong>Start</strong> (see Start/Stop on page 102). 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:WAVelength:STARt&lt;start value&gt; [&lt;unit&gt;]</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
<tr>
<td>➤ start value:</td>
<td>Scan start wavelength or frequency.</td>
</tr>
<tr>
<td>➤ unit:</td>
<td>Unit of the scan start value. The allowed units are: PM</td>
</tr>
<tr>
<td>The default unit is meter or hertz, depending on the unit setting (set with command :UNIT:X on page 330).</td>
<td></td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:WAV:STAR 1500NM</td>
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</table>

**:INITiate:WAVelength:STARt?**

<table>
<thead>
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<th>This query returns the scan start wavelength or frequency.</th>
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</thead>
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<td>Syntax</td>
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<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;start value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td></td>
</tr>
<tr>
<td>start value:</td>
<td>Scan start wavelength or frequency in meters or hertz depending on the unit setting (set with command :UNIT:X on page 330).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:WAV:STAR 1500NM</td>
</tr>
</tbody>
</table>
:INITiate:WAVelength:STOP

**Description**

This command sets the scan stop wavelength or frequency. The corresponding GUI setting is **Stop** (see **Start/Stop** on page 102).

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 267).

**Type**

Sequential.

**Syntax**

:INITiate:WAVelength:STOP <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 330).

**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 330).

**Example(s)**

:INIT:WAV:STOP 1650NM

:INIT:WAV:STOP? returns +1.65000000E-006
### :INITiate:WAVelength:SAMPling

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This command sets the scan sampling value. The corresponding GUI setting is <em>Sampling</em> on page 102.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicability</strong></td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Sequential.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:INITiate:WAVelength:SAMPling &lt;wsp&gt; &lt;sampling&gt;[PM]</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td><strong>sampling:</strong> Scan sampling value in picometer in the range 1 to 2000.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>:INIT:WAVelength:SAMPling 20PM</td>
</tr>
</tbody>
</table>

### :INITiate:WAVelength:SAMPling?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the scan sampling value.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:INITiate:WAVelength:SAMPling?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;sampling&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td><strong>sampling:</strong> Scan sampling value in meters.</td>
</tr>
</tbody>
</table>
### :INITiate:ILRL[:SENSe]

**Description**  
This command defines the slot number of the IL RL OPM2 module in use in the CTP10 mainframe and sets the optical link from the OUT TO DUT port of the IL RL OPM2 module to the input port of the DUT.

**Type**  
Sequential.

**Syntax**  
`:INITiate:ILRL[:SENSe]<wsp><slot>`

**Parameter(s)**  
- **slot:**  
  - Integer representing the position of the IL RL OPM2 module in the mainframe (from left to right), in the range 1 to 10.  
  - If no IL RL OPM2 module is in use, set 0.

**Example(s)**  
- `:INIT:ILRL:SENSe 4`

### :INITiate:ILRL[:SENSe]?

**Description**  
This query returns the slot number of the IL RL 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 module in the mainframe (from left to right), in the range 1 to 10.  
  - The query returns 0 if no IL RL OPM2 module is defined.

**Example(s)**  
- `:INIT:ILRL:SENSe 4`
- `:INIT:ILRL:SENSe? returns 4`
This command defines and sets the optical link to the laser (or FBC module) connected to the input port of the IL RL OPM2 module in use in the CTP10 mainframe.

To modify the connection of a TLS previously connected to the IL RL OPM2 module (to connect it 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.

In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Sequential.

**Syntax**

`:INITiate:ILRL:TLSIn<wsp><laser>`

**Parameter(s)**

`laser`:

Integer representing the laser or FBC output port connected to the TLS IN port of the IL RL OPM2 module, in the range 0 to 5:

- 0: no laser is connected.
- 1: laser set as TLS 1 in the subsystem (with :INITiate:TLS[1...4]/[:Identifer] on page 288).
- 2: laser set as TLS 2 in the subsystem (with :INITiate:TLS[1...4]/[:Identifer] on page 288).
- 3: laser set as TLS 3 in the subsystem (with :INITiate:TLS[1...4]/[:Identifer] on page 288).
- 4: laser set as TLS 4 in the subsystem (with :INITiate:TLS[1...4]/[:Identifer] on page 288).
- 5: output port of the FBC module (FBC OUT).

**Example(s)**

`:INIT:ILRL:TLS 4`
### :INITiate:ILRL:TLSin?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the laser (or FBC module) set as connected to the input port of the IL RL OPM2 module in use in the CTP10 mainframe.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicability</strong></td>
<td>In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to :CTP:LSHARING:STATus? on page 267).</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Sequential.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:INITiate:ILRL:TLSin?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;laser&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td></td>
</tr>
</tbody>
</table>
| laser | Integer representing the laser or FBC output port connected to the TLS IN port of the IL RL 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). |
| **Example(s)** | :INIT:ILRL:TLSin 4  
| | :INIT:ILRL:TLSin? returns 4 |
### :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 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: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 267).

**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 267).

**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 module is defined.

**Example(s)**
:INIT:FBC:SENSe 2
:INIT:FBC:SENSe? returns 2
Specific Commands

: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.

To modify the connection of a TLS previously connected to the FBC (to directly connect it to the IL RL OPM2 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 267).

**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 288).

2: laser set as TLS 2 in the subsystem (with command :INITiate:TLS[1...4][:IDentifier] on page 288).

3: laser set as TLS 3 in the subsystem (with command :INITiate:TLS[1...4][:IDentifier] on page 288).

4: laser set as TLS 4 in the subsystem (with command :INITiate:TLS[1...4][:IDentifier] on page 288).

**Example(s)**
:INIT:FBC:INP1 3
This query returns the TLS connected to the given TLS IN port of the FBC module in use in the CTP10 mainframe.

In laser sharing mode, this query is not available on Distributed CTP10s (response 2 to \texttt{:CTP:LSHARING:STATUs?} on page 267).

Sequential.

:INITiate:FBC:INPut[1...4]?

None.

\texttt{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.

:INIT:FBC:INP1 3
:INIT:FBC:INP1? returns 3
Specific Commands

:INITiate:TLS[1...4][:IDentifier]

<table>
<thead>
<tr>
<th>Description</th>
<th>This command defines the identifier of the laser to use in the subsystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARING:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:TLS[1...4][:IDentifier]&lt;wsp&gt;&lt;identifier&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>identifier: Integer representing the identifier of the laser that you want to use 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 246 (in the GUI, it corresponds to the position of the laser in the Modules &amp; Lasers window from left to right).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:TLS1:IDentifier 4</td>
</tr>
</tbody>
</table>

:INITiate:TLS[1...4][:IDentifier]?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the identifier of the selected laser in use in the subsystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
</tbody>
</table>
| 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]:WAVelength:STARt

**Description**

This command sets the sweeping start wavelength or frequency of the given laser for the scan (the overall scan range is set with commands :INITiate:WAVelength:STARt on page 278 and :INITiate:WAVelength:STOP on page 279).

The corresponding GUI setting is Low wav./freq. on page 99.

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 267).

**Type**

Sequential.

**Syntax**

:INITiate:TLS[1...4]:WAVelength:STARt<wsp><start value>[<unit>]

**Parameter(s)**

- [1...4] designates the identifier of the laser in use in the subsystem.
  - **start value:**
    - Start wavelength or frequency of the sweep part of the laser.
  - **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 330).

**Example(s)**

:INIT:TLS2:WAV:STAR 1500NM
### :INITiate:TLS[1...4]:WAVelength:STARt?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the sweeping start wavelength or frequency of the laser for the scan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:TLS[1...4]:WAVelength:STARt?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td>[1...4] designates the identifier of the laser in use in the subsystem.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;start value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>start value: Sweeping start wavelength or frequency of the laser in meters or hertz depending on the unit setting (set with command :UNIT:X on page 330).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:INIT:TLS2:WAV:STAR 1500NM</td>
</tr>
</tbody>
</table>
### :INITiate:TLS[1...4]:WAVelength:STOP

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the sweeping stop wavelength or frequency of the given laser for the scan (the overall scan range is set with commands :INITiate:WAVelength:STARt on page 278 and :INITiate:WAVelength:STOP on page 279). The corresponding GUI setting is High wav./freq. on page 99. 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:INITiate:TLS[1...4]:WAVelength:STOP &lt;stop value&gt; [ &lt;unit&gt; ]</td>
</tr>
</tbody>
</table>
| Parameter(s) | [1...4] designates the identifier of the laser in use in the subsystem.  
  ➤ stop value: Stop wavelength or frequency of the sweep part of the laser.  
  ➤ 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 330). |
| Example(s) | :INIT:TLS2:WAV:STOP 1650NM |
Specific Commands

:INITiate:TLS[1...4]:WAVelength:STOP?

**Description**
This query returns the sweeping stop wavelength or frequency of the laser for the scan.

**Type**
Overlapping.

**Syntax**
:INITiate:TLS[1...4]:WAVelength:STOP?

**Parameter(s)**
None.

[1...4] designates the identifier of the laser in use in the subsystem.

**Response Syntax**
<stop value>

**Response(s)**
*stop value:*
Sweeping stop wavelength or frequency set for the laser in meters or hertz depending on the unit settings (set with command :UNIT:X on page 330).

**Example(s)**
:INIT:TLS2:WAV:STOP 1650NM
:INIT:TLS2:WAV:STOP? returns +1.65000000E-006
Specific Commands

:INITiate:TLS[1...4]:SPEed

**Description**
This command sets the sweeping speed of the laser for the scan. The corresponding GUI setting is Speed on page 99.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**Type**
Sequential.

**Syntax**
:INITiate:TLS[1...4]:SPEed <speed>

**Parameter(s)**
[1...4] designates the identifier of the laser in use in the subsystem.

speed:
Sweeping speed of the given laser 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; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 17; 18; 20; 22; 25; 29; 33; 40; 50; 67; 100
- Keysight 8164A: 0.5; 5; 10; 20; 40
- Keysight 8164B: 0.5; 1; 2; 5; 10; 20; 40; 50; 80; 100; 150; 160; 200
- New Focus TLB-6600: any value in the range 10 to 1000

**Example(s)**
:INIT:TLS2:SPE 100

:INITiate:TLS[1...4]:SPEed?

**Description**
This query returns the sweeping speed of the laser for the scan.

**Type**
Overlapping.

**Syntax**
:INITiate:TLS[1...4]:SPEed?

**Parameter(s)**
None.

1...4 designates the identifier of the laser in use in the subsystem.

**Response Syntax**
<speed>

**Response(s)**

speed:
Sweeping speed of the given laser in nm/s.

**Example(s)**
:INIT:TLS2:SPE 100
:INIT:TLS2:SPE? returns 100
**:INITiate:TLS[1...4]:AVG**

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the averaging time of the sweep part defined for the given laser. The corresponding GUI setting is <em>Averaging Time</em> on page 99.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to <em>:CTP:LSHARing:STATus?</em> on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td><code>:INITiate:TLS[1...4]:AVG&lt;wsp&gt;&lt;mode&gt;[,&lt;value&gt;[&lt;unit&gt;]]</code></td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
<tr>
<td>➤ mode:</td>
<td>Averaging time mode for the given laser. The allowed values are: 0</td>
</tr>
<tr>
<td>➤ value:</td>
<td>Averaging time value between 1μs and 1s as float value.</td>
</tr>
<tr>
<td>➤ unit:</td>
<td>Unit of the sweeping start value. The allowed values are: US (microsecond) or MS (millisecond). The default unit is microsecond.</td>
</tr>
<tr>
<td>Example(s)</td>
<td><code>:INIT:TLS1:AVG 0,100MS</code></td>
</tr>
</tbody>
</table>
**Description**
This query returns the averaging time mode and value of the sweep part defined for the given laser.

**Type**
Overlapping.

**Syntax**
:INITiate:TLS[1...4]:AVG?

**Parameter(s)**
None.

[1...4] designates the identifier of the laser in use in the subsystem.

**Response Syntax**
<mode>,<value>

**Response(s)**

- **mode:**
  - Averaging time mode for the given laser:
  - 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
**Description**
This command sets the electrical trigger input to use for the given laser.

**Applicability**
In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to ":CTP:LSHARing:STATus?" on page 267).

**Type**
Sequential.

**Syntax**
`:INITiate:TLS[1...4]:TRIGin <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`

---

**Description**
This query returns the electrical trigger input used for the given laser.

**Type**
Overlapping.

**Syntax**
`:INITiate:TLS[1...4]:TRIGin?`

**Parameter(s)**
None.

**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`
REFerence Commands and Queries

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<th>Section</th>
</tr>
</thead>
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<td>see p. 297</td>
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<tr>
<td>REFerence SENSE[1...10] CHANnel[1...6] INIT?</td>
<td>RESULT?</td>
<td>see p. 298</td>
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<tr>
<td>CLEAR</td>
<td></td>
<td>see p. 298</td>
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<td>QUICK SENSE[1...10] CHANnel[1...6] INIT</td>
<td>RESULT?</td>
<td>see p. 299</td>
</tr>
<tr>
<td>CLEAR</td>
<td></td>
<td>see p. 299</td>
</tr>
<tr>
<td>WAVelength SENSE[1...10] CHANnel[1...6] INIT &lt;gas cell&gt;</td>
<td>RESULT?</td>
<td>see p. 300</td>
</tr>
<tr>
<td>WAVelength SENSE[1...10] CHANnel[1...6] INIT &lt;gas cell&gt;</td>
<td>RESULT?</td>
<td>see p. 300</td>
</tr>
</tbody>
</table>

In REFerence:SENSe[1...10]:CHANnel[1...6]:

- [1...10] designates the module identification number, which is the position of the module in the mainframe from left to right.
- [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.

:REFerence:SENSe[1...10]: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 105.

**Type**
Sequential, no query.

**Syntax**
:REFerence:SENSe[1...10]:CHANnel[1...6]:INIT

**Parameter(s)**
None.

**Example(s)**
:REFerence:SENSe5:CHANnel1:INIT
:REFerence:SENSe[1...10]:CHANnel[1...6]:RESult?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the result of the referencing operation on the given detector.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:REFerence:SENSe[1...10]:CHANnel[1...6]:RESult?</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;,&lt;date&gt;,&lt;time&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>➤ state:</td>
</tr>
<tr>
<td></td>
<td>Result of the referencing operation on the detector:</td>
</tr>
<tr>
<td></td>
<td>0: there is no valid reference.</td>
</tr>
<tr>
<td></td>
<td>1: the reference is valid.</td>
</tr>
<tr>
<td></td>
<td>➤ date:</td>
</tr>
<tr>
<td></td>
<td>If the state is equal to 1: date of the referencing operation in YYYYMMDD format.</td>
</tr>
<tr>
<td></td>
<td>If the state is equal to 0: no value.</td>
</tr>
<tr>
<td></td>
<td>➤ time:</td>
</tr>
<tr>
<td></td>
<td>If the state is equal to 1: time of the referencing operation in HHMMSS format.</td>
</tr>
<tr>
<td></td>
<td>If the state is equal to 0: no value.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:REFerence:SEN5:CHAN1:RESULT? returns 1,20181024,173427</td>
</tr>
<tr>
<td></td>
<td>:REFerence:SEN5:CHAN1:RESULT? returns 0,,</td>
</tr>
</tbody>
</table>

:REFerence:CLEAR

<table>
<thead>
<tr>
<th>Description</th>
<th>This command clears all the references of the subsystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:REFerence:CLEAR</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:REF:CLEAR</td>
</tr>
</tbody>
</table>
### :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 105.

**Type**
Sequential, no query.

**Syntax**
:REFerence:QUICk:SENSe[1...10]:CHANnel[1...6]:INIT

**Parameter(s)**
None.

**Example(s)**
:REF:QUIC:SENS5:CHAN1:INIT

### :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:CLEAR

<table>
<thead>
<tr>
<th>Description</th>
<th>This command clears the quick reference of the subsystem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:REFerence:QUICK:CLEAR</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:REFerence:QUICK:CLEAR</td>
</tr>
</tbody>
</table>

### :REFerence:WAVelength:SENSe[1...10]:CHANnel[1...6]:INIT

<table>
<thead>
<tr>
<th>Description</th>
<th>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 detector. For more details on the wavelength referencing operation, see Performing Wavelength Referencing on page 109.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:REFerence:WAVelength:SENSe[1...10]:CHANnel[1...6]:INIT &lt;gas cell&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>gas cell:</td>
</tr>
<tr>
<td></td>
<td>Type of the connected gas cell:</td>
</tr>
<tr>
<td></td>
<td>1: Acetylene C2H2 50 Torr</td>
</tr>
<tr>
<td></td>
<td>2: Acetylene C2H2 200 Torr</td>
</tr>
<tr>
<td></td>
<td>3: Hydrogen Fluoride HF</td>
</tr>
<tr>
<td></td>
<td>4: Hydrogen Cyanide HCN 25 Torr</td>
</tr>
<tr>
<td></td>
<td>5: Hydrogen Cyanide HCN 100 Torr</td>
</tr>
<tr>
<td></td>
<td>6: Carbon Monoxide 12C16O 1000 Torr</td>
</tr>
<tr>
<td></td>
<td>7: Carbon Monoxide 13C16O 1000 Torr</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:REFerence:WAVelength:SENSe5:CHANnel1:INIT 2</td>
</tr>
</tbody>
</table>
**:REference:WAVelength:RESult?**

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the result of the last wavelength referencing operation.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Sequential, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:REference:WAVelength:RESult?</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;shift&gt;,&lt;date&gt;,&lt;time&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td></td>
</tr>
</tbody>
</table>
  - **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 |
### TRACe Commands and Queries

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<th>Parameter(s)</th>
<th>Section</th>
</tr>
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<td>p. 303</td>
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<td>COLo5</td>
<td>&lt;red&gt;, &lt;green&gt;, &lt;blue&gt;</td>
<td>p. 304</td>
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<tr>
<td>WIDTH</td>
<td>&lt;thickness&gt;</td>
<td>p. 305</td>
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<tr>
<td>NOTE</td>
<td>&lt;comment&gt;</td>
<td>p. 306</td>
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<td>DATA</td>
<td>START?</td>
<td>p. 307</td>
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<tr>
<td>LENGTH?</td>
<td>p. 307</td>
<td></td>
</tr>
<tr>
<td>SAMPling?</td>
<td>p. 307</td>
<td></td>
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<td>TYPE[1...10] COLor</td>
<td>&lt;red&gt;, &lt;green&gt;, &lt;blue&gt;</td>
<td>p. 313</td>
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<td>p. 315</td>
<td></td>
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<td>ACTive</td>
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<tr>
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<td>&lt;count&gt;</td>
<td>p. 317</td>
</tr>
<tr>
<td>LIST STORe?</td>
<td>p. 319</td>
<td></td>
</tr>
<tr>
<td>SENSE?</td>
<td>p. 320</td>
<td></td>
</tr>
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</table>

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 319.

In TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:

- [1...10] designates the module identification number, which is the position of the module in the mainframe from left to right.
- [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.
[1...10] or [1...13] designates the trace type:

1: TF live
2: TF max
3: TF min
4: TF average
5: TF roll average
6: BR live (only available on IL RL OPM2 modules)
7: BR max (only available on IL RL OPM2 modules)
8: BR min (only available on IL RL OPM2 modules)
9: BR average (only available on IL RL OPM2 modules)
10: BR roll average (only available on IL RL OPM2 modules)
11: Raw Live, which is the unreferenced "TF live" trace type.
12: Raw Reference, which is the reference trace of the "TF live" trace type.
13: Raw Quick Reference, which is the quick reference trace of the "TF live" trace type.

<table>
<thead>
<tr>
<th><strong>:TRACe:STORe[1...n]:SAVE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
</tr>
</tbody>
</table>
### :TRACe:STORe[1...n]:COlor

<table>
<thead>
<tr>
<th>Description</th>
<th>This command defines the color of the given store trace in RGB format.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:STORe[1...n]:COlor &lt;wsp&gt; &lt;red&gt;, &lt;green&gt;, &lt;blue&gt;</td>
</tr>
</tbody>
</table>
| 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?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the color of the given store trace in RGB format.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:STORe[1...n]:COlor?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;red&gt;, &lt;green&gt;, &lt;blue&gt;</td>
</tr>
</tbody>
</table>
| 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                                          
<pre><code>        | :TRAC:STOR3:COL? returns 70,130,180                                |
</code></pre>
<table>
<thead>
<tr>
<th>Description</th>
<th>This command defines the thickness state of the given store trace on graph.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:STOR[1...n]:WIDth&lt;sp&gt;&lt;thickness&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>thickness: Integer corresponding to the thickness state of the trace. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:STOR3:WID 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the thickness state of the given store trace on graph.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:STOR[1...n]:WID?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;thickness&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>thickness: Integer corresponding to the thickness state of the trace: 0: the trace is normal. 1: the trace is bold.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:STOR3:WID 1</td>
</tr>
<tr>
<td></td>
<td>:TRAC:STOR3:WID? returns 1</td>
</tr>
</tbody>
</table>
### :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:N0TE 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.

**Example(s)**
:TRAC:STOR3:N0TE my comment on the trace
:TRAC:STOR3:N0TE? returns MY COMMENT ON THE TRACE
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Type</th>
<th>Syntax</th>
<th>Parameter(s)</th>
<th>Response Syntax</th>
<th>Response(s)</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>:TRACe:STORe[1...n]:DATA:STARt?</td>
<td>This query returns the start wavelength of a trace of type store.</td>
<td>Overlapping, query only.</td>
<td>:TRACe:STORe[1...n]:DATA:STARt?</td>
<td>None.</td>
<td>&lt;wavelength&gt;</td>
<td>wavelength: Trace start wavelength in meters.</td>
<td>:TRAC:STOR1:DATA:STAR? returns +1.25000000E-006</td>
</tr>
<tr>
<td>:TRACe:STORe[1...n]:DATA:LENGth?</td>
<td>This query returns the length of a store trace.</td>
<td>Sequential, query only.</td>
<td>:TRACe:STORe[1...n]:DATA:LENGth?</td>
<td>None.</td>
<td>&lt;length&gt;</td>
<td>length: Number of points in the trace.</td>
<td>:TRAC:STOR1:DATA:LENG? returns 225001</td>
</tr>
<tr>
<td>:TRACe:STORe[1...n]:DATA:SAMPling?</td>
<td>This query returns the trace sampling interval.</td>
<td>Overlapping, query only.</td>
<td>:TRACe:STORe[1...n]:DATA:SAMPling?</td>
<td>None.</td>
<td>&lt;sampling&gt;</td>
<td>sampling: Trace sampling interval in meters.</td>
<td>:TRAC:STOR1:DATA:SAMP? returns +2.00000000E-012</td>
</tr>
</tbody>
</table>
This query returns the store trace data.

This query can only be executed if the CTP10 is in idle state (:STAT:OPER:COND? returns 0).

**Type**
Sequential, query only.

**Syntax**
:TRACe:STORRe[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, 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 #1821AOEBY912LO2...
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).

Type
Sequential, no query.

Syntax
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:SAVE
<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 only.
► .csv (csv file) for all types of traces.
Default extension (if not specified): .tra

Example(s)
:TRACe:SENS1:CHAN3:TYPE2:SAVE "trace.tra"
### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA:STARt?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the start wavelength of a trace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA:STARt?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;wavelength&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>wavelength:</td>
</tr>
<tr>
<td></td>
<td>Trace start wavelength in meters.</td>
</tr>
</tbody>
</table>

### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]: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...10]:CHANnel[1...6]:TYPE[1...13]: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 |
**Description**
This query returns the trace sampling interval.

**Type**
Overlapping, query only.

**Syntax**
```
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...13]:DATA
:SAMPling?
```

**Parameter(s)**
None.

**Response Syntax**
```
<sampling>
```

**Response(s)**
```
sampling:
Trace sampling interval in meters.
```

**Example(s)**
```
returns +2.00000000E-012
```
This query returns the wanted trace data.
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...10]:CHANnel[1...6]:TYPE[1...13]:DATA[:Y][:IMMediate]?
```

**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 result 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, 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:SENS1:CHAN3:TYPE2:DATA? ASC,DB**  
  returns `-5.00000000E+000,-5.10000000E+000,...`
- **:TRAC:SENS1:CHAN3:TYPE2:DATA? BIN,RATIO**  
  returns `#1821A0E3012L0`
Specific Commands

:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:COLor

<table>
<thead>
<tr>
<th>Description</th>
<th>This command defines the color of the given trace in RGB format.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:COLor&lt;/wsp&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➢ red: Integer corresponding to the level of red in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td></td>
<td>➢ green: Integer corresponding to the level of green in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td></td>
<td>➢ blue: Integer corresponding to the level of blue in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:SENS5:CHAN3:TYPE8:COL 75,0,130</td>
</tr>
</tbody>
</table>

:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:COLor?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the color of the given trace in RGB format.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:COLor?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;red&gt;,&lt;green&gt;,&lt;blue&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>➢ red: Integer corresponding to the level of red in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td></td>
<td>➢ green: Integer corresponding to the level of green in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td></td>
<td>➢ blue: Integer corresponding to the level of blue in the trace color, in the range 0 to 255.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:SENS5:CHAN3:TYPE8:COL 75,0,130</td>
</tr>
<tr>
<td></td>
<td>:TRAC:SENS5:CHAN3:TYPE8:COL? returns 75,0,130</td>
</tr>
</tbody>
</table>
**Specific Commands**

---

### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:WIDth

**Description**
This command defines the thickness state of the given trace.

**Type**
Overlapping.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:WIDth <wsp> <thickness>

**Parameter(s)**
*thickness:*
Integer corresponding to the thickness state of the trace on graph.
The allowed values are:
- 0|NORMal: sets the trace to normal thickness.
- 1|BOLD: sets the trace to bold.

**Example(s)**
:TRAC:SENS6:CHAN4:TYPE3:WIDth 1

---

### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:WIDth?

**Description**
This query returns the thickness state of the given trace.

**Type**
Overlapping.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:WIDth?

**Parameter(s)**
None.

**Response Syntax**
<thickness>

**Response(s)**
*thickness:*
Integer corresponding to the thickness state of the trace on graph:
- 0: the trace is normal.
- 1: the trace is bold.

**Example(s)**
:TRAC:SENS6:CHAN4:TYPE3:WIDth 1
### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:NOTE

<table>
<thead>
<tr>
<th>Description</th>
<th>This command adds a comment on the given trace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:NOTE&lt;wsp&gt; &lt;comment&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>comment:</td>
</tr>
<tr>
<td></td>
<td>Comment to associate with the trace. It must be different from whitespace or empty (240 characters maximum, characters over this limit are ignored).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:SENS6:CHAN4:TYPE3:NOTE my comment on the trace</td>
</tr>
</tbody>
</table>

### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:NOTE?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the comment associated with the given trace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:NOTE?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;comment&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>comment:</td>
</tr>
<tr>
<td></td>
<td>Comment associated with the trace, in upper case.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRAC:SENS6:CHAN4:TYPE3:NOTE my comment on the trace</td>
</tr>
<tr>
<td></td>
<td>MY COMMENT ON THE TRACE</td>
</tr>
</tbody>
</table>
### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:ACTive

<table>
<thead>
<tr>
<th>Description</th>
<th>This command selects the trace type to create for the given detector and sets the optical link to the DUT output.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:ACTive&lt;wsp&gt; &lt;state&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>state:</td>
</tr>
<tr>
<td></td>
<td>Trace type selection state. The allowed values are:</td>
</tr>
<tr>
<td></td>
<td>0: clears the trace type for the given detector.</td>
</tr>
<tr>
<td></td>
<td>1: creates the given trace type for the given detector. The connection link from the DUT to the given detector is automatically configured.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRACe:SENSe1:CHANnel4:TYPE1:ACTive 1</td>
</tr>
</tbody>
</table>

### :TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:ACTive?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the state of the trace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:ACTive?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>state:</td>
</tr>
<tr>
<td></td>
<td>State of the trace:</td>
</tr>
<tr>
<td></td>
<td>0: the trace does not exist.</td>
</tr>
<tr>
<td></td>
<td>1: the trace is created.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRACe:SENSe1:CHANnel4:TYPE1:ACTive 1</td>
</tr>
<tr>
<td></td>
<td>:TRACe:SENSe3:CHANnel2:TYPE3:ACTive? returns 1</td>
</tr>
</tbody>
</table>
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE5|10:RAVG

**Description**
This command only applies to traces of type "roll average" (TYPE5 and TYPE10). It sets the number of scans to take into account for the roll averaging calculation.

**Type**
Sequential.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE5:RAVG <count>
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE10:RAVG <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...10]:CHANnel[1...6]:TYPE5|10:RAVG?

**Description**
This query only applies to traces of type "roll average" (TYPE5 and TYPE10). It returns the number of scans defined for the roll averaging calculation.

**Type**
Overlapping.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE5:RAVG?
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE10: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
Specific Commands

:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:STATe

**Description**
This command makes the trace visible/invisible on graph.

**Type**
Overlapping.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]: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...10]:CHANnel[1...6]:TYPE[1...10]:STATe?

**Description**
This query returns the visibility state of the trace.

**Type**
Overlapping.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]: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:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:DELete

**Description**
This command deletes the given trace type and all the associated analysis results.

**Type**
Sequential, no query.

**Syntax**
:TRACe:SENSe[1...10]:CHANnel[1...6]:TYPE[1...10]:DELete

**Parameter(s)**
None.

**Example(s)**
:TRACe:SENSe1:CHANnel4:TYPE5:DEL
### :TRACe:LIST:STORe?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the list of traces of type store.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:TRACe:LIST:STORe?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;list&gt;</td>
</tr>
</tbody>
</table>
| **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
<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the list of traces of type sense (all traces that are not store traces).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRACe:LIST:SENSe?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;list&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>List of traces of type sense such as: {MOD&lt;module number&gt; DET&lt;detector number&gt;&lt;trace name&gt;};</td>
</tr>
</tbody>
</table>

**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
```
MMEMory Commands and Queries

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.

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter(s)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMEMory CATalog</td>
<td>[IMMediate]?</td>
<td>see p. 322</td>
</tr>
<tr>
<td>DRIVe?</td>
<td>&lt;drive&gt;</td>
<td>see p. 323</td>
</tr>
<tr>
<td>CDRive</td>
<td></td>
<td>see p. 324</td>
</tr>
<tr>
<td>CDRive?</td>
<td></td>
<td>see p. 324</td>
</tr>
<tr>
<td>CDIRectory</td>
<td>&lt;directory&gt;</td>
<td>see p. 325</td>
</tr>
<tr>
<td>CDIRectory?</td>
<td></td>
<td>see p. 325</td>
</tr>
<tr>
<td>MDIRectory</td>
<td>&lt;directory&gt;</td>
<td>see p. 325</td>
</tr>
<tr>
<td>COPY</td>
<td>&lt;pathname1&gt;,&lt;pathname2&gt;</td>
<td>see p. 326</td>
</tr>
<tr>
<td>DELete</td>
<td>&lt;name&gt;</td>
<td>see p. 326</td>
</tr>
<tr>
<td>LOAD TRACe</td>
<td>&lt;filename&gt;</td>
<td>see p. 327</td>
</tr>
<tr>
<td>SETTings</td>
<td>&lt;filename&gt;</td>
<td>see p. 327</td>
</tr>
<tr>
<td>Default</td>
<td></td>
<td>see p. 327</td>
</tr>
<tr>
<td>STORe ARESults</td>
<td>&lt;filename&gt;</td>
<td>see p. 328</td>
</tr>
<tr>
<td>SETTings</td>
<td>&lt;filename&gt;</td>
<td>see p. 328</td>
</tr>
<tr>
<td>SCREenshot</td>
<td>&lt;filename&gt;</td>
<td>see p. 329</td>
</tr>
</tbody>
</table>
### :MMEMory:CATalog[:IMMediate]?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the state of the current directory or drive and the list of files and folders that it contains.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:MMEMory:CATalog[:IMMediate]?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;pathname&gt;,&lt;free space&gt;,&lt;occupied space&gt;,&lt;number of folders&gt;,&lt;number of files&gt;,{&lt;folder name&gt;,DIR,-}, {&lt;file name&gt;,&lt;file type&gt;,&lt;file size&gt;}</td>
</tr>
<tr>
<td>Response(s)</td>
<td><strong>pathname:</strong> Name of the current directory or drive.</td>
</tr>
<tr>
<td></td>
<td><strong>free space:</strong> Directory memory size available on the drive in MB (1,048576 bytes).</td>
</tr>
<tr>
<td></td>
<td><strong>occupied space:</strong> Memory size occupied by the files under the current directory in MB (1,048576 bytes).</td>
</tr>
<tr>
<td></td>
<td><strong>number of folders:</strong> Number of folders contained in the current directory.</td>
</tr>
<tr>
<td></td>
<td><strong>number of files:</strong> Number of folders contained in the current directory.</td>
</tr>
<tr>
<td></td>
<td><strong>folder name:</strong> Name of a folder contained in the current directory or drive.</td>
</tr>
<tr>
<td></td>
<td><strong>file name:</strong> Name of a file in the current directory or drive.</td>
</tr>
<tr>
<td></td>
<td><strong>file type:</strong> Filename extension.</td>
</tr>
<tr>
<td></td>
<td><strong>file size:</strong> File size in KB (1,024 bytes).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>MMEM:CAT? returns</td>
</tr>
<tr>
<td></td>
<td>E:\SWEEPRESULT,+2.535152E+003, +1.302739E+001,12,46,</td>
</tr>
<tr>
<td></td>
<td>TRACE1, csv , +2.14015000E+002 , ...</td>
</tr>
</tbody>
</table>
### :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:CDRive

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the current drive letter.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:MMEMory:CDRive&lt;br&gt;<code>&lt;wsp&gt;</code>&lt;drive&gt;</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>drive: &lt;br&gt;Letter of the drive that you want to set as current.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>MMEM:CDR &quot;E:&quot;</td>
</tr>
</tbody>
</table>

### :MMEMory:CDRive?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the current drive letter.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:MMEMory:CDRive?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None. &lt;br&gt;</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;drive&gt; &lt;br&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td>drive: &lt;br&gt;Drive letter.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>MMEM:CDR &quot;E:&quot; &lt;br&gt;MMEM:CDR? returns E: &lt;br&gt;where E: is the current drive.</td>
</tr>
</tbody>
</table>
### :MMEMory:CDIRectory

**Description**
This command sets the current directory pathname.

**Type**
Overlapping.

**Syntax**
:MMEMory:CDIRectory <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:MDIRectory

**Description**
This command creates a new directory in the current drive or directory.

**Type**
Overlapping, no query.

**Syntax**
:MMEMory:MDIRectory <directory>

**Parameter(s)**
- `directory`:
  Directory name that you want to create.

**Example(s)**
- MMEM:MDIR "SAMPLE1\"
### :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: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**
Overlapping, no query.

**Syntax**
:MMEMory:LOAD:TRACe <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: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**
Sequential, no query.

**Syntax**
:MMEMory:LOAD:SETTings <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 328).

**Example(s)**
MMEM:LOAD:SETT "subsystemSettings.CTP10"

### :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 328).

**Type**
Sequential, no query.

**Syntax**
:MMEMory:LOAD:DEFault

**Parameter(s)**
- None.

**Example(s)**
MMEM:LOAD:DEF
### :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 <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: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**
Sequential, no query.

**Syntax**
:MMEMory:STORe:SETTings <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"
### :MMEMory:STORe:SCREenshot

<table>
<thead>
<tr>
<th>Description</th>
<th>This command captures and saves a screenshot of the subsystem window to a specific file in the current directory.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:MMEMory:STORe:SCREenshot&lt;sp&gt;&lt;filename&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>filename:</td>
</tr>
<tr>
<td></td>
<td>Name of the file to which you want to save the screenshot in *.jpg or *.png format.</td>
</tr>
<tr>
<td></td>
<td>Default file extension, if not specified: .jpg</td>
</tr>
<tr>
<td>Example(s)</td>
<td>MMEM:STOR:SCRE &quot;Subsystem Screenshot.jpg&quot;</td>
</tr>
</tbody>
</table>
**UNIT Commands and Queries**

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter(s)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT X</td>
<td>&lt;unit&gt;</td>
<td>see p. 330</td>
</tr>
<tr>
<td>X?</td>
<td></td>
<td>see p. 330</td>
</tr>
<tr>
<td>Y</td>
<td>&lt;unit&gt;</td>
<td>see p. 331</td>
</tr>
<tr>
<td>Y?</td>
<td></td>
<td>see p. 331</td>
</tr>
</tbody>
</table>

### :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 267).

**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 267).

**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`
### TRIGger Commands and Queries

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter(s)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIGger IN</td>
<td>[INPUT]</td>
<td>&lt;input&gt;</td>
</tr>
<tr>
<td>[INPUT]?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLOPe</td>
<td>&lt;slope&gt;</td>
<td></td>
</tr>
<tr>
<td>SLOPe?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O/U</td>
<td>[OUTPut]</td>
<td>&lt;output&gt;</td>
</tr>
<tr>
<td>[OUTPut]?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVerted</td>
<td>&lt;state&gt;</td>
<td></td>
</tr>
<tr>
<td>INVerted?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**: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 104).

**Applicability**

In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).

**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`
<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the input trigger used for the triggered optical acquisition.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:TRIGger:IN[:INPUT]?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;input&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td><em>input</em>:</td>
</tr>
<tr>
<td></td>
<td>TRIG IN port number that provides the trigger signal for the optical acquisition.</td>
</tr>
<tr>
<td></td>
<td>0 means that no TRIG IN port is selected.</td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
<td>:TRIG:IN 1</td>
</tr>
<tr>
<td></td>
<td>:TRIG:IN? returns 1</td>
</tr>
</tbody>
</table>
**:TRIGger:IN:SLOPe**

<table>
<thead>
<tr>
<th>Description</th>
<th>This command defines the slope of the signal that triggers the scan. The corresponding GUI setting is Slope (see Scan start on page 104).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>In laser sharing mode, this command is not available on Distributed CTP10s (response 2 to :CTP:LSHARing:STATus? on page 267).</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRIGger:IN:SLOPe&lt;wsp&gt;&lt;slope&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>slope: Slope of the signal that triggers the scan. The allowed values are: POSitive</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRIG:IN:SLOP 0</td>
</tr>
</tbody>
</table>

**:TRIGger:IN:SLOPe?**

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the slope of the signal that triggers the scan.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRIGger:IN:SLOPe?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;slope&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>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.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRIG:IN:SLOP NEG :TRIG:IN:SLOP? returns 01</td>
</tr>
</tbody>
</table>
### :TRIGger:OUT[:OUTPut]

**Description**
This command defines the output trigger to use.
The corresponding GUI setting is **Destination** (see *Scan trigger output* on page 104).

**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

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the state of the inverted logic of the output trigger signal. The corresponding GUI setting is <strong>Inverted logic</strong> (see <em>Scan trigger output</em> on page 104).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRIGger:OUT:INVerted&lt;wsp&gt;&lt;state&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>state:</td>
</tr>
<tr>
<td></td>
<td>State of the inverted logic setting for the output trigger. The allowed values are:</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>ON</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRIG:OUT:INV ON</td>
</tr>
</tbody>
</table>

### :TRIGger:OUT:INVerted?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the state of the inverted logic of the output trigger signal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:TRIGger:OUT:INVerted?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>state:</td>
</tr>
<tr>
<td></td>
<td>State of the <strong>Inverted logic</strong> setting for the output trigger:</td>
</tr>
<tr>
<td></td>
<td>0: the CTP10 outputs a high level signal during the time of the scan.</td>
</tr>
<tr>
<td></td>
<td>1: the CTP10 outputs a low level signal during the time of the scan.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:TRIG:OUT:INVerted ON</td>
</tr>
<tr>
<td></td>
<td>:TRIG:OUT:INVerted? returns 1</td>
</tr>
<tr>
<td>Command</td>
<td>Parameter(s)</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>DISPLAY</td>
<td>FOCUS</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>FOCUS?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DISPLAY Commands and Queries

- DISPLAY FOCUS

- FOCUS?

See p. 338

See p. 339
### :DISP:FOCUS

<table>
<thead>
<tr>
<th>Description</th>
<th>This command selects a trace for auto-scale, zooming operations and marker measurements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:DISP:FOCUS &lt;wsp&gt; &lt;category&gt;, &lt;trace&gt;, &lt;channel&gt;, &lt;type&gt;</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➤ <em>category:</em> Category of the trace to select:</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>➤ <em>trace:</em> 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 n. To know the store trace identifier, use the command :TRACe:LIST:STORe? on page 319.</td>
</tr>
<tr>
<td></td>
<td>➤ <em>channel:</em> 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.</td>
</tr>
<tr>
<td></td>
<td>➤ <em>type:</em> For SENse traces only: integer corresponding to the trace type, in the range 1 to 10:</td>
</tr>
<tr>
<td></td>
<td>1: TF live</td>
</tr>
<tr>
<td></td>
<td>2: TF max</td>
</tr>
<tr>
<td></td>
<td>3: TF min</td>
</tr>
<tr>
<td></td>
<td>4: TF average</td>
</tr>
<tr>
<td></td>
<td>5: TF roll average</td>
</tr>
<tr>
<td></td>
<td>6: BR live (only available on IL RL OPM2 modules)</td>
</tr>
<tr>
<td></td>
<td>7: BR max (only available on IL RL OPM2 modules)</td>
</tr>
<tr>
<td></td>
<td>8: BR min (only available on IL RL OPM2 modules)</td>
</tr>
<tr>
<td></td>
<td>9: BR average (only available on IL RL OPM2 modules)</td>
</tr>
<tr>
<td></td>
<td>10: BR roll average (only available on IL RL OPM2 modules)</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:DISP:FOCUS 1,2,5,3</td>
</tr>
</tbody>
</table>
### :DISPlay:FOCUS?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the selected trace.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:DISPlay:FOCUS?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td><code>&lt;category&gt;,&lt;trace&gt;,&lt;channel&gt;,&lt;type&gt;</code></td>
</tr>
</tbody>
</table>
| **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.  
For STORe traces: integer corresponding to the store trace identifier, in the range 1 to n. To know the store trace identifier, use the command :TRACe:LIST:STORe? on page 319.  
➤ *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:  
1: TF live  
2: TF max  
3: TF min  
4: TF average  
5: TF roll average  
6: BR live (only available on IL RL OPM2 modules)  
7: BR max (only available on IL RL OPM2 modules)  
8: BR min (only available on IL RL OPM2 modules)  
9: BR average (only available on IL RL OPM2 modules)  
10: BR roll average (only available on IL RL OPM2 modules)  

| **Example(s)** | :DISP:FOCUS 2,15,0,0  
:DISP:FOCUS? returns 2,15,0,0 |
### CALCulate Commands and Queries

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter(s)</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALCulate [:IMMediate]</td>
<td></td>
<td>see p. 341</td>
</tr>
<tr>
<td>AUTO</td>
<td>&lt;state&gt;</td>
<td>see p. 341</td>
</tr>
<tr>
<td>AUTO?</td>
<td></td>
<td>see p. 342</td>
</tr>
<tr>
<td>SOURce</td>
<td>&lt;category&gt;,&lt;trace&gt;,&lt;channel&gt;,&lt;type&gt;</td>
<td>see p. 343</td>
</tr>
<tr>
<td>SOURce?</td>
<td></td>
<td>see p. 344</td>
</tr>
<tr>
<td>MULTitraces</td>
<td>&lt;category&gt;,&lt;trace&gt;,&lt;channel&gt;,&lt;type&gt;</td>
<td>see p. 345</td>
</tr>
<tr>
<td>MULTitraces?</td>
<td></td>
<td>see p. 346</td>
</tr>
<tr>
<td>MODe</td>
<td>&lt;mode&gt;</td>
<td>see p. 347</td>
</tr>
<tr>
<td>MODe?</td>
<td></td>
<td>see p. 347</td>
</tr>
<tr>
<td>NFLOor [LVL] &lt;value&gt;&lt;unit&gt;</td>
<td>MIN</td>
<td>MAX</td>
</tr>
<tr>
<td>[LVL]?</td>
<td>[MIN][MAX]</td>
<td>see p. 348</td>
</tr>
<tr>
<td>STATEs</td>
<td>&lt;state&gt;</td>
<td>see p. 349</td>
</tr>
<tr>
<td>STATEs?</td>
<td></td>
<td>see p. 349</td>
</tr>
<tr>
<td>MARKers ARANge &lt;state&gt;</td>
<td></td>
<td>see p. 350</td>
</tr>
<tr>
<td>ARANge?</td>
<td></td>
<td>see p. 350</td>
</tr>
<tr>
<td>STARt</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>STARt?</td>
<td>[MIN][MAX]</td>
<td>see p. 351</td>
</tr>
<tr>
<td>STOP</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>STOP?</td>
<td>[MIN][MAX]</td>
<td>see p. 352</td>
</tr>
<tr>
<td>STATEs</td>
<td>&lt;state&gt;</td>
<td>see p. 353</td>
</tr>
<tr>
<td>STATEs?</td>
<td></td>
<td>see p. 353</td>
</tr>
<tr>
<td>X</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>X?</td>
<td>[MIN][MAX]</td>
<td>see p. 354</td>
</tr>
<tr>
<td>Y?</td>
<td>see p. 355</td>
<td></td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 355</td>
</tr>
<tr>
<td>X</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>X?</td>
<td>[MIN][MAX]</td>
<td>see p. 356</td>
</tr>
<tr>
<td>Y?</td>
<td>see p. 357</td>
<td></td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 357</td>
</tr>
<tr>
<td>BADiff X</td>
<td>&lt;value&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>X?</td>
<td>[MIN][MAX]</td>
<td>see p. 358</td>
</tr>
<tr>
<td>Y?</td>
<td>see p. 359</td>
<td></td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 359</td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
</tr>
<tr>
<td>Y?</td>
<td>[MIN][MAX]</td>
<td>see p. 360</td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 361</td>
</tr>
<tr>
<td>D</td>
<td>Y</td>
<td>&lt;value&gt;&lt;unit&gt;</td>
</tr>
<tr>
<td>Y?</td>
<td>[MIN][MAX]</td>
<td>see p. 362</td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 361</td>
</tr>
<tr>
<td>DCDiff Y</td>
<td>&lt;value&gt;</td>
<td>MIN</td>
</tr>
<tr>
<td>Y?</td>
<td>[MIN][MAX]</td>
<td>see p. 363</td>
</tr>
<tr>
<td>CENTER</td>
<td></td>
<td>see p. 363</td>
</tr>
<tr>
<td>PARameters</td>
<td></td>
<td>see p. 364</td>
</tr>
<tr>
<td>DATA?</td>
<td></td>
<td>see p. 444</td>
</tr>
</tbody>
</table>
### :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 343 or :CALCulate:SOURce:MULTitraces on page 345).

**Type**
Sequential, no query.

If the analysis takes more than 30 seconds, you will get a timeout error (code -302, see SCPI-Based Errors on page 465 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 139.

**Type**
Sequential.

**Syntax**
:CALCulate[:IMMediate]:AUTO<sp><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 341.

**Example(s)**
:CALC:AUTO ON
### :CALCulate[:IMMediate]:AUTO?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the state of the <em>Auto analyze</em> function.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CALCulate[:IMMediate]:AUTO?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>Response Syntax</strong></td>
<td>&lt;state&gt;</td>
</tr>
<tr>
<td><strong>Response(s)</strong></td>
<td>State of the auto analysis function:</td>
</tr>
<tr>
<td></td>
<td>0: the <em>Auto analyze</em> function is disabled.</td>
</tr>
<tr>
<td></td>
<td>1: the <em>Auto analyze</em> function is enabled.</td>
</tr>
</tbody>
</table>

**Example(s)**

:CALC:AUTO ON

:CALC:AUTO? returns 1
### Description

This command selects the trace to analyze in PCT analysis mode.

### Type

Sequential.

### Syntax

```
:CALCulate:SOURce<ws> <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.
  - For STORe traces: integer corresponding to the store trace identifier, in the range 1 to n. To know the store trace identifier, use the command `:TRACe:LIST:STORe?` on page 319.

- **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:
    - 1: TF live
    - 2: TF max
    - 3: TF min
    - 4: TF average
    - 5: TF roll average
    - 6: BR live (only available on IL RL OPM2 modules)
    - 7: BR max (only available on IL RL OPM2 modules)
    - 8: BR min (only available on IL RL OPM2 modules)
    - 9: BR average (only available on IL RL OPM2 modules)
    - 10: BR roll average (only available on IL RL OPM2 modules)

### 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**
\(<\text{state}>[,<\text{trace}>,<\text{channel}>,<\text{type}>]\)

**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 \(n\). The store trace name corresponding to the identifier is available with the command :TRACE:LIST:STORe? on page 319.

- **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 (default value is 4).

- **type:**
  - Integer corresponding to the trace type, in the range 1 to 10:
    - 1: TF live
    - 2: TF max
    - 3: TF min
    - 4: TF average
    - 5: TF roll average
    - 6: BR live (only available on IL RL OPM2 modules)
    - 7: BR max (only available on IL RL OPM2 modules)
    - 8: BR min (only available on IL RL OPM2 modules)
    - 9: BR average (only available on IL RL OPM2 modules)
    - 10: BR roll average (only available on IL RL OPM2 modules)

**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.

**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.
  For STORe traces: integer corresponding to the store trace identifier, in the range 1 to n. To know the store trace identifier, use the command :TRACE:LIST:STORE? on page 319.

- **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:
  - 1: TF live
  - 2: TF max
  - 3: TF min
  - 4: TF average
  - 5: TF roll average
  - 6: BR live (only available on IL RL OPM2 modules)
  - 7: BR max (only available on IL RL OPM2 modules)
  - 8: BR min (only available on IL RL OPM2 modules)
  - 9: BR average (only available on IL RL OPM2 modules)
  - 10: BR roll average (only available on IL RL OPM2 modules)

**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?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the trace selected for the PCT WDM analysis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:SOURce?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;state&gt;,&lt;trace&gt;[,&lt;channel&gt;,&lt;type&gt;]</td>
</tr>
</tbody>
</table>
| 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 n. The store trace name corresponding  
|             | to the identifier is available with the command  
|             | • **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 (default value is 4).  
|             | • **type:**  
|             | Integer corresponding to the trace type, in the range 1 to 10:  
|             | 1: TF live  
|             | 2: TF max  
|             | 3: TF min  
|             | 4: TF average  
|             | 5: TF roll average  
|             | 6: BR live (only available on IL RL OPM2 modules)  
|             | 7: BR max (only available on IL RL OPM2 modules)  
|             | 8: BR min (only available on IL RL OPM2 modules)  
|             | 9: BR average (only available on IL RL OPM2 modules)  
|             | 10: BR roll average (only available on IL RL OPM2 modules)  
| 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:MODe

**Description**
This command sets the analysis mode.
The corresponding GUI setting is *Mode* on page 139.

**Type**
Sequential.

**Syntax**
[:CALCulate:MODe](<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?](<mode>)

**Parameter(s)**
None.

**Response Syntax**
- **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 139. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Sequential.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CALCulate:NFLOor[:LVL] [&lt;wsp&gt;] &lt;value&gt; [&lt;unit&gt;]</td>
</tr>
</tbody>
</table>
| **Parameter(s)** | ![image](https://via.placeholder.com/150) **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]?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns noise floor defined for the analysis.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CALCulate:NFLOor[:LVL]? [MIN</td>
</tr>
</tbody>
</table>
| **Parameter(s)** | ![image](https://via.placeholder.com/150) **MIN:**  
The query returns the minimum programmable value.  
  ➤ **MAX:**  
The query returns the maximum programmable value. |
| **Response Syntax** | <value> |
| **Response(s)** | ![image](https://via.placeholder.com/150) **value:**  
Noise detection threshold of the analysis tools. |
| **Example(s)** | :CALC:NFLO -55.0 DB  
:CALC:NFLO? returns -5.5000000000E+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 139.

**Applicability**
This command is only available if :CALCulate:MODe on page 347 is set to PCT.

**Type**
Sequential.

**Syntax**
`:CALCulate:NFLOor:STATe <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: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 139.

**Type**
Sequential.

**Syntax**
:CALCulate:MARKers:ARANge <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**

**Response(s)**
*state:*
State of the *Between markers only* analysis function:
- 0|OFF: the analysis is not performed between analysis markers.
- 1|ON: 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 <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 330).
  - **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 330).

**Example(s)**
```
:CALC:MARK:ARAN:STAR 1300NM
```
### :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 330).
- **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**

**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 330).

**Example(s)**
:CALC:MARK:ARAN:STOP 1300NM
### :CALCulate:MARKers:STATe

**Description**  
This command makes the makers visible/invisible on graph. Corresponding command buttons on the GUI: ![marker_off](image1.png) ![marker_on](image2.png).

**Type**  
Overlapping.

**Syntax**  
`:CALCulate:MARKers:STATe<wsp><state>`

**Parameter(s)**  
`state:`  
State of the markers 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`

**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 330).
- **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 330).

**Example(s)**
:CALC:MARK:A:X 1300NM
### :CALCulate:MARKers:A:Y?

<table>
<thead>
<tr>
<th>Description</th>
<th>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 338.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:MARKers:A:Y?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>&lt;value&gt;: 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 331).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:MARK:A:Y? returns -7.350000000E+001</td>
</tr>
</tbody>
</table>

### :CALCulate:MARKers:A:CENTer

<table>
<thead>
<tr>
<th>Description</th>
<th>This command places the A marker at the center of the X axis of the graph zoom area. Corresponding command buttons on the GUI: .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, no query.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:MARKers:A:CENTer</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:MARK:A:CENT</td>
</tr>
</tbody>
</table>
### :CALCulate:MARKers:B:X

**Description**
This command defines the B marker position on graph.

**Type**
Overlapping.

**Syntax**

```
:CALCulate:MARKers:B:X <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 330).

- `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 position of the B marker's position as float value in meters or Hertz depending on the unit setting (see :UNIT:X on page 330).

**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 338.

### 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 331).

### Example(s)
- :CALC:MARK:B:Y? returns -6.230000000E+001

## :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: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 <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 330).
  - `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**

**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 330).

**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 338.

**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 331).

**Example(s)**  

### :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:C:Y**

**Description**
This command defines the C marker position on graph.

**Type**
Overlapping.

**Syntax**
`:CALCulate:MARKers:C:Y <value> | 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 331).

**Example(s)**
`:CALC:MARK:C:Y? returns -3.50000000E+001`

`:CALC:MARK:C:Y -35DB`
**: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: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: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:D:Y

**Description**  
This command defines the D marker position on graph.

**Type**  
Overlapping.

**Syntax**  
`:CALCulate:MARKers:D:Y <value> | MIN | MAX`

<table>
<thead>
<tr>
<th>Parameter(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>value:</td>
<td>Power level or ratio as float value corresponding to the position of the D marker</td>
</tr>
<tr>
<td>unit:</td>
<td>Unit of the position value. The allowed units are DB (dB) or RATIO (ratio). The default unit is dB.</td>
</tr>
<tr>
<td>MIN:</td>
<td>Minimum value: -110 dB or 0 ratio.</td>
</tr>
<tr>
<td>MAX:</td>
<td>Maximum value: 20 dB or 100 ratio.</td>
</tr>
</tbody>
</table>

**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]`

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<thead>
<tr>
<th>Parameter(s)</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>MIN:</td>
<td>The query returns the minimum programmable value.</td>
</tr>
<tr>
<td>MAX:</td>
<td>The query returns the maximum programmable value.</td>
</tr>
</tbody>
</table>

**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 331).

**Example(s)**  
`:CALC:MARK:D:Y 3.5DB`

`:CALC:MARK:D:Y? returns +3.50000000E+000`
Specific Commands

: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 <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 331).
  - **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**

**Parameter(s)**
- **MIN:**
  The query returns the minimum programmable value.
- **MAX:**
  The query returns the maximum programmable value.

**Response Syntax**

**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 331).

**Example(s)**
:CALC:MARK:DCD:Y -38.5
### SPECIFIC COMMANDS

#### CALCulate:PARameters Commands and Queries

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</tr>
</tbody>
</table>
## 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 142.

## 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`

---

## 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
`:CALCulate:PARameters:PTSearch:DISPlay[: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 142).

**Applicability**  
This command is only available if :CALCulate:PARameters:PTSearch:DISPlay[:STATe] on page 368 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 368 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
Specific Commands

:CALCulate:PARameters:PTSearch:PTTHreshold

**Description**
This command sets the PT Threshold value for the Peak Trough Search analysis tool (see PT Threshold on page 141).

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PTSearch:PTTHreshold\(<\text{wsp}>\)<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**

**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:PTSearch:ANTHreshold

**Description**
This command enables/disables the Auto Noise Threshold function for the Peak Trough Search analysis tool (see Auto Noise Threshold on page 142).

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PTSearch:ANTHreshold<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**

**Response(s)**
- **state**: Integer corresponding to the activation state set for the Auto Noise Threshold function:
  - 0 | OFF: the function is disabled.
  - 1 | ON: the function is enabled.

**Example(s)**
- :CALC:PAR:PTS:ANTH ON
- :CALC:PAR:PTS:ANTH? returns 1
### :CALCulate:PARameters:PTSearch:MTHReshold

**Description**
This command sets the **Mode Threshold** value for the Peak Trough Search analysis tool (see *Mode Threshold* on page 141).

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PTSearch:MTHReshold <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**

**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:CSELection:TYPE

<table>
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<td>Parameter(s) type:</td>
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<tr>
<td>Parameter(s)</td>
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<td>1</td>
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<td>Parameter(s)</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>:CALC:PAR:CSEL:TYPE ISOL</td>
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</table>

### :CALCulate:PARameters:CSELection:TYPE?

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<tr>
<td>Syntax</td>
<td>:CALCulate:PARameters:CSELection:TYPE?</td>
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<tr>
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</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;type&gt;</td>
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<tr>
<td>Response(s)  type:</td>
<td></td>
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<tr>
<td>Response(s)</td>
<td>Integer corresponding to the selected component under test:</td>
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<tr>
<td>Response(s)</td>
<td>0: the pass band filter is selected as component under test.</td>
</tr>
<tr>
<td>Response(s)</td>
<td>1: the stop band filter is selected as component under test.</td>
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<td>Response(s)</td>
<td>2: the isolator or circulator is selected as component under test.</td>
</tr>
<tr>
<td>Response(s)</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example(s)</th>
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<tbody>
<tr>
<td>:CALC:PAR:CSEL:TYPE ISOL</td>
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</table>
### :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 373 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 373 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]: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 150).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:SW[1...3]:ALGorithm <algorithm>

**Parameter(s)**
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
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
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</tr>
<tr>
<td><strong>Example(s)</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
: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 153).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to WPCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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
<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the bandwidth calculation method used for the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if:</td>
</tr>
<tr>
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<td>– :CALCulate:MODe on page 347 is set to WPCT.</td>
</tr>
<tr>
<td></td>
<td>– :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:PARameters:SW[1...3]:METhod?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;method&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>method:</td>
</tr>
<tr>
<td></td>
<td>Integer corresponding to the method used for bandwidth calculation of the Spectral Width 1, Spectral Width 2 or Spectral Width 3 analysis tool:</td>
</tr>
<tr>
<td></td>
<td>0: the <strong>Width at Threshold</strong> method is used.</td>
</tr>
<tr>
<td></td>
<td>1: the <strong>ITU-T G.671</strong> method is used.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:SW1:MET G671</td>
</tr>
<tr>
<td></td>
<td>:CALC:PAR:SW1:MET? returns 1</td>
</tr>
</tbody>
</table>
Specific Commands

: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 150).

Applicability
This command is only available if :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

Type
Sequential.

Syntax
:CALCulate:PARameters:SW[1...3]:WTHReshold <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 373 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 +1.0000000E+001
: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 150).

Applicability
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (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 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (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]: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 150).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 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 dB.
- *MAX*:
  Maximum value: 10 dB.

**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 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 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**

**Response(s)**

**Example(s)**
:CALC:PAR:SW1:MULT 2.45
:CALC:PAR:SW1:MULT? returns +2.45000000E+000
: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 153).

**Applicability**
This command is only available if:
- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (for the corresponding tool) is set to THReshold.
- :CALCulate:PARameters:SW[1...3]:MANalysis on page 383 (for the corresponding tool) is set to ON.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:SW[1...3]:FMODe <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 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (for the corresponding tool) is set to THReshold.
- :CALCulate:PARameters:SW[1...3]:MANalysis on page 383 (for the corresponding tool) is set to ON.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:SW[1...3]:FMODe?

**Parameter(s)**
None.

**Response Syntax**

**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 153).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (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 347 is set to PCT.
- :CALCulate:PARameters:SW[1...3]:ALGorithm on page 375 (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**

**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:SW2|3[:ACTivate]

<table>
<thead>
<tr>
<th>Description</th>
<th>This command enables/disables the Spectral Width 2 or Spectral Width 3 analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This command is only available if: :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:PARameters:SW2</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>state: Activation state of the Spectral width tool. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:SW2:ACT ON</td>
</tr>
</tbody>
</table>

### :CALCulate:PARameters:SW2|3[:ACTivate]?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the activation state of the Spectral Width 2 or Spectral Width 3 analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if: :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
</tbody>
</table>
| Syntax | :CALCulate:PARameters:SW2|3[: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: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 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 is set to STOP or ISOL.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:NW[1...3]:DISPlay?

**Parameter(s)**
- None.

**Response Syntax**

**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]: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 156).

**Applicability**
This command is only available if:
- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:CSELection:TYPE on page 373 is set to STOP or ISOL.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:NW[1...3]:NSELection <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 347 is set to PCT.
- :CALCulate:PARameters:CSELection:TYPE on page 373 is set to STOP or ISOL.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:NW[1...3]:NSELection?

**Parameter(s)**
None.

**Response Syntax**

**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
Specific Commands

: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 156).

Applicability
This command is only available if:

- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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:MW1: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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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:MW1:WREF TOP
:CALC:PAR:MW1:WREF? returns 1
Specific Commands

:`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 156).

**Applicability**
This command is only available if:
- `:CALCulate:MODE` on page 347 is set to PCT.
- `:CALCulate:PARameters:CSElector:TYPE` on page 373 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 347 is set to PCT.
- `:CALCulate:PARameters:CSElector:TYPE` on page 373 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]: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 156).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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: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 156).

**Applicability**
This command is only available if:
- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 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: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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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:REFerence**

**Description**
This command sets the Reference parameter for the Pass Band Test analysis tool (for more details, see CrossTalk Settings on page 159).

**Applicability**
This command is only available if:

- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PBANd:REFerence <wsp> <point>

**Parameter(s)**
In-band point to use as Reference point, calculated from the Spectral Width 1 tool results (see :CALCulate:DATA:SW1? on page 448). 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PBANd:REFerence?

**Parameter(s)**
None.

**Response Syntax**

**Response(s)**
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:BMEThod

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the IN/OUT Band Method parameter for the Pass Band Test analysis tool (for more details, see CrossTalk Settings on page 159).</th>
</tr>
</thead>
</table>
| Applicability | This command is only available if:  
|               | ➤ :CALCulate:MODe on page 347 is set to PCT.  
|               | ➤ :CALCulate:PARameters:CSElector:TYPE on page 373 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 448).  
|               | 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 394. |
| Example(s)   | :CALC:PAR:PBAN:BMET BWID |

### :CALCulate:PARameters:PBANd:BMEThod?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the IN/OUT Band Method parameter set for the Pass Band Test analysis tool.</th>
</tr>
</thead>
</table>
| Applicability | This query is only available if:  
|               | ➤ :CALCulate:MODe on page 347 is set to PCT.  
|               | ➤ :CALCulate:PARameters:CSElector:TYPE on page 373 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: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 159).

**Applicability**
This command is only available if:
- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:PBAn:BMETHod on page 393 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 330).
- **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 347 is set to PCT.
- :CALCulate:PARameters:PBANd:BMETHod on page 393 is set to SET.

**Type**
Sequential.

**Syntax**

**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 330).

**Example(s)**
:CALC:PAR:PBAN:BDIS 5NM
### :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 160).

**Applicability**

This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

**Type**

Sequential.

**Syntax**

:CALCulate:PARameters:PBANd:ARANge <wsp> <method>

**Parameter(s)**

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 398.
- 1|PBWidth: sets the averaging range to **% Bandwidth 1**. The corresponding percentage is defined with the following command :CALCulate:PARameters:PBANd:PERCentage on page 400.
- 2|PTDetection: sets the averaging range to **PT Detection**. The corresponding value is defined with the following command :CALCulate:PARameters:PBANd:THReshold on page 402.

**Example(s)**

:CALC:PAR:PBAN:ARAN PBW
### Specific Commands

**:CALCulate:PARameters:PBANd:ARANge?**

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the <strong>Averaging Range</strong> parameter set for the Pass Band Test analysis tool.</th>
</tr>
</thead>
</table>
| **Applicability** | This query is only available if:  
  - :CALCulate:MODE on page 347 is set to PCT.  
  - :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS. |
| **Type** | Sequential. |
| **Syntax** | :CALCulate:PARameters:PBANd:ARANge? |
| **Parameter(s)** | None. |
| **Response Syntax** | `<method>` |
| **Response(s)** | **method:**  
  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: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 160).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.
- :CALCulate:PARameters:PBANd:ARANge on page 396 is set to FIXED.

**Type**
Sequential.

**Syntax**
```plaintext
: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 330).
- *MIN*:
  Minimum value: 0 nm or 0 THz.
- *MAX*:
  Maximum value: 100 nm or 12.085 THz.

**Example(s)**
```
:CALC:PAR:PBAN:SPAN 200PM
```
Specific Commands

:CALCulate:PARameters:PBANd:SPAN?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the Calculation Span parameter set for the Pass Band Test analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if:</td>
</tr>
<tr>
<td></td>
<td>:CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td></td>
<td>:CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.</td>
</tr>
<tr>
<td></td>
<td>:CALCulate:PARameters:PBAnD:ARAnge on page 396 is set to FIXed.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>➤ MIN: The query returns the minimum programmable value.</td>
</tr>
<tr>
<td></td>
<td>➤ MAX: The query returns the maximum programmable value.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>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 330).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:PBAN:SPAN 200PM</td>
</tr>
<tr>
<td></td>
<td>:CALC:PAR:PBAN:SPAN? returns +2.00000000E-010</td>
</tr>
</tbody>
</table>
### :CALCulate:PARameters:PBANd:PERCentage

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This command defines the % Bandwidth parameter for the Pass Band Test analysis tool (for more details, see Average Loss &amp; Ripple Settings on page 160).</th>
</tr>
</thead>
</table>
| **Applicability** | This command is only available if:  
- :CALCulate:MODe on page 347 is set to PCT.  
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.  
- :CALCulate:PARameters:PBANd:ARANge on page 396 is set to PBWidth. |
| **Type** | Sequential. |
| **Syntax** | :CALCulate:PARameters:PBANd:PERCentage \(<percentage> | \text{MIN} | \text{MAX} \) |
| **Parameter(s)** |  
- percentage: Fraction in percent of Bandwidth 1 calculated from Spectral Width 1 tool (see :CALCulate:DATA:SW1? on page 448) 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 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.
- :CALCulate:PARameters:PBANd:ARANge on page 396 is set to PBWidth.

**Type**
Sequential.

**Syntax**

**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
**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 160).

**Applicability**  This command is only available if:

- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to PASS.
- :CALCulate:PARameters:PBANd:ARANge on page 396 is set to PTDetection.

**Type**  Sequential.

**Syntax**  

```
:CALCulate:PARameters:PBANd:THReshold <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
```
Specific Commands

: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 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to PASS.
- `:CALCulate:PARameters:PBAn:ARAnge` on page 396 is set to PTDetection.

**Type**
Sequential.

**Syntax**

**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
### :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 162).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PBANd:TRANsition\(<\text{wsp}>\) <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 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:PBANd:TRANsition?

**Parameter(s)**
None.

**Response Syntax**
\(<\text{method}>\)

**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: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 162).

**Applicability**  
This command is only available if:
- `:CALCulate:MODe` on page 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to PASS.

**Type**  
Sequential.

**Syntax**  
`:CALCulate:PARameters:PBANd:EXCLusion:MINimum <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 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to PASS.

**Type**  
Sequential.

**Syntax**  

**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  
### :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 162).

**Applicability**  
This command is only available if:  
- :CALCulate:MODe on page 347 is set to PCT.  
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

**Type**  
Sequential.

**Syntax**  
:CALCulate:PARameters:PBANd:EXCLusion:MAXimum <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 347 is set to PCT.  
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to PASS.

**Type**  
Sequential.

**Syntax**  
:CALCulate:PARameters:PBANd:EXCLusion:MAXimum?

<table>
<thead>
<tr>
<th>Parameter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIN:</strong></td>
</tr>
</tbody>
</table>
| 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  
### :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 347 is set to PCT.
- :CALCulate:PARameters:CSELeetor:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSELeetor:TYPE on page 373 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:REFerence

**Description**
This command sets the *Reference* parameter for the Stop Band Test analysis tool (for more details, see *Isolation Depth Settings* on page 165).

**Applicability**
This command is only available if:
- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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 451). 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to STOP.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:SBANd:REFerence?

**Parameter(s)**
None.

**Response Syntax**
<br>

**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: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 165).

Applicability
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 is set to STOP.

Type
Sequential.

Syntax
:CALCulate:PARameters:SBANd:BMETHod <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 451).
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 410.

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 347 is set to PCT.
- :CALCulate:PARameters:CSELeector:TYPE on page 373 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
**Specific Commands**

<table>
<thead>
<tr>
<th>:CALCulate:PARameters:SBANd:BDISstance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Example(s)</strong></td>
</tr>
</tbody>
</table>
## :CALCulate:PARameters:SBANd:BDIStance?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the IN/OUT Band Distance parameter set for the Stop Band Test analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if:</td>
</tr>
<tr>
<td></td>
<td>➤ :CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td></td>
<td>➤ :CALCulate:PARameters:CSElector:TYPE on page 373 is set to STOP.</td>
</tr>
<tr>
<td></td>
<td>➤ :CALCulate:PARameters:SBANd:BMEthod on page 409 is set to SET.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>➤ MIN:</td>
</tr>
<tr>
<td></td>
<td>The query returns the minimum programmable value.</td>
</tr>
<tr>
<td></td>
<td>➤ MAX:</td>
</tr>
<tr>
<td></td>
<td>The query returns the maximum programmable value.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;value&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>value:</td>
</tr>
<tr>
<td></td>
<td>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 330).</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:SBAN:BDIS 5NM</td>
</tr>
</tbody>
</table>
### 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 166).

### Applicability
This command is only available if:
- \(\text{:CALCulate:MODe}\) on page 347 is set to PCT.
- \(\text{:CALCulate:PARameters:CSElector:TYPE}\) on page 373 is set to STOP.

### Type
Sequential.

### Syntax
\[
\text{:CALCulate:PARameters:SBANd:ARANge}\ <\text{method}> \\
\text{Parameter(s)}:
\begin{align*}
\text{method:} & \quad \text{Parameter set as } \text{Averaging Range}, \text{ spectral range over which the average loss and ripple are calculated.} \\
& \text{The allowed values are:} \\
0|\text{FIXed}: & \quad \text{sets the averaging range to } \text{Fixed Range}. \text{ The corresponding fixed span value is defined with the following command } \text{:CALCulate:PARameters:SBANd:SPAN} \text{ on page 414} \\
1|\text{PBWidth}: & \quad \text{sets the averaging range to } \% \text{ Bandwidth 1}. \text{ The corresponding percentage is defined with the following command } \text{:CALCulate:PARameters:SBANd:PERCentage} \text{ on page 416}. \\
2|\text{PTDetection}: & \quad \text{sets the averaging range to } \text{PT Detection}. \text{ The corresponding value is defined with the following command } \text{:CALCulate:PARameters:SBANd:THReshold} \text{ on page 418}. \\
\end{align*}
\]

### Example(s)
\[
\text{:CALC:PAR:SBAN:ARAN PBW}
\]
### :CALCulate:PARameters:SBANd:ARANge?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the Averaging Range parameter set for the Stop Band Test analysis tool.</th>
</tr>
</thead>
</table>
| **Applicability** | This query is only available if:  
  ➤ :CALCulate:MODe on page 347 is set to PCT.  
  ➤ :CALCulate:PARameters:CSElector:TYPE on page 373 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 |
Specific Commands

: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 166).

**Applicability**
This command is only available if:

- :CALCulate:MODE on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to STOP.

**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 330).
- **MIN:** Minimum value: 0 nm or 0 THz.
- **MAX:** Maximum value: 100 nm or 12.085 THz.

**Example(s)**
:CALC:PAR:SBAN:SPAN 200PM
**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 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to STOP.

**Type**
Sequential.

**Syntax**

**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 330).

**Example(s)**
`:CALC:PAR:SBAN:SPAN 200PM
`:CALC:PAR:SBAN:SPAN? returns +2.00000000E-010
**: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 166).

**Applicability**
This command is only available if:

- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to STOP.
- :CALCulate:PARameters:SBANd:ARANge on page 412 is set to PBWidth.

**Type**
Sequential.

**Syntax**
`:CALCulate:PARameters:SBANd:PERCentage <percentage> | MIN | MAX`

**Parameter(s)**
- **percentage:**
  
  Fraction in percent of Bandwidth 1 calculated from Notch Width 1 tool (see :CALCulate:DATA:NW1? on page 451) 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to STOP.
- :CALCulate:PARameters:SBANd:ARANge on page 412 is set to PBWidth.

**Type**
Sequential.

**Syntax**

**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
This command defines the **Detection Threshold** parameter for the Stop Band Test analysis tool (for more details, see *Average Loss & Ripple Settings* on page 166).

This command is only available if:

- `:CALCulate:MODe` on page 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to STOP.
- `:CALCulate:PARameters:SBANd:ARAnge` on page 412 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 is set to STOP.
- :CALCulate:PARameters:SBANd:ARANge on page 412 is set to PTDetection.

**Type**
Sequential.

**Syntax**

**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
**: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 168).

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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 347 is set to PCT.
- :CALCulate:PARameters:CSELector:TYPE on page 373 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: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 168).

**Applicability**
This command is only available if:
- `:CALCulate:MODe` on page 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to STOP.

**Type**
Sequential.

**Syntax**
```
:CALCulate:PARameters:SBANd:EXCLusion:MINimum <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)**
```
```

### :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 347 is set to PCT.
- `:CALCulate:PARameters:CSELector:TYPE` on page 373 is set to STOP.

**Type**
Sequential.

**Syntax**
```
:CALCulate:PARameters:SBANd:EXCLusion:MINimum?
```

**Parameter(s)**
- **MIN:** The query returns the minimum programmable value.
- **MAX:** The query returns the maximum programmable value.

**Response Syntax**
```
<integer>
```

**Response(s)**
- **value:** Minimum threshold in dB above which the roll-off is calculated.

**Example(s)**
```
```
Specific Commands

: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 168).

Applicability
This command is only available if:
- :CALCulate:MODe on page 347 is set to PCT.
- :CALCulate:PARameters:CSElector:TYPE on page 373 is set to STOP.

Type
Sequential.

Syntax
:CALCulate:PARameters:SBANd:EXCLusion:MAXimum\(<\text{wsp}>\)<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)
Specific Commands

**: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 347 is set to PCT.
- **:CALCulate:PARameters:CSELector:TYPE** on page 373 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)**

Specific Commands

**: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 170.

**Applicability**
This command is only available if **:CALCulate:MODe** on page 347 is set to WPCT.

**Type**
Sequential.

**Syntax**
`:CALCulate:PARameters:IMEASurement:RANGe <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|**FIX**ed: a fixed span is used to define the spectral range. It is set using the command **:CALCulate:PARameters:IMEASurement:SPAN** on page 425.

1|**PB**Width: 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 427.

2|**PC**Width: 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 429.

**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 347 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`
Specific Commands

: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 171.

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to WPCT
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 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 330).

- **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?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the <strong>Calculation span</strong> parameter set for the WDM Filter test analysis tool.</th>
</tr>
</thead>
</table>
| Applicability | This query is only available if:  
- :CALCulate:MODE on page 347 is set to WPCT  
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 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 330). |
| Example(s) | :CALC:PAR:IMEAS:SPAN 200PM  
:CALC:PAR:IMEAS:SPAN? returns +2.00000000E-010 |
## :CALCulate:PARameters:IMEASurement:BPERCentage

<table>
<thead>
<tr>
<th>Description</th>
<th>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 171.</th>
</tr>
</thead>
</table>
| Applicability | This command is only available if:  
- :CALCulate:MODe on page 347 is set to WPCT  
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 is set to PBWidt |
| Type | Sequential. |
| Syntax | \( \text{:CALCulate:PARameters:IMEASurement:BPERCentage}\ <\text{percentage}> \ | \text{MIN} \ | \text{MAX} \ |
| Parameter(s) | \( \text{percentage}: \)  
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.  
- \( \text{MIN}: \)  
Minimum programmable value: 0.1 %  
- \( \text{MAX}: \)  
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 347 is set to WPCT
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 is set to PBWidth

**Type**  
Sequential.

**Syntax**  
:CALCulate:PARameters:IMEASurement:BPERCentage?

**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 171.

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to WPCT
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 is set to PCWidth

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:IMEASurement:CPERCentage <percentage> [<unit>] | 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:
- :CALC:MODE on page 347 is set to WPCT
- :CALC:PAR:IMEAS:RANGE on page 424 is set to PCWidth

**Type**
Sequential.

**Syntax**

**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: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 347 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 347 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: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 145.

**Applicability**
This command is only available if :CALCulate:MODE on page 347 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: sets the **CWDM** grid as WDM channel detection method.

**Example(s)**
:CALC:PAR:WDMC:MODE 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 347 is set to WPCT.

**Type**
Sequential.

**Syntax**
:CALCulate:PARameters:WDMChannel:MODE?

**Parameter(s)**
None.

**Response Syntax**
<wsp><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
### :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** on page Common.

**Applicability**
This command is only available if :CALCulate:MODe on page 347 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 347 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
Specific Commands

**: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 146.

**Applicability**  This command is only available if:
- :CALCulate:MODe on page 347 is set to WPCT.
- :CALCulate:PARameters:WDMChannel:MODe on page 432 is set to CGRID.

**Type**  Sequential.

**Syntax**  
```
:CALC:PAR:WDMC:GSP <spacing> \n```

**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 347 is set to WPCT.
- :CALCulate:PARameters:WDMChannel:MODe on page 432 is set to CGRID.

**Type**  Sequential.

**Syntax**  
```
:CALC:PAR:WDMC:GSP [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: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 146.

**Applicability**
This command is only available if:
- :CALCulate:MODe on page 347 is set to WPCT.
- :CALCulate:PARameters:WDMChannel:MODe on page 432 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 347 is set to WPCT.
- :CALCulate:PARameters:WDMChannel:MODe on page 432 is set to CGRID.

**Type**
Sequential.

**Syntax**

**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:ECHannels

<table>
<thead>
<tr>
<th>Description</th>
<th>This command sets the <strong>Empty Channel</strong> setting for the Channel Detection analysis tool. The corresponding GUI setting is <em>Empty Channels</em> on page Common.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This command is only available if :CALCulate:MODE on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:PARameters:WDMChannel:ECHannels</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>display: State of the channel visibility in the analysis result table. The allowed values are: 0</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:WDMC:ECH HIDE</td>
</tr>
</tbody>
</table>

### :CALCulate:PARameters:WDMChannel:ECHannels?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the <strong>Empty Channel</strong> setting for the Channel Detection analysis tool.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODE on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Sequential.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:PARameters:WDMChannel:ECHannels?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;display&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>display: Integer corresponding to the channel visibility in the result table: 0: the empty channels are hidden. 1: the empty channels are shown.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:PAR:WDMC:ECH HIDE</td>
</tr>
</tbody>
</table>
**: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 146.

**Applicability**
This command is only available if:
- **:CALCulate:MODe** on page 347 is set to WPCT
- **:CALCulate:PARameters:IMEASurement:RANGe** on page 424 is set to FIXed

**Type**
Sequential.

**Syntax**
```plaintext
:CALCulate:PARameters:WDMChannel:STARt <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 330).

- **MIN**
  Minimum programmable value: 1240 nm or 178.448 THz

- **MAX:**
  Maximum programmable value: 1679.99 nm or 241.767 THZ

**Example(s)**
```plaintext
: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 347 is set to WPCT
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 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 330).

**Example(s)**  
:CALC:PAR:WDM:STAR 1525NM  
**: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 146.

**Applicability**
This command is only available if:

- :CALCulate:MODe on page 347 is set to WPCT
- :CALCulate:PARameters:IMEASurement:RANGe on page 424 is set to FIXed

**Type**
Sequential.

**Syntax**
`:CALCulate:PARameters:WDMChannel:STOP <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 330).
- **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 347 is set to WPCT
- :CALCulate:PARameters:IMEAsurement:RANGe on page 424 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 330).

Example(s)
:CALC:PAR:WDM:STOP 1525NM
### :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 147.

**Applicability**  
This command is only available if:  
- :CALCulate:MODe on page 347 is set to WPCT.  
- :CALCulate:PARameters:WDMChannel:MODe on page 432 is set to ITU.

**Type**  
Sequential.

**Syntax**  
`:CALC:PAR:WDMC:SPAC <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 100 GHz.  
- `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 347 is set to WPCT.  
- :CALCulate:PARameters:WDMChannel:MODe on page 432 is set to ITU.

**Type**  
Sequential.

**Syntax**  
`:CALC:PAR:WDMC:SPAC?`

**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 100 GHz.  
- `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: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 147.

**Applicability**
This command is only available if:
- [:CALCulate:MODe](#) on page 347 is set to WPCT.
- [:CALCulate:PARameters:WDMChannel:MODe](#) on page 432 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 347 is set to WPCT.
- [:CALCulate:PARameters:WDMChannel:MODe](#) on page 432 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? returns 1
```
::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 147.

**Applicability**
This command is only available if:
- ::CALCulate:MODe on page 347 is set to WPCT.
- ::CALCulate:PARameters:WDMChannel:MODe on page 432 is set to CWDM.

**Type**
Sequential.

**Syntax**
::CALCulate:PARameters:WDMChannel:FCHannel<sp><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 347 is set to WPCT.
- ::CALCulate:PARameters:WDMChannel:MODe on page 432 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:DATA? Queries

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<th>Section</th>
</tr>
</thead>
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<td>PTSearch LIST?</td>
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<td>SW3?</td>
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<td>CH CHANnel? &lt;channel&gt;</td>
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<tr>
<td>IMEASurement? &lt;channel&gt;</td>
<td></td>
<td>see p. 462</td>
</tr>
<tr>
<td>SW7</td>
<td></td>
<td>see p. 463</td>
</tr>
</tbody>
</table>

The unit returned depends on the unit settings (see UNIT Commands and Queries on page 330). The results headers WL (in meter) becomes FREQ when in Hertz.

All results are expressed in base unit (e.g. M|HZ)
**Description**
This query collects all analysis results available in PCT analysis mode, grouped by analysis tools.

**Applicability**
This query is only available if `:CALCulate:MODe` on page 347 is set to PCT.

**Type**
Overlapping, query only.

**Syntax**
`:CALCulate:DATA[:ALL]?

**Parameter(s)**
None.

**Response Syntax**

```plaintext
<results from PTSearch tool>,<results from activated tools>
```

**Response(s)**

- **results from PTSearch tool:**

- **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 373.

**Example(s)**

```plaintext
:CALC:DATA? returns
```
**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 330):
<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 330).

- **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
Specific Commands

:CALCulate:DATA:PTSearch:MAIN:PEAK?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the wavelength/frequency and power level of the peak with the highest power.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:PTSearch:MAIN:PEAK?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;peak wavelength or frequency&gt;, &lt;peak power level&gt;</td>
</tr>
</tbody>
</table>
| 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 331). |

Example(s): CALC:DATA:PTS:MAIN:PEAK? returns  
+1.52950600E-006,-1.15200000E+001

:CALCulate:DATA:PTSearch:MAIN:TROugh?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the wavelength/frequency and power level of the trough with the lower power.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:PTSearch:MAIN:TROugh?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>&lt;trough wavelength or frequency&gt;, &lt;trough power level&gt;</td>
</tr>
</tbody>
</table>
| 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 331). |

Example(s): CALC:DATA:PTS:MAIN:TRO? returns  
+1.52774400E-006,-6.45200000E+001
### :CALCulate:DATA:SW1?

**Description**
This query returns the results of the Spectral Width 1 analysis tool used in PCT analysis mode (for more details, see *Analyzing Spectral Width Results* on page 154).

**Applicability**
This query is only available if :CALCulate:MODE on page 347 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_LEVEL,LEVEL_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_LEVEL,LEVEL_MEAN,<value>,<unit>, LEVEL_MEAN,<value>,<unit>, SIGMA,<value>,<unit>

**Response(s)**
The analysis results are described in *Analyzing Spectral Width Results* on page 154.

**Example(s)**
:CALC:DATA:SW1? returns
SPECTRAL WIDTH 1 RESULTS,
WL_PEAK,+1.54547800E-006,M,LEVEL_PEAK,-9.12000000E-001,D BM,LEVEL_MEAN,+1.54547100E-006,M,LEVEL_MEAN,-9.10000000E-0 01, DBM, DWL@3.00DB,+1.02800000E-010,M
### :CALCulate:DATA:SW2?

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>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 154).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicability</strong></td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CALCulate:DATA:SW2?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
</tbody>
</table>
| **Response Syntax** | For Threshold, Envelope, Gaussian Fit and Lorentzian Fit Algorithm:  
```plaintext
SPECTRAL WIDTH 2 RESULTS,WL_MEAN,<value>,<unit>,  
LEVEL_MEAN,<value>,<unit>,DWL,<value>,<unit>
```  
For RMS and RMS Peak Algorithm:  
```plaintext
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 154. |
| **Example(s)** | :CALC:DATA:SW2? returns  
```plaintext
SPECTRAL WIDTH 2  
RESULTS,WL_MEAN,+1.54547100E-006,M,LEVEL_MEAN,-9.100000E-001,DBM,DWL@1.00DB,+1.02800000E-010,M
``` |
### :CALCulate:DATA:SW3?

<table>
<thead>
<tr>
<th>Description</th>
<th>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 154).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:SW3?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>For Threshold, Envelope, Gaussian Fit and Lorentzian Fit Algorithm:</td>
</tr>
<tr>
<td></td>
<td>SPECTRAL WIDTH 2 RESULTS, WL_MEAN, &lt;value&gt;, &lt;unit&gt;, LEVEL_MEAN, &lt;value&gt;, &lt;unit&gt;, DWL, &lt;value&gt;, &lt;unit&gt;</td>
</tr>
<tr>
<td></td>
<td>For RMS and RMS Peak Algorithm:</td>
</tr>
<tr>
<td></td>
<td>SPECTRAL WIDTH 2 RESULTS, WL_MEAN, &lt;value&gt;, &lt;unit&gt;, LEVEL_MEAN, &lt;value&gt;, &lt;unit&gt; SIGMA, &lt;value&gt;, &lt;unit&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>The analysis results are described in Analyzing Spectral Width Results on page 154.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:DATA:SW3? returns</td>
</tr>
</tbody>
</table>

SPECTRAL WIDTH 3
RESULTS, WL_MEAN, +1.54547100E-006, M, LEVEL_MEAN, -9.100000E-001, DBM, DWL@20.00DB, +1.02800000E-010, M
<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>This query returns the results of the Notch Width 1 analysis tool (for more details, see Analyzing Notch Width Results on page 157).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicability</strong></td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>:CALCulate:DATA:NW1?</td>
</tr>
<tr>
<td><strong>Parameter(s)</strong></td>
<td>None.</td>
</tr>
</tbody>
</table>
| **Response Syntax** | NOTCH WIDTH 1 RESULTS,  
WL_TROUGH,<value>,<unit>,LEVEL_THOUGH,<value>,<unit>,WL_NOTCH,<value>,LEVEL_NOTCH,<value>,<unit>,DWL_NOTCH,<value>,<unit> |
| **Response(s)** | The analysis results are described in Analyzing Notch Width Results on page 157.                                                     |
| **Example(s)**  | :CALC:DATA:NW1? returns  
NOTCH WIDTH 1 RESULTS,  
### :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 157).

**Applicability**
This query is only available if :CALCulate:MODE on page 347 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>,
WL_NOTCH,<value>,<unit>
```

**Response(s)**
The analysis results are described in Analyzing Notch Width Results on page 157.

**Example(s)**
:CALC:DATA:NW2? returns
```
NOTCH WIDTH 2 RESULTS,
WL_NOTCH,+1.54669440E-006,M,LEVEL_NOTCH,-3.65600000E+001,DBM,
WL_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 157).

**Applicability**
This query is only available if :CALCulate:MODE on page 347 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>,
WL_NOTCH,<value>,<unit>
```

**Response(s)**
The analysis results are described in Analyzing Notch Width Results on page 157.

**Example(s)**
:CALC:DATA:NW3? returns
```
NOTCH WIDTH 3 RESULTS,
WL_NOTCH,+1.54669440E-006,M,LEVEL_NOTCH,-3.65600000E+001,DBM,
WL_NOTCH_20dB,+5.93161000E-008,M
```
**Description**
This query returns the results of the Loss Measurement analysis tool (for more details, see *Setting Up Loss Measurement Analysis* on page 172).

**Applicability**
This query is only available if :CALCulate:MODE on page 347 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 172.

**Example(s)**
:CALC:DATA:LOSS? returns LOSS MEASUREMENT RESULTS , AVERAGELOSSDB , -7.00000000E-001 , DBM , UNIFORMITY , +1.10000000E-001 , DB
Specific Commands

:CALCulate:DATA:PBANd?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the results of the Pass Band analysis tool (for more details, see Analyzing Pass Band Test Results on page 163).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to PCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:PBANd?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>PASSBANDTESTRESULTS(NOISELIMITED),IN-BANDRESULTS,,,AVGLOSS,&lt;Value&gt;,&lt;Unit&gt;,RIPPLE,&lt;Value&gt;,&lt;Unit&gt;,SLOPE,&lt;Value&gt;,&lt;Unit&gt;,OUT-BANDSIDE1RESULTS,,,AVGLOSS,&lt;Value&gt;,&lt;Unit&gt;,RIPPLE,&lt;Value&gt;,&lt;Unit&gt;,CROSSTALK,&lt;Value&gt;,&lt;Unit&gt;,<a href="mailto:ROLLOFF@X.XDB">ROLLOFF@X.XDB</a>,&lt;Value&gt;,&lt;Unit&gt;,ROLLOFF_MAX,&lt;Value&gt;,&lt;Unit&gt;,WL@ROLLOFF_MAX,&lt;Value&gt;,&lt;Unit&gt;,TRANSITIONBAND,&lt;Value&gt;,&lt;Unit&gt;,OUT-BANDSIDE2RESULTS,,,AVGLOSS,&lt;Value&gt;,&lt;Unit&gt;,RIPPLE,&lt;Value&gt;,&lt;Unit&gt;,CROSSTALK,&lt;Value&gt;,&lt;Unit&gt;,<a href="mailto:ROLLOFF@X.XDB">ROLLOFF@X.XDB</a>,&lt;Value&gt;,&lt;Unit&gt;,ROLLOFF_MAX,&lt;Value&gt;,&lt;Unit&gt;,WL@ROLLOFF_MAX,&lt;Value&gt;,&lt;Unit&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>NOISELIMITED only appears if the measurement is limited by noise.</td>
</tr>
</tbody>
</table>
| Example(s) | :CALC:DATA:PBANd? returns PASSBANDTESTRESULTS,IN-BANDRESULTS,,,AVGLOSS,1.92000000E+000,DB,RIPPLE,0.00000000E+000,DB,SLOPE,1.95000000E-002,DB/IN,OUT-BANDSIDE1RESULTS,,,AVGLOSS,6.50900000E+001,DB/IN,RIPPLE,4.19000000E+000,DB/IN,CROSSTALK,6.31100000E+001,DB/IN,ROLLOFF@3.00DB,8.46260000E+000,DB/IN,ROLLOFF_MAX,1.14789000E+001,DB/IN,TRANSITIONBAND,1.56000000E+001,DB/IN,OUT-BANDSIDE2RESULTS,,,AVGLOSS,6.31000000E+001,DB/IN,RIPPLE,1.99000000E+000,DB/IN,CROSSTALK,6.07400000E+001,DB/IN,ROLLOFF@3.00DB,8.77800000E+000,DB/IN,ROLLOFF_MAX,1.83777000E+001,DB/IN,TRANSITIONBAND,1.54400000E+001,DB/IN,-,IN-BANDRESULTS,,,AVGLOSS,1.92000000E+000,DB/RIPPLE,0.00000000E+000,DB,SLOPE,1.95000000E-002,DB/IN,OUT-BANDSIDE1RESULTS,,,AVGLOSS,6.50900000E+001,DB/IN,RIPPLE,4.19000000E+000,DB/IN,CROSSTALK,6.31100000E+001,DB/IN,ROLLOFF@3.00DB,8.46260000E+000,DB/IN,ROLLOFF_MAX,1.14789000E+001,DB/IN,TRANSITIONBAND,1.56000000E+001,DB/IN,OUT-BANDSIDE2RESULTS,,,AVGLOSS,6.31000000E+001,DB/IN,RIPPLE,1.99000000E+000,DB/IN,CROSSTALK,6.07400000E+001,DB/IN,ROLLOFF@3.00DB,8.77800000E+000,DB/IN,ROLLOFF_MAX,1.83777000E+001,DB/IN,TRANSITIONBAND,1.54400000E+001,DB/IN,-,IN-BANDRESULTS,,,AVGLOSS,1.92000000E+000,DB/RIPPLE,0.00000000E+000,DB,SLOPE,1.95000000E-002,DB/IN,OUT-BANDSIDE1RESULTS,,,AVGLOSS,6.50900000E+001,DB/IN,RIPPLE,4.19000000E+000,DB/IN,CROSSTALK,6.31100000E+001,DB/IN,ROLLOFF@3.00DB,8.46260000E+000,DB/IN,ROLLOFF_MAX,1.14789000E+001,DB/IN,TRANSITIONBAND,1.56000000E+001,DB/IN,OUT-BANDSIDE2RESULTS,,,AVGLOSS,6.31000000E+001,DB/IN,RIPPLE,1.99000000E+000,DB/IN,CROSSTALK,6.07400000E+001,DB/IN,ROLLOFF@3.00DB,8.77800000E+000,DB/IN,ROLLOFF_MAX,1.83777000E+001,DB/IN,TRANSITIONBAND,1.54400000E+001,DB/IN,-,
**: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 169).

**Applicability**
This query is only available if :CALCulate:MODe on page 347 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 169.

**Example(s)**
:CALC:DATA:SBANd? returns

```
STOPBANDTESTRESULTS,IN-BANDRESULTS,,,AVGLOSS,5.2430000E+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,2.49708000E+001,DB/NM,WL@ROLLOFF_MAX,1.54124660E-006,M,TRANSITIONBAND,8.45000000E-010,M,OUT-BANDSIDE2RESULTS,,,AVGLOSS,1.90600000E+001,DB,RIPPLE,1.60000000E-001,DB,ISOLATIONDEPTH,3.45400000E+009,M,OUT-BANDSIDE2RESULTS,,,AVGLOSS,1.54124660E-006,M,TRANSITIONBAND,8.45000000E-010,M,,-
```
### :CALCulate:DATA:WDM:NChannels?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the number of channels that have been detected (for more details, see Analyzing Channel Detection Results on page 148).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:WDM:NChannels?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>NBROFCHANNELS,&lt;Value&gt;,</td>
</tr>
<tr>
<td>Response(s)</td>
<td>The analysis result is described in Table header on page 148.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:DATA:WDM:NChannels? returns NBROFCHANNELS, 6,</td>
</tr>
</tbody>
</table>
### :CALCulate:DATA:WDM:SLOPe?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the slope of all detected peaks on all analyzed traces (for more details, see Analyzing Channel Detection Results on page 148).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:WDM:SLOPe?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>SLOPE,&lt;Value&gt;,&lt;Unit&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>The analysis result is described in Table header on page 148.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:DATA:WDM:SLOPe? returns SLOPE,+3.95000000E+008,DB/M</td>
</tr>
</tbody>
</table>

### :CALCulate:DATA:WDM:UNIFormity?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the uniformity of all detected peaks (for more details, see Analyzing Channel Detection Results on page 148).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:WDM:UNIFormity?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>UNIFORMITY,&lt;Value&gt;,&lt;Unit&gt;</td>
</tr>
<tr>
<td>Response(s)</td>
<td>The analysis result is described in Table header on page 148.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:DATA:WDM:UNIFormity? returns UNIFORMITY,+2.17000000E+000,DB</td>
</tr>
</tbody>
</table>
### :CALCulate:DATA:WDM[:ALL]:CHANnel?

<table>
<thead>
<tr>
<th>Description</th>
<th>This query returns the results of the Channel Detection analysis tool (for more details, see Analyzing Channel Detection Results on page 148) for all analyzed traces.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability</td>
<td>This query is only available if :CALCulate:MODe on page 347 is set to WPCT.</td>
</tr>
<tr>
<td>Type</td>
<td>Overlapping, query only.</td>
</tr>
<tr>
<td>Syntax</td>
<td>:CALCulate:DATA:WDM[:ALL]:CHANnel?</td>
</tr>
<tr>
<td>Parameter(s)</td>
<td>None.</td>
</tr>
<tr>
<td>Response Syntax</td>
<td>CH,NBR,TRACE#,ID,WL_GRID,&lt;Unit&gt;,WL_CHAN,&lt;Unit&gt;,DWL,&lt;Unit&gt;,IL_GRID,&lt;Unit&gt;,IL_CHAN,&lt;Unit&gt;,{&lt;Channel number value&gt;,&lt;Trace ID value&gt;,&lt;WL Grid Value&gt;,&lt;WL chan Value&gt;,&lt;DWL Value&gt;,&lt;IL Grid Value&gt;,&lt;IL Chan Value&gt;}</td>
</tr>
<tr>
<td>Response(s)</td>
<td>The analysis results are described in Analyzing Channel Detection Results on page 148.</td>
</tr>
<tr>
<td>Example(s)</td>
<td>:CALC:DATA:WDM:CHAN? returns</td>
</tr>
</tbody>
</table>

### :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 171) for all analyzed traces.

**Applicability**  
This query is only available if :CALCulate:MODe on page 347 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,<RippleUnit>,ADJ.ISO.,<Adjacent Isolation Unit>,NON-ADJ.ISO.,<Non Adjacent Isolation Unit>,TOTALXTALK,<Total Crosstalk Unit>,{<Channel Number Value>,<Trace ID value>,<Slope Value>,<Ripple Value>,<Adjacent Isolation Value>,<Non Adjacent Isolation Value>,<Total Crosstalk Value>}

**Response(s)**  
The analysis results are described in Analyzing WDM Filter Test Results on page 171.

**Example(s)**  
:CALC:DATA:WDM:IMEAS? returns  
CH,NBR,TRACE#,ID,SLOPE,0.0000,-,RIPPLE,0.0000,ADJ.ISO.,1.1000,NON-ADJ.ISO.,1.2000,TOTALXTALK,1.3000,{2,3,1;3,2,1;1;5,1;1,1,1,1,1,1,1}

2,-1.04800000E-001,+0.00000000E+000,+1.00000000E-002,+6.289 0000E+000,+6.46000000E+001,+6.29700000E+001,+6.49700000E+001+E+001,+5.69500000E+001,+5.91600000E+001
**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 153) for all analyzed traces.

**Applicability**
This query is only available if :CALCulate:MODe on page 347 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>,DWL3@zz.zzdB,<Unit>,{<Channel Number Value>,<Trace ID Value>,<WL1@xx.xxdBValue>,<WL2@yy.yydBValue>,<WL3@zz.zzdBValue>}

**Response(s)**
The analysis results are described in *Analyzing WDM Filter Test Results* on page 171.

**Example(s)**
:CALC:DATA:WDM:SW? returns
CH,NBR,TRACE#,ID,DWL1@1.00DB,M,DWL2@3.00DB,M,DWL3@2.00DB,M,2,3,1;3;2;1,1;5;1;1,+1.69607000E-008,+1.70329000E-008,+1.75082000E-008,+1.76346000E-008,+2.00902000E-008,+2.04797000E-008,+2.10696000E-008,+2.11014000E-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 148) for the given grid channel. |
| **Applicability** | This query is only available if :CALCulate:MODe on page 347 is set to WPCT. |
| **Type** | Overlapping, query only. |
| **Syntax** | :CALCulate:DATA:WDM:CH:CHANnel? <wsp> <channel> |
| **Parameter(s)** | channel |
| **Response Syntax** | CH,NBR,TRACE#,ID,WL_GRID,<Unit>,WL_CHAN,<Unit>,DWL,<Unit>,IL_GRID,<Unit>,IL_CHAN,<Unit>,{<Channel number value>,<Trace ID value>,<WL Grid Value>,<WL chan Value>,<DWL Value>,<IL Grid Value>,<IL Chan Value>} |
| **Response(s)** | The analysis results are described in Analyzing Channel Detection Results on page 148. |
::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 171) for the given grid channel.

**Applicability**
This query is only available if ::CALCulate::MODe on page 347 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>, {<Channel Number Value>, <Trace ID value>, <Slope Value>, <Ripple Value>, <Adjacent Isolation Value>, <Non Adjacent Isolation Value>, <Total Crosstalk Value>}

**Response(s)**
The analysis results are described in *Analyzing WDM Filter Test Results* on page 171.

**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+00, +6.28900000E+001, +6.29700000E+001, +5.69500000E+001
: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 153) for the given grid channel.

**Applicability**
This query is only available if :CALCulate:MODE on page 347 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>, DWL3@zz.zzdB, <Unit>, {<Channel Number Value>, <Trace ID Value>, <WL1@xx.xxdBValue>, <WL2@yy.yydBValue>, <WL3@zz.zzdBValue>}

**Response(s)**
The analysis results are described in *Analyzing WDM Filter Test Results* on page 171.

**Example(s)**
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 section describes the instrument specific errors (-399 to -300).

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

<table>
<thead>
<tr>
<th>Error number</th>
<th>Description</th>
<th>Probable cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>-300</td>
<td>&quot;Device-specific error&quot;</td>
<td>This is the generic device-dependent error for devices that cannot detect more specific errors. This code indicates only that a Device-Dependent Error as defined in IEEE 488.2, 11.5.1.1.6 has occurred.</td>
</tr>
<tr>
<td>-301</td>
<td>&quot;CTP10 Scan State Busy&quot;</td>
<td>The CTP10 is still scanning, stopping or aborting and is not in an idle state.</td>
</tr>
<tr>
<td>-302</td>
<td>&quot;CTP10 Internal Timeout&quot;</td>
<td>The command did not execute in the allowed period of time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This error appears if you have launched an analysis (:CALCulate[:IMMediate] on page 341) that takes more than 30 seconds: in this case, you should not take this error into account.</td>
</tr>
<tr>
<td>-303</td>
<td>&quot;Identifier does not match any trace&quot;</td>
<td>There is no trace associated with this identifier.</td>
</tr>
<tr>
<td>-304</td>
<td>&quot;No data available&quot;</td>
<td>There is no data available for this trace.</td>
</tr>
<tr>
<td>-305</td>
<td>&quot;File save error&quot;</td>
<td>An error occurred while saving the file.</td>
</tr>
<tr>
<td>-306</td>
<td>&quot;Subsystem settings error&quot;</td>
<td>The settings are inadequate.</td>
</tr>
<tr>
<td>-307</td>
<td>&quot;Subsystem reference error&quot;</td>
<td>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.</td>
</tr>
<tr>
<td>-308</td>
<td>&quot;Subsystem laser error&quot;</td>
<td>A laser is missing, not connected or locked.</td>
</tr>
<tr>
<td>-309</td>
<td>&quot;Laser identifier error&quot;</td>
<td>There is no laser for the given identifier.</td>
</tr>
<tr>
<td>-310</td>
<td>&quot;Zeroing error&quot;</td>
<td>An error occurred during the zeroing of the detector. Maybe too much light on the input.</td>
</tr>
<tr>
<td>-311</td>
<td>&quot;Cannot do zeroing&quot;</td>
<td>There is no module or the module is initializing or there is no detector to zero.</td>
</tr>
<tr>
<td>-312</td>
<td>&quot;Cannot switch&quot;</td>
<td>There is no module or the module is initializing or this is not an FBC module.</td>
</tr>
<tr>
<td>-313</td>
<td>&quot;Cannot set averaging time&quot;</td>
<td>There is no module or the module is initializing or this is not a module with a detector.</td>
</tr>
<tr>
<td>-314</td>
<td>&quot;Command not available for this module&quot;</td>
<td>The module does not offer the functionality.</td>
</tr>
<tr>
<td>-315</td>
<td>&quot;Module not ready&quot;</td>
<td>There is no module in the given slot, the module is not locked or the module is initializing.</td>
</tr>
<tr>
<td>Error number</td>
<td>Description</td>
<td>Probable cause</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>-316</td>
<td>&quot;File load error&quot;</td>
<td>The file does not exist or the file format is not good.</td>
</tr>
<tr>
<td>-317</td>
<td>&quot;Wavelength referencing error&quot;</td>
<td>The gas cell or the expected peaks are not properly detected, or the detector is not properly configured.</td>
</tr>
<tr>
<td>-318</td>
<td>&quot;Cannot read switch&quot;</td>
<td>There is no module or the module is initializing or the module is not an FBC module.</td>
</tr>
<tr>
<td>-319</td>
<td>&quot;Cannot do selftest&quot;</td>
<td>There is no module or the module is initializing.</td>
</tr>
<tr>
<td>-320</td>
<td>&quot;Laser identity unavailable&quot;</td>
<td>There is no laser connected, the connection is not open or there is a connection error.</td>
</tr>
<tr>
<td>-321</td>
<td>&quot;Laser already connected&quot;</td>
<td>The laser is already connected to another input.</td>
</tr>
<tr>
<td>-322</td>
<td>&quot;Cannot add the trace&quot;</td>
<td>The maximum number of traces has been reached.</td>
</tr>
<tr>
<td>-323</td>
<td>&quot;Not available in this laser sharing mode&quot;</td>
<td>The command cannot be executed in laser sharing mode.</td>
</tr>
<tr>
<td>-324</td>
<td>&quot;Laser sharing communication error&quot;</td>
<td>An error occurred while trying to connect to a remote CTP10 in laser sharing mode.</td>
</tr>
<tr>
<td>-325</td>
<td>&quot;Invalid port number&quot;</td>
<td>The Controller or Distributed port is not valid for laser sharing configuration.</td>
</tr>
<tr>
<td>-326</td>
<td>&quot;Invalid IP address&quot;</td>
<td>The specified IP address is not valid for laser sharing configuration.</td>
</tr>
<tr>
<td>-327</td>
<td>&quot;Remote CTP10 is already in use&quot;</td>
<td>The remote CTP10 is already used in laser sharing mode (Controller or Distributed)</td>
</tr>
<tr>
<td>-328</td>
<td>&quot;Remote CTP10 is busy&quot;</td>
<td>Cannot connect to the remote CTP10 in laser sharing mode because the CTP10 is scanning or analyzing.</td>
</tr>
<tr>
<td>-329</td>
<td>&quot;Cannot open connection while scanning with an electrical trigger method&quot;</td>
<td>The CTP10 is scanning with an electrical trigger method, which is not compatible with laser sharing mode.</td>
</tr>
<tr>
<td>-330</td>
<td>&quot;Incompatible laser sharing protocol version&quot;</td>
<td>Cannot connect to the remote CTP10 because the version of its protocol is not compatible.</td>
</tr>
<tr>
<td>-350</td>
<td>&quot;Error Queue overflow&quot;</td>
<td>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.</td>
</tr>
</tbody>
</table>
### CHINESE REGULATION ON RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS)

**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

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Lead (Pb)</th>
<th>Mercury (Hg)</th>
<th>Cadmium (Cd)</th>
<th>Hexavalent Chromium (Cr(VI))</th>
<th>Polybrominated Biphenyls (PBB)</th>
<th>Polybrominated Diphenyl Ethers (PBDE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Electronic and electrical sub-assembly</td>
<td>X</td>
<td>0</td>
<td>X</td>
<td>0</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Optical sub-assembly</td>
<td>X</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical sub-assembly</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note:**

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Environmental protection uses period (years)</th>
<th>Logo</th>
</tr>
</thead>
<tbody>
<tr>
<td>This EXFO product</td>
<td>10</td>
<td><img src="image" alt="Logo" /></td>
</tr>
<tr>
<td>Battery</td>
<td>5</td>
<td><img src="image" alt="Logo" /></td>
</tr>
</tbody>
</table>

a. If applicable.

如果适用。