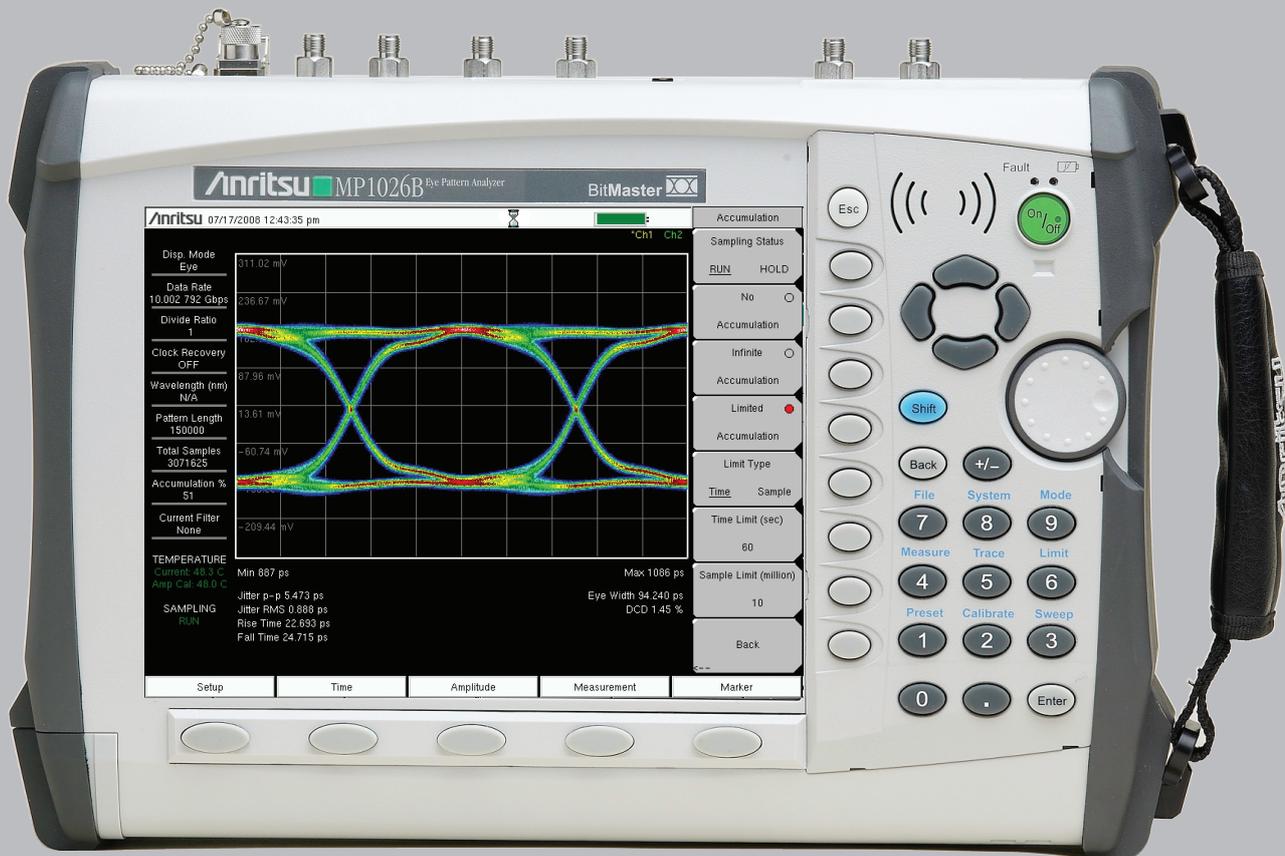


# Bit Master

## MP1026B Eye Pattern Analyzer





**Programming Manual**

# **Bit Master MP1026B**

**Eye Pattern Analyzer**

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**Manufacturer's Name:** ANRITSU COMPANY

**Manufacturer's Address:** Microwave Measurements Division  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
USA

declares that the product specified below:

**Product Name:** Eye Pattern Analyzer

**Model Number:** MP1026B

conforms to the requirement of:

EMC Directive: 2004/108/EC  
Low Voltage Directive: 2006/95/EC

## **Electromagnetic Compatibility: EN61326:1997**

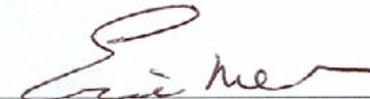
Emissions: EN55011: 2007 Group 1 Class A

Immunity: EN 61000-4-2:1995 +A1:1998 +A2:2001 4kV CD, 8kV AD  
EN 61000-4-3:2002 +A1:2002 3V/m  
EN 61000-4-4:2004 0.5kV SL, 1kV PL  
EN 61000-4-5:2006 0.5kV L-L, 1kV L-E  
EN 61000-4-6: 2007 3V  
EN 61000-4-11: 2004 100% @ 20msec

## **Electrical Safety Requirement:**

Product Safety: EN 61010-1:2001

Morgan Hill, CA

  
Eric McLean, Corporate Quality Director

05 Sept 08  
Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close, Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)

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Equipment marked with the Crossed-out Wheelie Bin symbol complies with the European Parliament and Council Directive 2002/96/EC (the "WEEE Directive") in the European Union.



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## Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

### Symbols Used in Manuals

#### Danger



This indicates a very dangerous procedure that could result in serious injury or death, and possible loss related to equipment malfunction, if not performed properly.

#### Warning



This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

#### Caution



This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

### Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.



## For Safety

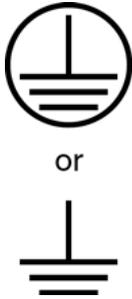
### Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

### Warning



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

### Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

### Warning



Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

### Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

---

**Warning**



Laser radiation may be present at fiber-optic cable connectors and ports. This laser radiation could present a severe ocular hazard from either direct viewing or by diffuse reflection. Do not view the emitted laser radiation directly or indirectly because permanent blindness may result.



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# Chapter 1 — General Programming Information

## 1-1 About this Programming Manual

This manual contains descriptions of the remote commands that are available for the Anritsu line of Master™ products. While it does reference the equivalent front-panel interface for each command, it does not provide a complete front panel reference. Please refer to the appropriate product User Guide or Operations Manual for that information.

### References

IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols, and Common Commands for Use with ANSI/IEEE Std 488.1-1987. IEEE, New York, NY, 1992.

SCPI Standard-1999, Standard Commands for Programmable Instruments Volume 1: Syntax and Style. SCPI Consortium, San Diego, CA, 1999.

MP1026B Bit Master User Guide (document #10580-00217). Anritsu Company, Morgan Hill, CA, 2007.

NI-VISA User Manual (document #370423A-01). National Instruments Corporation, Austin, TX, 2001.

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### Firmware Revisions

To check your current firmware revision, press **Shift-8** (System), **Status**. Remote commands are available beginning with Base Version 1.61. They are available in the applications beginning with the following firmware revisions: Bit Master Version 1.25.

## 1-2 Programming Overview

### Controller Interface

The physical interface is the RJ-45 connection on the instrument for 10BASE-T.

Data transfer takes place over Ethernet using TCP/IP and the VXI-11 protocol. In order to communicate with the Bit Master, the PC must have a VXI-11 client implementation either as part of the controller program or using a third party software package on the controlling PC. The sample commands in section [“Examples” on page 2-44](#) of this manual are written using the National Instruments NI-VISA™ product.

### Command Structure

#### Format

The Master™ product line implements a remote interface that is based upon the 1999 SCPI Standard. This is an ASCII-based command set.

Some basic details are described below. For a more detailed description, refer to the SCPI Standard, available for download on the SCPI Consortium Web site.

## Command Tree

SCPI commands are organized in a “tree” structure. The base of the tree is called the “root”. The “branches” are the functional subsystems. Each “branch” can have subbranches. The final node is called the “leaf”. The entire sequence of branches, plus the leaf, make up the command. For example, part of the “DISPlay” branch looks like the following:

```
:DISPlay
  :WINDow
    :Y
      [:SCALe]
        :UNIT
        :BITs
        :DIVision
          :CH1
```

Although they are at different levels in the tree, “UNIT” and “CH1” are both leaves on the tree.

Branches and leaves in the tree can have the same name as long as they appear at different levels. For example, there is a “CH1” leaf at the tip of both of the branches in the following table:

:DISPlay	:DISPlay
:WINDow	:WINDow
:Y	:Y
[:SCALe]	[:SCALe]
:DIVision	:OFFSetS
:CH1	:CH1

## Subsystems

A colon (:) separates each subsystem. For example, the command :CALCulate:MARKer:CH1:AOff turns all markers off for Channel 1. The turn marker off (AOff) is part of the :MARKer subsystem which is part of the :CALCulate subsystem. Center marker is also part of the :CALCulate:MARKer subsystem. It is specified by :CALCulate:MARKer:CH1:CENTer.

## Optional Subsystems

One subsystem at each “tree” level can be specified as optional. That is, the optional subsystem does not need to be specified in order to create a valid command. For example, if the specification is written as [:SENSe]:TIME:CLKRate the :SENSe subsystem is optional. So, both :SENSe:TIME:CLKRate and :TIME:CLKRate are valid commands and have the same result.

## Long Format versus Short Format

Each keyword has a long format and a short format. The input clock rate command can be specified by :SENSe:TIME:CLKRate or :SENS:TIME:CLKR. The capital letters in the command specification indicate the short form of the command.

Only the short form and the long form are acceptable. For example, :SENS:TIME:CLKRate is not an acceptable form of the command.

## Case Sensitivity

Commands are not case sensitive. For example, :SENS:TIME:CLKR 10 GHZ and :sens:time:clkr 10 ghz have the same result. The combination of UPPERCASE and lowercase in this manual is used to display the short format within the long format.

## Parameters

The command and its parameters are separated by a space. Parameters may be specified with optional units, depending on the command.

For example, `:SENS:TIME:CLKR 10 GHZ` sets the input clock rate to 10 GHz.

Multiple parameters are separated by a comma (“,”).

## Query Format

Many commands have a query format that returns a parameter value or other data. For example, `:SENS:TIME:CLKR?` returns the current value of the clock rate.

## Combining Multiple Commands

Multiple commands can be sent together if separated by a semicolon (“;”). For example, `:SENS:DISP:MODE EYE; :CONF:MEAS:TYPE AMPL` would set the display mode to EYE and then set the measurement type to Amplitude.

## Creating Valid Commands

Command Specification	Valid Forms
<code>[[:SENSe]:TIME:CLKRate &lt;freq&gt;</code>	The following all produce equivalent results: <code>:SENSe:TIME:CLKRate 1 GHZ</code> <code>:SENS:TIME:CLKR 1000 MHZ</code> <code>:sense:time:clkr 1000000000 Hz</code> <code>:TIME:CLKR 1000000 KHZ</code>
<code>:CALCulate:MARKer:LOCation:CH1 2:Y1 2 &lt;amplitude&gt;</code>	The first 2 commands set the location of marker for Channel 1. The last 2 commands set the location of marker for Channel 2. <code>:CALC:MARK:LOC:CH1:Y1 100 MV</code> <code>:CALC:MARK:LOC:CH1:Y2 100 MV</code> <code>:CALC:MARK:LOC:CH2:Y1 100 MV</code> <code>:CALC:MARK:LOC:CH2:Y2 100 MV</code>
<code>:CALCulate:MARKer:CH1 2:X1 2 ON OFF 1 0</code>	The following commands are identical: <code>:CALCulate:MARKer:CH1:X1 OFF</code> <code>:CALCulate:MARKer:CH1:X1 0</code>
<code>[[:SENSe]:TIME:DATRRate &lt;bit rate&gt;</code>	The following all produce equivalent results: <code>:SENSe:TIME:DATRRate 5 GBPS</code> <code>:SENS:TIME:DATR 5000 MBPS</code> <code>:sense:time:datr 5000000 KBPS</code> <code>:TIME:DATR 5000000000 BPS</code>

## Command Terminators

The `<new line>` character (ASCII 10) in the last data byte of a command string is used as a command terminator. Use of a command terminator resets the command path to the root of the tree.

## Conventions

The following conventions have been used throughout the document.

## Notational Conventions

This document uses several notational conventions. They are listed in the following table.

:COMMANds:WILL:LOOK:LIKE:THIS	Commands are formatted to differentiate them from text descriptions.
:COMMANd:QUERies:LOOK:LIKE:THIS?	The query form of the command is followed by a “?”
Front panel key sequences use this formatting: <b>Enter</b> Autoscale	Front panel key presses are formatted to differentiate them from text descriptions. Key presses are separated by a comma (“,”).
<identifier>	Identifiers are enclosed in “< >”. They indicate that some type of data must be provided.
	The pipe (“ ”) indicates that a choice must be made.
[optional input]	Optional input is enclosed in “[ ]”.

## Identifiers

The following identifiers have been used throughout the remote command definitions. Descriptions are provided here. In most cases, units are specified with the individual command.

Identifier	Description
<amplitude>	Amplitude value. Units specified with the command.
<freq>	Frequency. Units specified with the command.
<integer>	Integer value, no units. Range specified with the command.
<number>	Numeric value, integer or real.
<percentage>	Percentage value from 0–100. Units are always “%”.
<rel ampl>	Relative amplitude. Units are always dB.
<x-parameter>	Parameter value in the units of the x-axis. Units are specified with the command.
<string>	The string should be enclosed in either single quotes (‘ ’) or double quotes (“ ”).
<file name>	The name should be enclosed in either single quotes (‘ ’) or double quotes (“ ”). The need for an extension is documented with applicable commands.
<voltage>	Voltage. Units specified with the command.
<current>	Current. Units specified with the command.
<time>	Time value. Unit is not specified with the command. It is added by the instrument based on current unit setting.
<bit rate>	Bit rate. Unit specified with the command.

## 1-3 Remote Commands

### IEEE Common Commands

These commands are specified in IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols, and Common Commands for Use with ANSI/IEEE Std 488.1-1987. IEEE, New York, NY, 1992.

#### Identity Query

**\*IDN?**

This command returns the following information in <string> format separated by commas: manufacturer name (“Anritsu”), model number/options, serial number, firmware package number.

Note that the model number and options are separated by a “/”, and each additional option is separated by a “/”.

For example, the return string might look like the following:

```
"Anritsu,MP1026B/3/2,62011032,1.23"
```

#### Reset

**\*RST**

This command restores parameters in the current application (as well as system settings) to their factory default values.

System settings that are affected by this command are Ethernet configuration, language, volume, and brightness.

Note that the Bit Master power cycles after this command is executed.

Front Panel Access:	Shift-8 (System), System Options, Reset, Factory Defaults
See Also:	SYSTem:PRESet

**Note** The best practice when starting any remote program is to reset the instrument to a known state. This is especially important when the instrument is being used in both remote and front-panel operation. Use the **\*RST** or the **:SYSTem:PRESet** command to restore the instrument to the factory default settings.

If using Ethernet to connect to the instrument, note that **\*RST** will reset the Ethernet configuration and cause the instrument to re-boot, which may reset the instrument IP address. If you do not want to power cycle your instrument, then you may prefer to use the **:SYSTem:PRESet** command.

**Caution** Operating the instrument through the front panel and remotely at the same time could, under certain conditions, cause the instrument to hang up. To avoid conflicts, do not mix front-panel operation and remote operation.



# Chapter 2 — Programming Commands

## 2-1 Bit Master Specific Commands

**Note**

The Bit Master must have a clock present and must have the correct clock settings before making any measurements or retrieving any data. Otherwise, any data that is retrieved from the Bit Master may not be valid or may not have the correct format, and messages that are sent to the Bit Master take longer to process.

### :CALCulate Subsystem

The commands in this subsystem process data that have been collected via the :SENSe subsystem.

The following commands are used to manipulate data markers.

#### All Markers Off

**:CALCulate:MARKer:CH1|2:AOFF**

Turns all markers off.

Front Panel Access:	Marker, All Markers OFF
See Also:	:CONFigure:MEASure:CHANnel 1 2

#### Center Markers

**:CALCulate:MARKer:CH1|2:CENter**

Enables all markers, and centers all markers in the middle of the current display screen. From this default location, the X and Y values are much easier to adjust, as needed for extracting results.

Front Panel Access:	Marker, Center Markers
See Also:	:CONFigure:MEASure:CHANnel 1 2

#### X Marker

**:CALCulate:MARKer:CH1|2:X1|2 ON|OFF|1|0**

**:CALCulate:MARKer:CH1|2:X1|2?**

Enables or disables X1 or X2 marker of active channel.

The query returns current status of X marker.

ON/1: Enable marker

OFF/0: Disable marker

Factory Preset / *RST:	OFF
Front Panel Access:	Marker, X1/X2
See Also:	:CONFigure:MEASure:CHANnel 1 2

**Y Marker**

`:CALCulate:MARKer:CH1|2:Y1|2 ON|OFF|1|0`

`:CALCulate:MARKer:CH1|2:Y1|2?`

Enables or disables Y1 or Y2 marker of active channel.

The query returns current status of Y marker.

ON/1: Enable marker

OFF/0: Disable marker

Factory Preset / *RST:	OFF
Front Panel Access:	Marker, Y1/Y2
See Also:	:CONFigure:MEASure:CHANnel 1 2

**X Marker Location**

`:CALCulate:MARKer:LOCation:CH1|2:X1|2 <time>`

`:CALCulate:MARKer:LOCation:CH1|2:X1|2?`

Sets X1 or X2 marker value. It turns the marker ON if marker status is OFF.

The query returns current X marker value. "Marker Off" is returned if queried marker is disabled.

Factory Preset / *RST:	X1: 0.250, X2: 0.750
Default Unit:	Current time axis unit
Range:	PS: 0 to 4294967295 UI: 0 to 4294967
Front Panel Access:	Marker, X1/X2
See Also:	:CONFigure:MEASure:CHANnel 1 2

**Delta X Marker Location**

`:CALCulate:MARKer:LOCation:CH1|2:XDELta?`

Returns current delta value of X marker. "Marker Off" is returned if one of the queried markers is disabled.

The result is always a positive value.

Default Unit:	Current time axis unit
Front Panel Access:	Marker, X1/X2
See Also:	:CONFigure:MEASure:CHANnel 1 2

### Y Marker Location

`:CALCulate:MARKer:LOCation:CH1|2:Y1|2 <amplitude>`

`:CALCulate:MARKer:LOCation:CH1|2:Y1|2?`

Sets Y1 or Y2 marker value. It turns the marker ON if marker status is OFF.

The query returns current Y marker value. “Marker Off” is returned if queried marker is disabled. The marker location uses mV for Electrical channel and  $\mu$ W for Optical channel. For optical channels, the marker location range value depends upon the conversion gain value (specified by `:CALibrate:CGain <number>`).

Factory Preset / *RST:	Y1: 250 mV, Y2: -250 mV
Default Unit:	Current y-axis unit
Range:	Electrical: -1.00V to 1.00V Optical: range equals electrical range divide by Conversion Gain (V/W)
Front Panel Access:	Marker, Y1/Y2
See Also:	<code>:CONFIGure:MEASure:CHANnel 1 2</code>

### Delta Y Marker Location

`:CALCulate:MARKer:LOCation:CH1|2:YDELta?`

Returns current delta value of Y marker. “Marker Off” is returned if one of the queried markers is disabled. The result is always a positive value.

Default Unit:	Current y-axis unit
Front Panel Access:	Marker, Y1/Y2
See Also:	<code>:CALCulate:MASK:MARGin:TARGet</code> <code>:CALCulate:MASK:MARGin:TARGet?</code> <code>:CALCulate:MASK:MARGin</code> <code>:CALCulate:MASK:MARGin?</code>

The following commands are used to manipulate mask testing:

### Mask Margin Test

`:CALCulate:MASK:MARGin:TEST`

Runs the mask margin test. Puts the instrument on hold after the test is complete. Note that the instrument must be set to mask measurement before running the mask margin test.

Front Panel Access:	<b>Measurement</b> , Mask Test, Mask Margin Test
See Also:	<code>:CALCulate:MASK:MARGin:TARGet</code> <code>:CALCulate:MASK:MARGin:TARGet?</code> <code>:CALCulate:MASK:MARGin</code> <code>:CALCulate:MASK:MARGin?</code>

### Mask Margin Target Failed Samples

`:CALCulate:MASK:MARGIN:TARGet <number>`

`:CALCulate:MASK:MARGIN:TARGet?`

Sets the target failed samples for the mask margin test.

The query returns the current target failed samples.

Factory Preset / *RST:	1
Range:	1 to 1 000 000 000 000 000
Front Panel Access:	<b>Measurement</b> , Mask Test, Target Failed Samples
See Also:	:CALCulate:MASK:MARGIN:TEST :CALCulate:MASK:MARGIN :CALCulate:MASK:MARGIN?

### Update Mask

`:CALCulate:MASK:UPDate`

Updates the location of the mask based on the current eye pattern properties (One and Zero levels, Crossing Points). Note that the unit must be set to mask measurement before updating the mask.

Front Panel Access:	<b>Measurement</b> , Mask Test, Update Mask
---------------------	---

### Mask Margin

`:CALCulate:MASK:MARGIN <number>`

`:CALCulate:MASK:MARGIN?`

Sets the mask margin percentage.

The query returns the current mask margin percentage.

Factory Preset / *RST:	0
Range:	-100 to +100
Front Panel Access:	<b>Measurement</b> , Mask Test, Mask Margin
See Also:	:CONFigure:MEASure:CHANnel 1 2

The following commands are used to manipulate channel math:

## Channel Math

`:CALCulate:MATH ON|OFF|1|0`

`:CALCulate:MATH?`

Turns channel math on or off.

The query returns the current status of channel math.

Factory Preset / *RST:	OFF
Range:	ON (1), OFF (0)
Front Panel Access:	<b>Shift-5</b> (Trace), Math
See Also:	:CALCulate:MATH:FUNction :CALCulate:MATH:FUNction? :CALCulate:MATH:DIVision :CALCulate:MATH:DIVision? :CALCulate:MATH:OFFsets :CALCulate:MATH:OFFsets?

## Channel Math Function

`:CALCulate:MATH:FUNction CH1+CH2|CH1-CH2|CH2-CH1`

`:CALCulate:MATH:FUNction?`

Sets the channel math function to be used.

The query returns the current channel math function.

Please note that channel math must be on in order to set the channel math function.

Factory Preset / *RST:	CH1 + CH2
Range:	CH1 + CH2, CH1 – CH2, CH2 – CH1
Front Panel Access:	<b>Shift-5</b> (Trace), Define Function
See Also:	:CALCulate:MATH :CALCulate:MATH? :CALCulate:MATH:DIVision :CALCulate:MATH:DIVision? :CALCulate:MATH:OFFsets :CALCulate:MATH:OFFsets?

### Channel Math Division

`:CALCulate:MATH:DIVision <amplitude>`

`:CALCulate:MATH:DIVision?`

Sets the y-axis scale division for channel math.

The query returns the current channel math y-axis scale division.

Please note that channel math must be on in order to set the channel math scale division.

Factory Preset / *RST:	125.00 mV
Default Unit:	Current y-axis unit
Range:	Electrical: 1.0 mV to 250.0 x [10 <sup>(attenuation/20)</sup> ] mV Optical: range equals electrical range divided by Conversion Gain (V/W)
Front Panel Access:	<b>Shift-5</b> (Trace), Math Scale
See Also:	:CALCulate:MATH :CALCulate:MATH? :CALCulate:MATH:FUNCTion :CALCulate:MATH:FUNCTion? :CALCulate:MATH:OFFSet :CALCulate:MATH:OFFSet?

### Channel Math Offset

`:CALCulate:MATH:OFFSet <amplitude>`

`:CALCulate:MATH:OFFSet?`

Sets the y-axis offset for channel math.

The query returns the current channel math y-axis offset.

Please note that channel math must be on in order to set the channel math offset.

Factory Preset / *RST:	0 mV
Default Unit:	Current y-axis unit
Range:	Electrical: -501.0 mV to +501.0 mV Optical: offset equals electrical offset divided by Conversion Gain (V/W)
Front Panel Access:	<b>Shift-5</b> (Trace), Math Offset
See Also:	:CALCulate:MATH :CALCulate:MATH? :CALCulate:MATH:FUNCTion :CALCulate:MATH:FUNCTion? :CALCulate:MATH:DIVision :CALCulate:MATH:DIVision?

## :CALibration Subsystem

This subsystem controls the system calibration.

### Calibrate Amplitude

**:CALibrate:AMPLitude**

Initiates an amplitude calibration for both Channel 1 and Channel 2. The calibration could take more than 30 seconds. The calibration result is returned after the command is completed.

Front Panel Access:	Shift-2 (calibrate), Calibrate Amplitude
---------------------	--

### Calibrate Conversion Gain (V/W)

**:CALibrate:CGain <number>**

**:CALibrate:CGain?**

Sets transimpedance gain value of O/E module.

The query returns the current value for conversion gain.

Range:	1 to 9999
Front Panel Access:	Shift-2 (calibrate), Conversion Gain (V/W)

### Calibrate O/E Power

**:CALibrate:OEPower**

Executes a calibration of the O/E module. The calibration result is returned after the command is completed.

Front Panel Access:	Shift-2 (calibrate), Calibrate O/E Power
---------------------	--

### Calibrate Responsivity (A/W)

**:CALibrate:RESPonsivity <number>**

**:CALibrate:RESPonsivity?**

Sets responsivity value for O/E module. The value is used for average optical power measurement.

The query returns current value for responsivity.

Range:	0.001 to 9999
Front Panel Access:	Shift 2 (calibrate), Responsivity (A/W)

## Calibrate System Conversion Gain (V/W)

`:CALibrate:CGain:SYSTem <number>`

`:CALibrate:CGain:SYSTem?`

Sets the system conversion gain value of the O/E module.

The query returns the current value for system conversion gain.

Factory Preset / *RST:	411
Range:	1 to 9999
Front Panel Access:	<b>Amplitude</b> , O/E Configuration, Sys Conv Gain (V/W)

## Calibrate Pick-Off Tee

`:CALibrate:CGain:SYSTem:PTEE ON|OFF|1|0`

`:CALibrate:CGain:SYSTem:PTEE?`

Sets the pick-off tee parameter to on or off. When the parameter is set to on, the system accounts for the loss in the external pick-off tee being used.

The query returns the current status of the pick-off tee.

Factory Preset / *RST:	OFF
Range:	ON (1), OFF (0)
Front Panel Access:	<b>Amplitude</b> , O/E Configuration, Pick-Off Tee

## Calibrate ER Correction

`:CALibrate:ERCorrection ON|OFF|1|0`

`:CALibrate:ERCorrection?`

Turns ER correction on or off. ER correction compensates for the O/E module frequency response during the Extinction Ratio measurements. The system uses the appropriate correction factor based on the filter selected (refer to `:CONFigure:FILTER:TYPE <integer>`). The correction factor can be over-riden by using the command `:CALibrate:ERCorrection:FACTor <number>`.

The query returns the current status of the ER Correction.

Factory Preset / *RST:	OFF
Range:	ON (1), OFF (0)
Front Panel Access:	<b>Amplitude</b> , O/E Configuration, ER Correction

## Calibrate ER Correction Factor

**:CALibrate:ERCorrection:FACTOR <number>**

**:CALibrate:ERCorrection:FACTOR?**

Sets the ER correction factor for the O/E module. This setting overrides the default correction factor associated with the filter selection.

The query returns the current value of ER correction.

Factory Preset / *RST:	0
Range:	0 to 100
Front Panel Access:	<b>Amplitude</b> , O/E Configuration, ER Corr Factor

## :DISPlay Subsystem

This subsystem provides commands that modify the display of data for the user. They do not modify the way in which data are returned to the controller.

### Clear Display

**:DISPlay:WINDow:GRAPhics:CLEar**

Clears graphic display on screen.

Front Panel Access:	Setup, Clear Display
---------------------	----------------------

### Autoscale

**:DISPlay:WINDow[:SCALE]:AUTOscale**

Rescales the eye pattern display to the proper amplitude and time scale so that the eye pattern is centered on the screen.

This command is only valid for Eye pattern display mode.

Front Panel Access:	Setup, Autoscale
---------------------	------------------

### Bits

**:DISPlay:WINDow:X[:SCALE]:BITS <integer>**

**:DISPlay:WINDow:X[:SCALE]:BITS?**

Sets the number of bits that are displayed on the screen.

The query returns current bits setting.

Factory Preset / *RST:	2
Range:	1 to 65535
Front Panel Access:	Time, Bits

### X Offset

`:DISPlay:WINDow:X[:SCALE]:OFFSetS <number>`

`:DISPlay:WINDow:X[:SCALE]:OFFSetS?`

Sets the amount of horizontal (time) shift that is applied to the display. The units of the shift are either UI or picoseconds (ps) depending upon the instrument setting (specified by `:DISPlay:WINDow:X[:SCALE]:UNIT UI|PS`).

The query returns current X offset.

Factory Preset / *RST:	0
Range (when units are UI):	0 to 16777216
Range (when units are ps):	Offset (in UI) / Date-Rate (in Tbps or 1000 Gbps)
Front Panel Access:	Time, Offset

### Time Axis Unit

`:DISPlay:WINDow:X[:SCALE]:UNIT UI|PS`

`:DISPlay:WINDow:X[:SCALE]:UNIT?`

Sets time axis unit.

The query returns current time units.

UI: unit interval. A “unit interval” is a bit period.

PS: units of picoseconds

Factory Preset / *RST:	UI
Front Panel Access:	Time, Unit

## Y Scale

```
:DISPlay:WINDow:Y[:SCALE]:DIVision:CH1|2? <amplitude>
```

```
:DISPlay:WINDow:Y[:SCALE]:DIVision:CH1|2?
```

Sets value of Y-axis scale for Channel 1 or Channel 2.

The query returns current Y-axis scale.

The unit that must follow the amplitude value depends on the current setting of the active channel (specified by [:SENSe]:INPut:CH1|2 ELECTRical|OPTical|OFF). The setting can be Electrical or Optical. The scale uses mV for Electrical channel and  $\mu$ W for Optical channel. Maximum scale value depends on the attenuation setting for each channel (specified by [:SENSe]:INPut:ATTenuation:CH1|2 <rel amp1>). Optical scale value depends on conversion gain value (specified by :CALibrate:CGain <number>).

Factory Preset / *RST:	125 mV
Default Unit:	Current amplitude unit
Range:	Electrical: 1.0 mV to $250.0 \times [10^{(\text{attenuation}/20)}]$ mV Optical: range equals electrical range divided by Conversion Gain (V/W)
Front Panel Access:	Amplitude, Scale
See Also:	:SENSe]:INPut:CH1 2 ELECTRical OPTical OFF

## Y Offset

```
:DISPlay:WINDow:Y[:SCALE]:OFFSets:CH1|2 <amplitude>
```

```
:DISPlay:WINDow:Y[:SCALE]:OFFSets:CH1|2?
```

Sets Y-axis offset value for Channel 1 or Channel 2.

The query returns current y-axis offset.

The unit that must follow the amplitude value depends on the current setting of the active channel (specified by [:SENSe]:INPut:CH1|2 ELECTRical|OPTical|OFF). The setting can be Electrical or Optical. The offset uses mV for Electrical channel and  $\mu$ W for Optical channel. The optical scale value depends on the conversion gain value (specified by :CALibrate:CGain <number>).

Factory Preset / *RST:	0
Default Unit:	Current amplitude unit
Range:	Electrical: -500.0 mV to +500.0 mV Optical: offset equals electrical offset divided by Conversion Gain (V/W)
Front Panel Access:	Amplitude, Offset
See Also:	[:SENSe]:INPut:CH1 2 ELECTRical OPTical OFF

## :INSTRument Subsystem

One instrument may contain many logical instruments (“modes”). This subsystem controls the selection of the current instrument mode.

### Query Available Modes

**:INSTRument:CATalog:FULL?**

Returns a comma-separated list of available modes. Mode names are enclosed in double quotes (“”). Immediately following the string name is the application number.

For example: "SCOPE"17

Front Panel Access:	Shift-9 (Mode)
---------------------	----------------

### Select Mode by Number

**:INSTRument:NSElect <integer>**

**:INSTRument:NSElect?**

Sets the instrument mode based on the value of <integer>.

The query version returns the number that is associated with the current mode.

Use **:INSTRument:CATalog:FULL?** to get a list of available mode names and their integer representations.

Factory Preset / *RST:	17
Front Panel Access:	Shift-9 (Mode)
See Also:	:INSTRument:CATalog:FULL? :INSTRument[:SElect]

### Select Mode by Name

**:INSTRument[:SElect] <string>**

**:INSTRument[:SElect]?**

Sets the instrument mode based on the mode name specified by <string>.

The query version returns the name of the current mode.

Use **:INSTRument:CATalog:FULL?** to get a list of available modes.

Factory Preset / *RST:	"SCOPE"
Front Panel Access:	Shift-9 (Mode)
See Also:	:INSTRument:CATalog:FULL? :INSTRument:NSElect

## :MMEMory Subsystem

The Mass MEMory subsystem contains functions that provide access to the instrument setup and data storage.

### Transfer Data

**:MMEMory:DATA? <file name>**

Transfers the data stored in the given file from the instrument to the controlling program. Data is transferred in the form of <header><block>. The ASCII <header> specifies the number of data bytes. It looks like #AX, where A is the number of digits in X, and X is the number of bytes in <block>. <file name> should be enclosed in either single quotes ( ' ) or double quotes ( " ) and should contain a file extension (.jpg, for example). The file must not be larger than 524288 bytes. Use the command :MMEMory:MSIS to set the current storage location.

Front Panel Access:	NA
See Also:	:MMEMory:MSIS INTernal CFLash USB

### Delete Setup/Measurement

**:MMEMory:DELeTe <file name>**

Deletes the measurement or setup file specified by <file name>.

<file name> should be enclosed in either single quotes ( ' ) or double quotes ( " ) and should contain a file extension ".stp" for setup and ".scope" for measurement.

Front Panel Access:	Shift-7 (File), Delete, Delete Selected File
See Also:	:MMEMory:STORE:STATe :MMEMory:STORE:MData

### Format Storage Device

**:MMEMory:INITialize [CFLash]**

Formats the compact flash. Issuing this command erases all files on an installed Compact Flash module and creates the /usr directory for storage of measurements, setups, and jpg files.

Front Panel Access:	Shift-7 (File), Directory Management, Format Compact Flash
---------------------	--

### Recall Measurement Data

**:MMEMory:LOAD:MData <integer>, <file name>**

Recalls the measurement data from the file specified by <file name>.

<file name> should be enclosed in either single quotes ( ' ) or double quotes ( " ) and should contain a file extension ".scope".

The <integer> parameter is not currently used, but it must be sent. Send a 1.

Front Panel Access:	Shift-7 (File), Recall, Recall Measurement
See Also:	:MMEMory:STORE:MData

## Recall Setup

**:MMEMory:LOAD:STATe** <integer>, <file name>

Loads the current setup from the file specified by <file name>.

<file name> should be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and should include the extension “.stp”.

The <integer> parameter is not currently used, but it must be sent. Send a value of 1.

Front Panel Access:	Shift-7 (File), Recall, Recall Setup
See Also:	:MMEMory:STORE:STATe

## Storage Location

**:MMEMory:MSIS** INTernal | CFLash | USB

**:MMEMory:MSIS?**

Sets the storage location.

Setting the storage location to INTernal sets the current storage location to be the internal memory.

Setting the storage location to CFLash sets the current storage location to be the Compact Flash memory.

Setting the storage location to USB sets the current storage location to be the USB Flash drive memory, if supported by the instrument hardware.

Note that changing the current location causes the “Copy To Destination” on the front panel to be automatically changed if the “Copy To Destination” location is the same as the selected current storage location.

Note that the storage location must be available in order for it to be set.

Front Panel Access:	Shift-7 (File), Directory Management, Current Location
See Also:	:MMEMory:MSIS:DESTination

## Copy From Current Location To Destination

**:MMEMory:MSIS:COPY**

Copies all measurements, setups, and jpg files that are stored in the current storage location to the “copy to destination” location.

Front Panel Access:	Shift-7 (File), Directory Management, Copy From Current Location To Destination
See Also:	:MMEMory:MSIS :MMEMory:MSIS:DESTination

## Copy to Destination

**:MMEMory:MSIS:DESTination INTernal | CFLash | USB**

**:MMEMory:MSIS:DESTination?**

Sets the destination to where measurements and setups in the current storage location are copied.

Setting the location to `INTernal` results in copying the files that are stored at the current storage location to the internal memory when the command `:MMEMory:MSIS:COPY` is sent.

Setting the location to `CFLash` results in copying the files that are stored at the current storage location to the Compact Flash memory when the command `:MMEMory:MSIS:COPY` is sent.

Setting the storage location to `USB` results in copying the files that are stored at the current storage location to the USB flash drive memory (if supported by the instrument hardware) when the command `:MMEMory:MSIS:COPY` is sent.

Note that changing the destination to which the instrument copies files, automatically changes the “Current Location” on the front panel if the current location is the same as the selected copy to destination.

Front Panel Access:	Shift-7 (File), Directory Management, Copy To Destination
See Also:	:MMEMory:MSIS :MMEMory:MSIS:COPY

## Save Measurement

**:MMEMory:STORe:MData <integer>, <file name>**

Stores the current measurement data into the file specified by `<file name>`.

`<file name>` should be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and should not contain a file extension.

The `<integer>` parameter is not currently used, but it must be sent. Send a value of 1.

Front Panel Access:	Shift-7 (File), Save, Save measurement
See Also:	:MMEMory:LOAD:MData

## Save Setup

**:MMEMory:STORe:STATe <integer>, <file name>**

Stores the current setup into the file specified by `<file name>`.

`<file name>` should be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and should not contain a file extension.

The `<integer>` parameter is not currently used, but it must be sent. Send a value of 0.

Front Panel Access:	Shift-7 (File), Save, Save Setup
See Also:	:MMEMory:LOAD:STATe

## Save Screen as JPEG

**:MMEMory:STORe:JPEG** <file name>

Saves the current screen measurement as a JPEG file, which is specified by <file name> with the extension .jpg to the current storage location.

<file name> should be enclosed in either single quotes (‘ ’) or double quotes (“ ”) and should not contain a file extension.

Use the command **:MMEMory:MSIS** to set the current storage location.

Front Panel Access:	<b>Shift-7 (File), Save, Save Screen as JPEG</b>
Example:	To save the screen into the file name "trace": <b>:MMEMory:STORe:JPEG "trace"</b>
See Also:	<b>:MMEMory:DATA?</b> <b>:MMEMory:MSIS INTernal   USB   CFLash</b>

## [:SENSe] Subsystem

The commands in this subsystem relate to device-specific parameters, not signal-oriented parameters.

### Average Power Unit

`[:SENSe]:AVEPower:UNIT mW|dBm`

`[:SENSe]:AVEPower:UNIT?`

Sets the unit type for the average power reading in the amplitude measurement. This setting does not affect the eye pattern scale units.

The query returns the current average power unit type.

Factory Preset / *RST:	mW
Range:	mW, dBm
Front Panel Access:	<b>Shift-8</b> (System), Application Options, Measurement Options, Avg Pwr Unit

### CRU Loop Bandwidth

`[:SENSe]:INPut:CLKRecovery:BANDwidth 1|2|4|8`

`[:SENSe]:INPut:CLKRecovery:BANDwidth?`

Sets the CRU loop bandwidth for the > 8.5 G CRU setting.

The query returns the current CRU loop bandwidth.

Factory Preset / *RST:	4
Range:	1, 2, 4, 8
Front Panel Access:	<b>Setup</b> , CRU Setup
See Also:	<code>[:SENSe]:INPut:CLKRecovery OFF LESS27 85</code>

### Display Mode

`[:SENSe]:DISPlay:MODE EYE|PULSe`

`[:SENSe]:DISPlay:MODE?`

Sets the display mode. System defines two display modes: Eye pattern and Pulse pattern. Command `:CONFigure:MEASure:TYPE AMPLitude|TIME` could change the setting.

The query returns current display mode.

Factory Preset / *RST:	Eye
Front Panel Access:	Setup, Display Mode
See Also:	<code>:CONFigure:MEASure:TYPE AMPLitude TIME HISTogram MASK OFF</code>

## [:SENSe]:ACCUmulation Subsystem

Commands in this subsystem relate to the setup of parameters related to the sampling and accumulation of data.

### Accumulation Limit

**[:SENSe]:ACCUmulation:LIMit TIME|SAMPlE, <number>**

**[:SENSe]:ACCUmulation:LIMit?**

Sets limit type and number of the limit for Limited Accumulation.

The query returns current accumulation limit type and its value.

**TIME:** Accumulation is limited by time.

**SAMPlE:** Accumulation is limited by sample.

**Number:** Integer value of time in seconds for TIME limit or real number of samples in millions for SAMPLES limit.

The unit of number (second or million) does not need to be specified with the command. The command treats it as seconds for Time limit and as million samples for Sample limit.

This command clears data and restarts an accumulation if current Sampling Status is set to RUN. After the limit selected is reached, accumulation stops.

The query returns current accumulation limit type and its value.

Factory Preset / *RST:	TIME, 60
Default Unit:	Second(s)
Range:	1 to 99999
Front Panel Access:	Setup, Sampling & Accumulation, Limit Type, Time Limit (sec)/Sample Limit (million)
See Also:	: [SENSe]:Accumulation:TYPe : [SENSe:] SAMPling:STATus

### Sampling Status

**[:SENSe]:SAMPling:STATus RUN|HOLD**

**[:SENSe]:SAMPling:STATus?**

The query returns current sampling status.

**RUN:** Start sampling and update data.

**HOLD:** Stop sampling and keep last data.

FETCh commands can query measurement data at HOLD state. But a MEASure command may lose data at HOLD.

The data is lost if any parameter is changed at HOLD state. New setting is not available until RUN is selected. However, HOLD switches to RUN and stays on RUN if Autoscale command is received.

Factory Preset / *RST:	RUN
Front Panel Access:	Setup, Sampling & Accumulation, Sampling Status
See Also:	: [SENSe]:Accumulation:Limit : [SENSe]:ACCUmulation:TYPe

## Accumulation Type

```
[ :SENSe] :ACCUmulation:TYPE NONE | INFinite | LIMited
```

```
[ :SENSe] :ACCUmulation:TYPE?
```

Sets accumulation type to one of three below:

NONE: data are not accumulated on the screen but are refreshed with every new set of samples.

INFinite: Data are accumulated infinitely on the screen.

LIMited: Data are accumulated on the screen until a limit is reached.

The query returns current accumulation type.

This command clears data and restarts with the current accumulation type, limit type and limit value that are set by Accumulation Limit command : [SENSe] :ACCUmulation:LIMit if current Sampling Status is on RUN. Sampling Status switches from RUN to HOLD after the limit is reached.

The query returns current accumulation type.

Factory Preset / *RST:	NONE
Front Panel Access:	Setup, Sampling & Accumulation, No Accumulation / Infinite Accumulation / Limited Accumulation
See Also:	: [SENSe] :Accumulation:Limit : [SENSe:] SAMPLing:STATus

## [ :SENSe]:HISTogram Subsystem

Commands in this subsystem relate to the setup of values for the histogram window and to histogram measurements.

### Center Histogram

```
[ :SENSe] :HISTogram:CENTer
```

Centers a histogram in the middle of the current display screen. From this default location, it should be much easier to adjust the X and Y values of the histogram window as needed for extracting results.

Front Panel Access:	Measurement, Histogram, Center Histogram
---------------------	--

### Histogram X Marker

```
[ :SENSe] :HISTogram:X1 | 2 <time>
```

```
[ :SENSe] :HISTogram:X1 | 2?
```

Sets the position of the first or second horizontal side of the histogram window.

The query returns marker value.

Factory Preset / *RST:	Current time axis unit
Default Unit:	Current time axis unit
Range:	PS: 0 to 4294967295 UI: 0 to 4294967
Front Panel Access:	Measurement, Histogram, X1/X2
See Also:	: DISPlay:WINDow:X [:SCALe]:UNIT UI   PS : DISPlay:WINDow:X [:SCALe]:UNIT?

## Histogram Y Marker

`[ :SENSe ] :HISTogram:Y1 | 2 <amplitude>`

`[ :SENSe ] :HISTogram:Y1 | 2 ?`

Sets the position of the first or second vertical side of the histogram window.

The query returns marker value. The marker location uses mV for Electrical channel and  $\mu$ W for Optical channel. For Optical channels, the marker location range value depends on the conversion gain value (specified by `:CALibrate:CGain <number>`).

Default Unit:	Current y-axis unit
Range:	Electrical: -1 V to 1 V Optical: range equals electrical range divided by Conversion Gain (V/W)
Front Panel Access:	Measurement, Histogram, Y1/Y2
See Also:	: [SENSe:] INPut:CH1   2 ELECTRical   OPTical   OFF : [SENSe:] INPut: CH1   2 ?

## [ :SENSe ] :INPut Subsystem

Commands in this subsystem relate to the setup of input parameters.

### Channel Attenuation

`[ :SENSe ] :INPut:ATTenuation:CH1 | 2 <rel ampl>`

`[ :SENSe ] :INPut:ATTenuation:CH1 | 2 ?`

Sets input attenuation factor which adjusts the Y-axis (amplitude) scale of Channel 1 or Channel 2.

The query returns current channel attenuation value.

Factory Preset / *RST:	0 dB
Range:	0 to 80 dB
Default Unit:	dB
Front Panel Access:	Amplitude, Attenuation

### Channel Input Type

`[ :SENSe ] :INPut:CH1 | 2 ELECTRical | OPTical | OFF`

`[ :SENSe ] :INPut:CH1 | 2 ?`

Sets input type for Channel 1 or Channel 2. Switching input signals between Electrical and Optical affects amplitude measurement results.

The query returns current channel input type.

Factory Preset / *RST:	Electrical
Front Panel Access:	Setup, Channel 1/Channel 2 Amplitude, Channel 1/Channel 2

## Clock Recovery

`[ :SENSe ] :INPut:CLKRecovery OFF | LESS27 | 98`

`[ :SENSe ] :INPut:CLKRecovery?`

Turns clock recovery on and selects the clock recovery band.

The query returns current setting for clock recovery.

OFF: clock recovery off

LESS27: clock recovery on and set to <2.7 GHz band

98: clock recovery on and set to >9.8 GHz band

Factory Preset / *RST:	Off
Front Panel Access:	Setup, Recovery Clock

## Wavelength

`[ :SENSe ] :INPut:WAVLength 850 | 1310 | 1550`

`[ :SENSe ] :INPut:WAVLength?`

Sets wavelength of input signal into O/E module.

The query returns current wavelength used.

Factory Preset / *RST:	1550 nm
Range:	850 nm, 1310 nm, 1550 nm
Front Panel Access:	Setup, Wavelength Calibrate, Wavelength

## Maximum Number of Samples

`:SENSe:OPTion:MAX:SAMPles:NUMber`

`:SENSe:OPTion:MAX:SAMPles:NUMber?`

Sets the maximum number of samples that are acquired for one update of each channel. In Eye mode, the number of samples is equal to this maximum value. In Pulse mode, the number of samples depends upon the number of bits that are displayed and is less than this maximum value.

The available maximum values are: 509, 1021, 2039, 4093, 8191, and 16381. The Bit Master is optimized for the default setting value of 8191.

Query command returns number of samples.

Factory Preset / *RST:	8191
Range:	509, 1021, 2039, 4093, 8191, 16381
Front Panel Access:	Shift-8(File), Application Options, Number of Samples

## [[:SENSE]:TIME Subsystem

Commands in this subsystem relate to the setup of parameters related to the time axis.

### Acquire Clock Rate

`[[:SENSE]:TIME:ACQClock?`

Initiates the acquisition of the input clock rate and sets the Clock Rate parameter to this new detected value.

The query returns the new Clock Rate parameter value.

Factory Preset / *RST:	Hz
Front Panel Access:	Time, Acquire Clock Rate

### Clock Rate

`[[:SENSE]:TIME:CLKRate <freq>`

`[[:SENSE]:TIME:CLKRate?`

Sets the rate of the input clock that is used to trigger the Bit Master. When the clock rate is changed, the data rate value changes accordingly, depending upon the divide ratio setting.

The query returns current clock rate setting.

Factory Preset / *RST:	100 MHz
Range:	100 MHz to 12.5 GHz
Front Panel Access:	Time, Clock Rate

### Data Rate

`[[:SENSE]:TIME:DATRate <bit rate>`

`[[:SENSE]:TIME:DATRate?`

Sets data rate of the input bit pattern. When the data rate is changed, the clock rate value changes accordingly, depending on the divide ratio setting.

The query returns current data rate.

Factory Preset / *RST:	100 Mbps
Range:	100 Mbps to 12.5 Gbps
Front Panel Access:	Time, Data Rate

## Divide Ratio

`[[:SENSe]:TIME:DIVRatio <integer>, DATR|CLKR`

`[[:SENSe]:TIME:DIVRatio?`

Sets integer value of the clock divide ratio (Clock Rate = Data Rate / Divide Ratio). When the divide ratio is changed, either the data rate or clock rate must change, as identified by the following parameter:

DATR: Recalculate data rate based on new divide ratio and existing clock rate.

CLKR: Recalculate clock rate based on new divide ratio and existing data rate.

The query returns current divide ratio.

Factory Preset / *RST:	1
Range:	1 to 64
Front Panel Access:	Time, Divide Ratio

## Pattern Length

`[[:SENSe]:TIME:PATLength <integer>`

`[[:SENSe]:TIME:PATLength?`

Sets the length of the repeating data pattern (for pulse pattern display mode).

The query returns current pattern length.

Factory Preset / *RST:	32
Range:	1 to 16777216
Front Panel Access:	Time, Pattern Length

## :SYSTEM Subsystem

This subsystem contains commands that affect instrument functionality that does not directly relate to data collection, display or transfer.

### Query Installed Options

`:SYSTEM:OPTions?`

Returns a string of the installed options. Options are separated by a “/”.

The string returns “NONE” if no options are installed.

See Also:	*IDN?
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## Preset

`:SYSTEM:PRESet`

This command restores all application parameters to their factory preset values. This does not modify system parameters such as Ethernet configuration, language, volume, or brightness.

Front Panel Access:	Shift-1 (Preset), Preset
See Also:	*RST

## :SYSTem:FILE Subsystem

This subsystem provides commands that modify how file lists should be displayed on the instrument. They do not modify the way in which data is returned to the controller.

### File Lists Sort Method

**:SYSTem:FILE:SORT:METHOD** NAME|TYPE|DATE

**:SYSTem:FILE:SORT:METHOD?**

Sets the file lists sort method.

Setting the sort method to NAME results in file lists that are sorted by the name of the file.

Setting the sort method to TYPE results in the file lists that are sorted by the type of file.

Setting the sort method to DATE results in the file lists that are sorted by the date that the file was saved.

Front Panel Access:	Shift-7 (File), Directory Management, Sort Method
See Also:	:SYSTem:FILE:SORT:ORDER

### File Lists Sort Order

**:SYSTem:FILE:SORT:ORDER** ASCend|DESCend

**:SYSTem:FILE:SORT:ORDER?**

Sets the file lists sort order.

Setting the sort order to ASCend results in file lists that are sorted from lowest to highest.

Setting the sort order to DESCend results in the file lists that are sorted from highest to lowest.

When sorting by name, the sort places file names that start with numbers before file names that start with letters.

Front Panel Access:	Shift-7 (File), Directory Management, Sort Order
See Also:	:SYSTem:FILE:SORT:METHOD

## :TRACe Subsystem

This subsystem contains commands that are related to the transfer of trace data to and from the instrument.

### Trace Data Prepare

**:TRACe[:DATA]:PREPare CH1|CH2|BOTH**

Sets the instrument into a special mode that is required for the Trace Data Query command. In this mode, the data on the screen are not updated, and the Bit Master is optimized for downloading trace data via the Trace Data Query command `:TRACe[:DATA]:CHANnel1|2|s?`. Use this command only prior to using the trace data query command. To remove the instrument from this special mode, use the command `:TRACe[:DATA]:END`.

**CH1:** Trace data prepare for CH1 only. The command that follows should be `:TRACe[:DATA]:CHANnel1? only`

**CH2:** Trace data prepare for CH2 only. The command that follows should be `:TRACe[:DATA]:CHANnel2? only`

**Both:** Trace data prepare for both CH1 and CH2. The command that follows should be `:TRACe[:DATA]:CHANnels? Only`

See Also:	<code>:TRACe[:DATA]:CHANnel1 2 s?</code> <code>:TRACe[:DATA]:END</code>
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### Trace Data Query

**:TRACe[:DATA]:CHANnel1|2|s?**

Transfers the current eye pattern data from the instrument to the controller for either one channel or both channels. This command currently does not support Pulse Mode transfers.

Prior to using this command, the `:TRACe[:DATA]:PREPare` command must be sent to the instrument in order to set it into a special mode that turns off the display updates. To remove the instrument from this special mode (after completing the trace data query), the command `:TRACe[:DATA]:END` must be used.

`:TRACe[:DATA]:CHANnel1` Transfers trace data for Channel 1 only. CH2 must be turned OFF before issuing this command. Refer to example scripts below.

`:TRACe[:DATA]:CHANnel2` Transfers trace data for Channel 2 only. CH1 must be turned OFF before issuing this command. Refer to example scripts below.

`:TRACe[:DATA]:CHANnels` Transfers trace data for both Channel 1 and Channel 2. Both channels must be ON in order to get correct data points; otherwise, "Channel Off" will be returned.

For one channel only, the response begins with an identification of the channel ("CH1-" or "CH2-") followed by a number that specifies the number of data points that are being transferred. For two channel transfers, CH1 data are returned first with the channel 1 header. At the end of the channel 1 data, the channel 2 header is sent followed by the channel 2 data. The channel 1 and channel 2 headers are the same as those for a single channel transfer. Refer to examples of the output formats below. The data points X and Y are in "(" and represent the time and amplitude values of the sampled points. The units of X are "ps", and the units of Y are "mV" when the channel is set to Electrical or "µW" when the channel is set to Optical.

The maximum number of data points that can be set for this query command is 8191 (refer to `:SENSe:OPTion:MAX:SAMPles:NUMber`). In Eye Mode, the number of data points is always equal to the maximum.

The following example code shows how to use trace data query command.

:SENSe:OPTion:MAX:SAMPles:NUMber 4093	//Select Number of Samples
(delay 100 ms)	//Add 100 ms delay
:CONFigure:MEASure:CHANnel 2	//Set CH2 as active channel
:SENSe:INPut:CH2 ELEC	//Set CH2 as electrical
:SENSe:INPut:CH1 OFF	// Turn CH1 off
(delay 100ms)	// Add 100 ms delay
:TRACe:DATA:PREPare CH2	//Send trace data query prepare cmd
:TRACe:DATA:CHANnel2?	//Send trace data query for CH2 only
:TRACe:DATA:CHANnel2?	
:TRACe:DATA:CHANnel2?	
.....	
.....	
:TRACe:DATA:CHANnel2?	
:TRACe:DATA:CHANnel2?	
:TRACe:DATA:END	//Send trace data query end

The following is an example of the output file for a single channel download (channel 1 with 2039 sample points):

```
CH1-2039(86.0,39.97),(86.0,167.13), ...
.....
```

The following is an example of the output file for a dual channel download (with 2039 sample points):

```
CH1-2039(86.0,39.97),(86.0,167.13), .....
.....
.....,(285.9,-3.92),CH2-2039(86.0,152.10), .....
.....
```

See Also:	:TRACe[:DATA]:PREPare :TRACe[:DATA]:END [:SENSe]:OPTion:MAX:SAMPles:NUMber
-----------	--

### Trace Data End

**:TRACe [:DATA] :END**

Disables the special mode set by `:TRACe [:DATA] :PREPare`. After executing this command, the instrument goes back to normal mode with normal screen updates. This command should be sent after the trace data query commands have been sent and executed and after no more data queries are required. This command works in conjunction with the `:TRACe [:DATA] :PREPare` command.

See Also:	<code>:TRACe [:DATA] :CHANnel1   2   s?</code> <code>:TRACe [:DATA] :PREPare</code>
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### Trace Header Transfer

**:TRACe :PREamble?**

Returns current setup information for the Bit Master.

The response begins with an ASCII header. The header specifies the number of following bytes. It appears as `#AX`, where `A` is the number of digits in `X` and `X` is the number of bytes that follow the header.

Parameters are returned in comma-delimited ASCII format. Each parameter is returned as `?NAME=VALUE [UNITS] , ?`

Valid parameter names are:

Parameter Name	Description
SN	Instrument serial #
UNIT_NAME	Instrument name
TYPE	Data type (Setup or Data)
DESCR	Trace name
DATE	Trace date/time
BASE_VER	Base FW version
APP_NAME	Application name
APP_VER	Application FW version

Parameter Name	Description
MEAS_MODE	Display mode
CLOCK_RECOVERY	Clock Recovery
OPTICAL_RECEIVER	Optical receiver
LOW_FREQ_CLOCK	Low frequency clock
PERSISTENCE	Accumulation type
DATA_RATE	Clock Rate
X_UNIT	Unit for X axis
BITS	Number of Bits
OFFSET	Waveform offset

Parameter Name	Description
PATTERN_LEN	Pulse pattern length
CHANNEL_1	Channel 1 Status
SCALE_1	Scale of Channel 1
OFFSET_1	Offset of Channel 1
ATTENUATION_1	Attenuation of Channel 1
CHANNEL_2	Channel 2 Status
SCALE_2	Scale of Channel 2
OFFSET_2	Offset of Channel 2
ATTENUATION_2	Attenuation of Channel 2
CURRENT_MEASUREMENT	Measurement type
HISTOGRAM_X1	Histogram X1 marker
HISTOGRAM_X2	Histogram X2 marker
HISTOGRAM_Y1	Histogram Y1 marker
HISTOGRAM_Y2	Histogram Y2 marker
STARTING_DATA_POINT	Start point of new data in each buffer
DATA_POINTS	Number of points remained for a data transfer command
CRU_STATUS	Clock recover unit status
ACTIVE_CHANNEL	Active channel
X_SCALE_START	Scale start point on X axis
X_SCALE_STOP	Scale stop point on X axis
MARKER_X1_CH1	Marker X1 of Channel 1
MARKER_X2_CH1	Marker X2 of Channel 1
MARKER_Y1_CH1	Marker Y1 of Channel 1
MARKER_Y2_CH1	Marker Y2 of Channel 1
MARKER_X1_CH1_LOCATION	Marker X1 location of Channel 1
MARKER_X2_CH1_LOCATION	Marker X2 location of Channel 1
MARKER_Y1_CH1_LOCATION	Marker Y1 location of Channel 1
MARKER_Y2_CH1_LOCATION	Marker Y2 location of Channel 1
MARKER_X1_CH2	Marker X1 of Channel 2
MARKER_X2_CH2	Marker X2 of Channel 2
MARKER_Y1_CH2	Marker Y1 of Channel 2
MARKER_Y2_CH2	Marker Y2 of Channel 2
MARKER_X1_CH2_LOCATION	Marker X1 location of Channel 2
MARKER_X2_CH2_LOCATION	Marker X2 location of Channel 2
MARKER_Y1_CH2_LOCATION	Marker Y1 location of Channel 2
MARKER_Y2_CH2_LOCATION	Marker Y2 location of Channel 2
ONE_LEVEL	One Level
ZERO_LEVEL	Zero Level
EYE_AMPLITUDE	Eye amplitude
EYE_HEIGHT	Eye Height
CROSSING_PERCENT	Eye Crossing Percentage

Parameter Name	Description
SNR	Signal Noise Ratio
AVERAGE_POWER	Average Power
EXTINCTION_RATIO	Extinction Ratio
JITTER_P_P	Peak to peak jitter
JITTER_RMS	RMS jitter
RISE_TIME	Rise time
FALL_TIME	Fall time
EYE_WIDTH	Eye width
DCD	Duty cycle distortion
MEAN	Mean
STD_DEV	Standard deviation
P_P	Time peak to peak
HITS	Hits
TOTAL_SAMPLES	Total samples
FAILED_SAMPLES	Failed samples
DIVIDE_RATIO	Clock divide ratio
HISTOGRAM_TYPE	Histogram type
CURRENT_MASK	Current mask
OE_A_W	OE Responsivity
OE_V_W	OE Conversion gain
NUM_OF_SWEEPS	For Internal Use Only
SAMPLES_PER_SWEEP	Samples per sweep
DEBUG_OPTICAL_POWER	For Internal Use Only
DEBUG_RESPONSIVITY	For Internal Use Only
DEBUG_CONVERSION_GAIN	For Internal Use Only
REPORTED_CURRENT	For Internal Use Only
WAVELENGTH	Wavelength
OE_A_W_BACKUP	For Internal Use Only
OE_V_W_BACKUP	For Internal Use Only
CAL_TEMP	Calibration temperature
CAL_DATE	Calibration date
DATA_RATE_BPS	Data Rate
SCALE_1_BACKUP	For Internal Use Only
OFFSET_1_BACKUP	For Internal Use Only
SCALE_2_BACKUP	For Internal Use Only
OFFSET_2_BACKUP	For Internal Use Only
SAMPLING_STATUS	Sampling status
LIMIT_TYPE	Accumulation limit type
TIME_LIMIT	Accumulation time limit
SAMPLE_LIMIT	Accumulation sample limit
ACCUMULATION	Accumulation percentage of completion

Parameter Name	Description
CFDR1	For Internal Use Only
CFDR2	For Internal Use Only
CFDR3	For Internal Use Only
CFDR4	For Internal Use Only
CFDR5	For Internal Use Only
OFFSET_1_ACTUAL	For Internal Use Only
OFFSET_2_ACTUAL	For Internal Use Only
OFFSET_1_ACTUAL_BACKUP	For Internal Use Only
OFFSET_2_ACTUAL_BACKUP	For Internal Use Only
OPTIONS	For Internal Use Only
MAX_NUM_OF_SAMPLES	Parameter of Maximum Number of Samples
CHANNEL_MATH	Channel Math function
CHANNEL_MATH_ENABLE	Channel Math status
CH1_MINUS	For Internal Use Only
CH1_PLUS	For Internal Use Only
CH2_MINUS	For Internal Use Only
CH2_PLUS	For Internal Use Only
FPGA_VERSION	For Internal Use Only
MATH_SCALE	Amplitude Scale for Channel Math
MATH_OFFSET	Amplitude Offset for Channel Math
SCALE_1_STORE	For Internal Use Only
OFFSET_1_STORE	For Internal Use Only
CHANNEL_STATE_STORE	For Internal Use Only
SCALE_1_BACKUP_STORE	For Internal Use Only
OFFSET_1_BACKUP_STORE	For Internal Use Only
ACTIVE_CHANNEL_STORE	For Internal Use Only
CURRENT_FILTER	Current filter selection
ER_CORR_FACTOR	Extinction Ratio Correction Factor value
ER_CORR_ENABLE	Extinction Ratio Correction Factor status
SYS_OE_V_W	System conversion gain value
SYS_OE_V_W_BACKUP	For Internal Use Only
PICKOFF_TEE_ENABLE	Pick-off Tee status
AVG_PWR_UNITS	Units for Average Power
AVERAGE_POWER_DBM	For Internal Use Only
RISE_FALL_TIME	Units for rise-time and fall-time
WAVELENGTH_FACTOR_1310	For Internal Use Only
WAVELENGTH_FACTOR_850	For Internal Use Only

## :CONFigure Subsystem

This set of commands prepares the Bit Master for the selected measurement. It disables any currently-enabled measurements and activates the specified measurement. Depending on the setup, Bit Master may start taking measurements after these configuration setting commands.

CONFigure commands may affect the value of any other setting in the instrument. Current instrument settings may be changed to default values. These changes are identified with their respective measurement commands.

The :CONFigure? query returns the name of the current measurement.

### Configure Histogram Axis

**:CONFigure:HISTogram:AXIS TIME|AMPLitude**

**:CONFigure:HISTogram:AXIS?**

Sets the histogram measurement axis to either time or amplitude.

Query command returns current selected histogram axis.

Factory Preset / *RST:	AMPLitude
Front Panel Access:	Measurement, Histogram, Axis

### Configure Mask Type

**:CONFigure:MASK:TYPE <integer>**

**:CONFigure:MASK:TYPE?**

Selects the mask type based upon its location in the list of masks that are available in the Bit Master (with index 0 referring to the first mask that is listed). The mask list can be customized, and new masks can be added by using Master Software Tools.

The query returns the index of the current selected mask.

Factory Preset / *RST:	0 (first listed mask in the installed mask list file)
Front Panel Access:	Measurement, Mask

### Configure Measure Channel

**:CONFigure:MEASure:CHANnel 1|2**

**:CONFigure:MEASure:CHANnel?**

Sets active channel to Channel 1 or Channel 2. The active channel is the one on which the measurements are made and the one to which markers are applied.

Query commands returns current active channel.

Factory Preset / *RST:	1 (Channel 1)
Front Panel Access:	Measurement, Active Channel Marker, Active Channel

## Configure Measurement Type

**:CONFigure:MEASure:TYPe** **AMPLitude** | **TIME** | **HISTogram** | **MASK** | **OFF**

**:CONFigure:MEASure:TYPe?**

Sets measurement type to be performed.

The query returns current measurement type.

**AMPLitude**: Sets measurement type to Amplitude. Sets display mode to Eye Pattern.

One Level, Zero Level, Eye Amplitude, Eye Height, Crossing, SNR, Average Power and Extinction Ratio are updated after a **:MEASure:AMPLitude** command execution.

**TIME**: Sets measurement type to Time. Sets display mode to Eye Pattern.

Jitter p-p, Jitter RMS, Rise Time, Fall Time, Eye Width, and DCD are updated after a **:MEASure:TIME** command execution.

**HISTogram**: sets measurement type to Histogram.

Mean value, standard Deviation, Peak-to-Peak, and Hits of Time or Amplitude are updated after a **:MEASure:HISTogram** command execution.

**MASK**: sets measurement type to Mask.

Total Samples and Failed Samples are updated after a **:MEASure:MASK** command execution.

**OFF**: All above measurements are disabled.

Histogram and mask measurement settings can be modified by using the **[ :SENSe ] : DISPlay:MODE** commands before initiating a measurement.

Factory Preset / *RST:	Amplitude
Front Panel Access:	Measurement, Amplitude, Time, Histogram, Mask, OFF
See Also:	[ :SENSe ] :DISPlay:MODE

## Configure Filter Type

**:CONFigure:FILTer:TYPe** **<integer>**

**:CONFigure:FILTer:TYPe?**

Selects the filter type used with the O/E module based on its location in the list of filters that are available in the instrument (with index 0 referring to the first filter listed).

The query returns the index of the current filter selected.

Factory Preset / *RST:	0 (first listed filter in the installed filter list file)
Front Panel Access:	<b>Amplitude</b> , O/E Configuration, Filter Select

## :FETCh:AMPLitude Subsystem

This set of commands returns the most recent measurement data of the active measurement. These commands are used for repeating query measurement data following a :MEASure command or a :CONFigure command (if the Bit Master is setup to continuously take measurements). They will not switch to another measurement. If the Bit Master is collecting data, it will not return until the data collection is complete. This could occur if an \*RST command were issued immediately before the :FETCh?

To get new measurement data, use the :MEASure command.

Commands in this subsystem return most recent measurement data for amplitude measurements. The command :FETCh:AMPLitude? returns eight measurement results. Eight more commands are available that can return the eight results individually.

The units of a result depend upon the current setting of the active channel (specified by [:SENSE]:INPut:CH1|2 ELECTRical|OPTical|OFF). The setting can be Electrical (mV units) or Optical ( $\mu$ W units). These data are valid only for Eye Pattern display mode. They are not valid for Pulse Pattern mode. Refer to command [:SENSE]:DISPlay:MODE EYE|PULSe

### Fetch Amplitude Measurement Result

**:FETCh:AMPLitude:MEASurement?**

Returns the most recent results for all the amplitude measurements.

Data are returned as 8 comma-separated values: level one, level zero, eye amplitude, eye height, crossing, SNR, average power, and extinction ratio.

Average Power and Extinction Ratio are valid only for an optical channel. "N/A" is returned if the channel is set to Electrical.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

### Fetch Average Power

**:FETCh:AMPLitude:AVEPower?**

Returns the most recent value of the average optical power that is derived from the O/E module. This measurement is available only for an optical channel.

Default Units:	$\mu$ W
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

### Fetch Eye Crossing Percentage

**:FETCh:AMPLitude:CROSSing?**

Returns the most recent eye crossing point that represents a percentage of eye height.

Default Units:	%
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch Extinction Ratio

**:FETCh:AMPLitude:EXTRatio?**

Returns the most recent extinction ratio that measures the ratio of the average power levels for the logic High to the logic Low of an optical waveform. This measurement is available only for an optical channel.

Default Units:	dB
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch Eye Amplitude

**:FETCh:AMPLitude:EYEAmplitude?**

Returns the most recent eye amplitude value.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch Eye Height

**:FETCh:AMPLitude:EYEHeight?**

Returns the most recent value of vertical opening of an eye pattern.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch One Level

**:FETCh:AMPLitude:LEVel:ONE?**

Returns the most recent one-level value that is the mean value of the top histogram distribution of an eye pattern.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch Zero Level

**:FETCh:AMPLitude:LEVel:ZERO?**

Returns the most recent zero-level value that is the mean value of the bottom histogram distribution of an eye pattern.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## Fetch SNR

**:FETCh:AMPLitude:SNR?**

Returns the most recent signal-to-noise ratio measurement.

Default Units:	None
Front Panel Access:	Measurement, Amplitude
See Also:	:MEASure:AMPLitude?

## :FETCh:HISTogram Subsystem

This set of commands return the most recent measurement data of the active measurement. These commands are used for repeating query measurement data following a :MEASure command or a :CONFigure command (if the Bit Master is set up to continuously take measurements). They will not switch to another measurement. If the Bit Master is collecting data, it will not return until the data collection is complete. This could occur if an \*RST were issued immediately before the :FETCh?

To get new measurement data, use the :MEASure command.

Commands in this subsystem return the most recent measurement data for two histogram measurements: histogram time and histogram amplitude (specified by :CONFigure:HISTogram:AXIS TIME|AMPLitude). Four measurement results are returned by :FETCh:HISTogram:TIME:MEASurement? or :FETCh:HISTogram:AMPLitude:MEASurement? They also can be queried individually by other lower level histogram commands. The measurement results are derived from the current histogram window settings.

The units of a result depend on the current setting of the active channel (specified by [:SENSE] INPut:CH1|2 ELEctrical|OPTical|OFF). The setting can be Electrical (mV units) or Optical ( $\mu$ W units).

## Fetch Histogram Time Measurement Result

**:FETCh:HISTogram:TIME:MEASurement?**

Returns the most recent time histogram measurement results.

Data are returned as 4 comma-separated values: mean, std dev, peak-to-peak, and hits.

Default Units:	ps
Front Panel Access:	Measurement, Histogram, Time
See Also:	:MEASure:HISTogram:TIME?

## Fetch Histogram Amplitude Measurement Result

**:FETCh:HISTogram:AMPLitude:MEASurement?**

Returns the most recent amplitude histogram measurement results.

Data are returned as 4 comma-separated values: mean, std dev, peak-to-peak, and hits.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Histogram, Amplitude
See Also:	:MEASure:HISTogram:AMPLitude?

## Fetch Histogram Amplitude Hits

**:FETCh:HISTogram:AMPLitude:HITS?**

Returns the most recent measurement result for the number of hits, which is the number of samples inside the histogram window.

Front Panel Access:	Measurement, Histogram, Amplitude
See Also:	:MEASure:HISTogram:AMPLitude?

## Fetch Histogram Amplitude Mean

**:FETCh:HISTogram:AMPLitude:MEAN?**

Returns the most recent measurement result of the amplitude mean value of the samples inside the histogram window.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Histogram, Amplitude
See Also:	:MEASure:HISTogram:AMPLitude?

## Fetch Histogram Amplitude Peak to Peak Value

**:FETCh:HISTogram:AMPLitude:PPeak?**

Returns the most recent measurement result of the amplitude peak-to-peak value of the samples inside the histogram window.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Histogram, Amplitude
See Also:	:MEASure:HISTogram:AMPLitude?

## Fetch Histogram Amplitude Standard Deviation

**:FETCh:HISTogram:AMPLitude:STDDeviation?**

Returns the most recent measurement result of the amplitude standard deviation value of the samples inside the histogram window.

Default Units:	Current amplitude units
Front Panel Access:	Measurement, Histogram, Amplitude
See Also:	:MEASure:HISTogram:AMPLitude?

## Fetch Histogram Time Hits

**:FETCh:HISTogram:TIME:HITS?**

Returns the most recent measurement result for the number of hits, which is the number of samples inside the histogram window.

Front Panel Access:	Measurement, Histogram, Time
See Also:	:MEASure:HISTogram:TIME?

## Fetch Histogram Time Mean

**:FETCh:HISTogram:TIME:MEAN?**

Returns the most recent measurement result of the time mean value of the samples inside the histogram window.

Default Units:	ps
Front Panel Access:	Measurement, Histogram, Time
See Also:	:MEASure:HISTogram:TIME?

## Fetch Histogram Time Peak to Peak Value

**:FETCh:HISTogram:TIME:PPeak?**

Returns the most recent measurement result of the time peak-to-peak value of the samples inside the histogram window.

Default Units:	ps
Front Panel Access:	Measurement, Histogram, Time
See Also:	:MEASure:HISTogram:TIME?

## Fetch Histogram Time Standard Deviation

**:FETCh:HISTogram:TIME:STDDeviation?**

Returns the most recent measurement result of the time standard deviation value of the samples inside the histogram window.

Default Units:	ps
Front Panel Access:	Measurement, Histogram, Time
See Also:	:MEASure:HISTogram:TIME?

## :FETCh:MASK Subsystem

This set of commands return the most recent measurement data of the active measurement. These commands are used for repeating query measurement data following a :MEASure command or a :CONFigure command (if the Bit Master is set up to continuously take measurements). They will not switch to another measurement. If the Bit Master is collecting data, it will not return until the data collection is complete. This could occur if an \*RST were issued immediately before the :FETCh?

To get new measurement data, use the :MEASure command.

Commands in this subsystem calculate the most recent total samples and failed samples for a mask measurement. The results are based on the current mask type selected (specified by :CONFigure:MASK:TYPe <index> ). The results are returned collectively by one command or individually by using two commands.

## Fetch Mask Measurement Result

**:FETCh:MASK:MEASurement?**

Returns the most recent results for the mask measurement.

Data are returned as 2 comma-separated values: total samples, failed samples.

Front Panel Access:	Measurement, Mask
See Also:	:MEASure:MASK?

## Fetch Failed Samples

**:FETCh:MASK:SAMPles:FAILED?**

Returns the most recent failed samples for the mask measurement.

Front Panel Access:	Measurement, Mask
See Also:	:MEASure:MASK?

## Fetch Total Samples

**:FETCh:MASK:SAMPles:TOTal?**

Returns the most recent total samples for the mask measurement.

Front Panel Access:	Measurement, Mask
See Also:	:MEASure:MASK?

## :FETCh:TIME Subsystem

This set of commands return the most recent measurement data of the active measurement. These commands are used for repeating query measurement data following a :MEASure command or a :CONFIgure command (if the Bit Master is set up to continuously take measurements). They will not switch to another measurement. If the Bit Master is collecting data, it will not return until the data collection is complete. This could occur if an \*RST were issued immediately before the :FETCh?

To get new measurement data, use the :MEASure command.

Commands in this subsystem return the most recent measurement data for time related measurements. The command :FETCh:TIME:MEASurement? returns six measurement results. Six more commands are available that return the six results individually.

These data are valid only for Eye Pattern display mode. They are not valid for Pulse Pattern. Refer to command [:SENSE]:DISPlay:MODE EYE|PULSe

## Fetch Time Measurement Result

**:FETCh:TIME:MEASurement?**

Returns the most recent result for all the time measurements.

Data are returned as 6 comma-separated values: jitter p-p, jitter RMS, rise time, fall time, eye width, and DCD.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Duty Cycle Distortion

**:FETCh:TIME:DCD?**

Returns the most recent Duty Cycle Distortion result as a percentage.

Default Units:	%
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Eye Width

**:FETCh:TIME:EYEWidth?**

Returns the most recent the eye width result of the current measurement.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Fall Time

**:FETCh:TIME:FTIME?**

Returns the most recent fall time result of the current measurement.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Rise Time

**:FETCh:TIME:TRISe?**

Returns the most recent rise time result of the current measurement.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Jitter Peak to Peak

**:FETCh:TIME:JITTer:PPeak?**

Returns the most recent peak-to-peak jitter result of the current measurement.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## Fetch Jitter RMS

**:FETCh:TIME:JITTer:RMS?**

Returns the most recent RMS jitter result of the current measurement.

Default Units:	ps
Front Panel Access:	Measurement, Time
See Also:	:MEASure:TIME?

## :MEASure Subsystem

These commands take the instrument from its current state and enable the specified measurement. They correct any parameters that are invalid given the new measurement state such that a valid measurement can take place. They are taken on the active channel with some default settings. Those default settings are not specified in a :MEASue command and may be changed by a :CONFIgure command and other relative commands. They then initiate the measurement. When the measurement is complete, they return the result. If these :MEASure commands are used to change measurement modes, then the Bit Master may take longer to return the results than if the measurement mode is unchanged by the command.

The message “Active channel is OFF” is returned if default setting for the active channel is OFF.

To get the current measurement data, use the appropriate :FETCh command.

## Amplitude Measurement

**:MEASure:AMPLitude?**

Sets the active measurement to Amplitude.

Sets display mode to Eye.

Triggers a new amplitude measurement and returns the results as 8 comma-separated values: Level One, Level Zero, Eye Amplitude, Eye Height, Crossing, SNR, Average Power, and Extinction Ratio.

If the measurement is set to OFF, then more time may be required to receive the results. Average Power and Extinction Ratio are valid only for an optical channel. “N/A” is returned if the active channel is Electrical.

Units depend upon the current setting of active channel. The units are mV for an Electrical channel or  $\mu$ W for an Optical channel.

Results also can be queried by :FETCh:AMPLitude:MEASurement?. To query specific data, refer to command :FETCh:AMPLitude:xxxx?.

The current measurement can be queried using :CONFIgure?.

See Also:	:CONFIgure:MEASure:CHANnel 1 2 [:SENSE]:INPut:CH1 2 ELECTrical OPTical OFF
-----------	---

## Time Measurement

**:MEASure:TIME?**

Sets the active measurement to Time. Sets display mode to Eye.

Triggers a new time measurement and returns the results as 6 comma-separated values: Jitter p-p, Jitter RMS, Rise Time, Fall Time, EYE Width, and DCD. If the measurement is set to OFF, then more time may be required to receive the results.

Results also can be queried by `:FETCh:TIME?` To query specific data, refer to command `:FETCh:TIME:xxxx?`

The current measurement can be queried using `:CONFigure?`

See Also:	<code>:CONFigure:MEASure:CHANnel 1 2</code> <code>[:SENSe]:INPut:CH1 2 ELECTrical OPTical OFF</code>
-----------	---

## Histogram Time Measurement

**:MEASure:HISTogram:TIME?**

Sets the active measurement to histogram time. Triggers a new histogram time measurement and returns the results as 4 comma-separated values: Mean, Std Deviation, Peak-to-Peak, and Hits.

Results also can be queried by `:FETCh:HISTogram:TIME?`. To query specific data, refer to command `:FETCh:HISTogram:TIME:xxxx?`.

The current measurement can be queried using `:CONFigure:HISTogram:AXIS?`.

See Also:	<code>:CONFigure:MEASure:CHANnel 1 2</code> <code>[:SENSe]:INPut:CH1 2 ELECTrical OPTical OFF</code> <code>[:SENSe]:HISTogram:X1 2 &lt;time&gt;</code> <code>[:SENSe]:HISTogram:Y1 2 &lt;amplitude&gt;</code>
-----------	--

## Histogram Amplitude Measurement

**:MEASure:HISTogram:AMPLitude?**

Sets the active measurement to histogram amplitude. Triggers a new histogram amplitude measurement and returns the results as 4 comma-separated values: Mean, Std Deviation, Peak-to-Peak, and Hits.

Results also can be queried by `:FETCh:HISTogram:AMPLitude?`. To query specific data, refer to command `:FETCh:HISTogram:AMPLitude:xxxx?`.

The current measurement can be queried using `:CONFigure:HISTogram:AXIS?`.

See Also:	<code>:CONFigure:MEASure:CHANnel 1 2</code> <code>[:SENSe]:INPut:CH1 2 ELECTrical OPTical OFF</code>
-----------	---

## Mask Measurement

### :MEASure:MASK?

Sets the active measurement to MASK. Triggers a new mask measurement and returns the results as 2 comma-separated values: Total Samples, Failed Samples.

Results also can be queried by :FETCh:MASK:MEASUREMENT?. To query specific data, refer to command :FETCh:MASK:SAMPLES:xxxx?.

The mask measurement must specified by :CONFiGure:MASK:TYPe. The current measurement can be queried using :CONFiGure:MASK:TYPe?.

See Also:	:CONFiGure:MASK:TYPe <index> :CONFiGure:MEASure:CHANnel 1 2 [:SENSe]:INPut:CH1 2 ELEctRical OPTical OFF
-----------	---

## 2-2 Examples

### C/C++

This example is run on the command line. It sends the \*IDN? query to the instrument and prints the response to the console.

```
// IdnExample.cpp : Microsoft Visual Studio-Generated Example
//Based on Example 2-1 in the NI-VISA User Manual
//Usage : IdnExample "TCPIP::xxx.xxx.xxx.xxx::inst0::INSTR"
//where xxx.xxx.xxx.xxx is the IP address of the
//instrument.
//Output : The string identity string returned from the
//instrument.
//VISA Header : visa.h (must be included)
//VISA Library : visa32.lib(must be linked with)

#include "stdafx.h"
#include "stdio.h"
#include "string.h"
#include "visa.h"

#define BUFFER_SIZE 255

int main(int argc, char* argv[])
{
    ViStatus status; /* For checking errors */
    ViSession defaultRM, instr; /* Communication channels */
    ViUInt32 retCount; /* Return count from string I/O */
    ViChar buffer[BUFFER_SIZE]; /* Buffer for string I/O */
    char tempDisplay[BUFFER_SIZE]; /* Display buffer for example */
    char *pAddress;

    /* Make sure we got our address. */
    if ( argc < 2 )
    {
        printf("Usage: IdnExample \"TCPIP::xxx.xxx.xxx.xxx::inst0::INSTR\\\"\\n\");
printf("\\t where xxx.xxx.xxx.xxx is the IP address of your instrument.\\n\");
        return -1;
    }
}
```

```
/* Store the address. */
pAddress = argv[1];

/* Begin by initializing the system*/
status = viOpenDefaultRM(&defaultRM);

if (status < VI_SUCCESS)
{
    /* Error Initializing VISA...exiting*/
    printf("Can't initialize VISA\n");
    return -1;
}

/* Open communication with TCP/IP device at xxx.xxx.xxx.xxx*/
/* NOTE: For simplicity, we will not show error checking*/
/* TODO: Add error handling. */
status = viOpen(defaultRM, pAddress, VI_NULL, VI_NULL, &instr);

/* Set the timeout for message-based communication*/
/* TODO: Add error handling. */
status = viSetAttribute(instr, VI_ATTR_TMO_VALUE, 5000);

/* Ask the device for identification */
sprintf(buffer, "*IDN?\n");
status = viWrite(instr, (unsigned char *)&buffer[0], 6, &retCount);
status = viRead(instr, (unsigned char *)buffer, BUFFER_SIZE, &retCount);

/* TODO: Add code to process data. */
strncpy(tempDisplay, buffer, retCount);
tempDisplay[retCount] = 0; /* Null-terminate display string. */
printf("*IDN? Returned %d bytes: %s\n", retCount, tempDisplay);

/* Close down the system */
/* TODO: Add error handling. */
status = viClose(instr);
status = viClose(defaultRM);

return 0;
}
```

## Visual Basic

This function can be called in a Visual Basic program. It sends the \*IDN? query to the instrument and returns the byte count and the ASCII response string.

Rem This example is based on Example 2-1 from the NI-VISA User Manual.

```
Public Sub IdnMain(ByVal address As String, ByRef byteCount As String, ByRef
returnBytes As String)
    Const BUFFER_SIZE = 200
    Dim stat As ViStatus
    Dim dfltRM As ViSession
    Dim sesn As ViSession
    Dim retCount As Long
    Dim buffer As String * BUFFER_SIZE

    Rem ***Include visa32.dll as a reference in your project.***

    Rem Begin by initializing the system
    stat = viOpenDefaultRM(dfltRM)
    If (stat < VI_SUCCESS) Then
        Rem Error initializing VISA...exiting
        MsgBox "Can't initialize VISA"
        Exit Sub
    End If

    Rem Open communication with Device
    Rem NOTE: For simplicity, we will not show error checking
    Rem TODO: Add error handling.
    stat = viOpen(dfltRM, address, VI_NULL, VI_NULL, sesn)

    Rem Set the timeout for message-based communication
    Rem TODO: Add error handling.
    stat = viSetAttribute(sesn, VI_ATTR_TMO_VALUE, 5000)

    Rem Ask the device for identification
    Rem TODO: Add error handling.
    stat = viWrite(sesn, "*IDN?", 5, retCount)
    stat = viRead(sesn, buffer, BUFFER_SIZE, retCount)

    Rem TODO: Add code to process the data.
```

```
byteCount = retCount  
returnBytes = Left(buffer, retCount)
```

```
Rem Close down the system  
Rem TODO: Add error handling.
```

```
stat = viClose(sesn)  
stat = viClose(dfltRM)
```

```
End Sub
```

## 2-3 Master Programming Manual Revision History

Document Part Number: 10580-00218

Date	Revision	Change Description
AUG /2008	A	Initial release, firmware V1.25
NOV 2009	B	Firmware V1.29