RIGOL

Programming Guide

MSO2000A/DS2000A Series Digital Oscilloscope

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RIGOL Technologies, Inc.

Guaranty and Declaration

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Document Overview

This manual guides users to control **RIGOL** MSO2000A/DS2000A series digital oscilloscope remotely by programming using SCPI commands through the remote interface. MSO2000A/DS2000A can build communication with a PC through the USB, LAN or GPIB (with the USB-GPIB interface converter provided by **RIGOL**) interface.

Main Topics in this Manual:

- SCPI Overview
- Command System
- Programming Demos

Content Conventions in this Manual:

MSO2000A/DS2000A series includes the following models. Unless otherwise noted, this manual takes MSO2302A-S as an example to illustrate the functions and using method of the command system of MSO2000A/DS2000A series.

Model	Analog Bandwidth	Number of Analog Channels	Number of Signal Source Channels	Number of Digital Channels
MSO2072A	70MHz	2	--	16
MSO2072A-S	70MHz	2	2	16
MSO2102A	100MHz	2	--	16
MSO2102A-S	100MHz	2	2	16
MSO2202A	200MHz	2	--	16
MSO2202A-S	200MHz	2	2	16
MSO2302A	300MHz	2	--	16
MSO2302A-S	300MHz	2	2	16
DS2072A	70MHz	2	--	--
DS2072A-S	70MHz	2	2	--
DS2102A	100MHz	2	--	--
DS2102A-S	100MHz	2	2	--
DS2202A	200MHz	2	--	--
DS2202A-S	200MHz	2	2	--
DS2302A	300MHz	2	--	--
DS2302A-S	300MHz	2	2	--

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1 SCPI Overview

SCPI (Standard Commands for Programmable Instruments) is a standardized instrument programming language that is built upon the standard IEEE 488.1 and IEEE 488.2 and conforms to various standards (such as the floating point operation rule in IEEE 754 standard, ISO 646 7-bit coded character for information interchange (equivalent to ASCII programming)). The SCPI commands provide a hierarchical tree structure and consist of multiple subsystems. Each command subsystem consists of a root keyword and one or more sub-keywords.

The topics of this chapter:

- Syntax
- Symbol Description
- Parameter Type
- Command Abbreviation

Syntax

The command string usually starts with ":"; the keywords are separated by ":" and are followed by the parameter settings available; "?" is added at the end of the command string to indicate query or execute the corresponding function and then make query (for example, *TST?); the command keywords and the first parameter are separated by a space.

For example,
:CALCulate:ADVanced:EXPRession <expression>
:CALCulate:ADVanced:EXPRession?

CALCulate is the root keyword of the command. ADVanced and EXPRession are the second-level and third-level keywords respectively. The command string starts with ":" which is also used to separate the multiple-level keywords. <expression> represents the parameters available for setting. "?" represents query. The command keywords :CALCulate:ADVanced:EXPRession and parameter <expression> are separated by a space.

"," is generally used for separating multiple parameters contained in the same command, for example,
:SYSTem:DATE <year>,<month>,<day>

Symbol Description

The following symbols will not be sent with the commands.

1. Braces { }

The parameters enclosed in the braces are optional and are usually separated by the vertical bar "|". When using the command, one of the parameters must be selected.

2. Vertical Bar |

The vertical bar is used to separate multiple parameters and one of the parameters must be selected when using the command.

3. Square Brackets [ ]

The content in the square brackets can be omitted.

4. Triangle Brackets < >

The parameter enclosed in the triangle brackets must be replaced by an effective value.

Parameter Type

1. Bool

The parameter could be ON, OFF, 1 or 0. For example,

:MEASure:ADISplay <bool>

:MEASure:ADISplay?

Wherein, <bool> can be set to {{1|ON}|{0|OFF}}.

The query returns 1 or 0.

2. Discrete

The parameter could be any of the values listed. For example,

:ACQuire:TYPE <type>

:ACQuire:TYPE?

Wherein, <type> can be set to NORMal|AVERages|PEAK|HRESolution.

The query returns the abbreviations (NORM, AVER, PEAK or HRES).

3. Integer

Unless otherwise noted, the parameter can be any integer within the effective value range. Note that do not set the parameter to a decimal, otherwise errors will occur.

For example,

:DISPlay:GBRightness <brightness>

:DISPlay:GBRightness?

Wherein, <brightness> can be set to any integer between 0 and 100.

The query returns an integer between 0 and 100.

4. Real

The parameter can be any real number within the effective value range and this command accepts decimal and scientific notation parameter input. For example,

:FUNCtion:WREPlay:INTerval <interval>

:FUNCtion:WREPlay:INTerval?

Wherein, <interval> can be set to any real number between 0.0000001 (or 1e-07, namely 100ns) to 10 (or 1e+01, namely 10s).

The query returns a real number in scientific notation.

5. ASCII String

The parameter should be the combinations of ASCII characters. For example,

:CALCulate:ADVanced:EXPRession <expression>

:CALCulate:ADVanced:EXPRession?

Wherein, <expression> can be set to CH1+CH2

The query returns an ASCII string.

Command Abbreviation

All the commands are case-insensitive and you can use any of them. If abbreviation is used, all the capital English letters and numbers in the command must be written completely. For example,

:CALCulate:ADVanced:VARiable1?

can be abbreviated to

:CALC:ADV:VAR1?

2 Command System

This chapter introduces the command subsystems of MSO2000A/DS2000A command set.

The topics of this chapter:

- :AUToscale
- :CLEar
- :RUN
- :STOP
- :SINGle
- :TFORce
- :TLHAlf
- IEEE 488.2 Common Commands
- :ACQuire Commands
- :BUS<n> Commands
- :CALCulate Commands
- :CALibrate Commands
- :CHANnel<n> Commands
- :CURSor Commands
- :DISPlay Commands
- :FUNCtion Commands
- :LA Commands (For MSO2000A/MSO2000A-S)
- :LAN Commands
- :MASK Commands
- :MEASure Commands
- :OUTPut<n> Commands (For MSO2000A-S/DS2000A-S)
- :RECall Commands
- :REFerence Commands
- :SAVE Commands
- :SOURce<n> Commands (For MSO2000A-S/DS2000A-S)
- :SYSTem Commands
- :TIMebase Commands
- :TRACe<n> Commands (For MSO2000A-S/DS2000A-S)
- :TRIGger Commands
- :WAVeform Commands

Note:

1. Unless otherwise noted, the introductions and parameter ranges in this manual are based on MSO2302A-S.
2. For parameter setting commands (such as time, frequency and amplitude), the oscilloscope can only accept numbers and set the parameters using the default units; it cannot recognize the units sent with the parameters. For the default unit of each parameter, please refer to the description in each command in the following introductions.

:AUToscale

Syntax

:AUToscale

Description

Enable the waveform auto setting function. The oscilloscope adjusts the vertical scale, horizontal time base and trigger mode according to the input signal automatically to realize optimum waveform display. The function of this command is the same with that of **AUTO** at the front panel.

Explanation

- This command is invalid when the AUTO function is disabled. For the details, please refer to :SYSTem:AUToscale.
- When the current status of the pass/fail function is “Enable Test”, this command is not available. For the details, please refer to :MASK:ENABle.

:CLEar

Syntax

:CLEar

Description

Clear all the waveforms on the screen. New waveforms will still be displayed if the oscilloscope is in RUN state. The function of this command is the same with that of **CLEAR** at the front panel.

:RUN

:STOP

Syntax

:RUN

:STOP

Description

The :RUN command starts the oscilloscope and the :STOP command stops the oscilloscope. The functions of these commands are the same with those of **RUN / STOP** at the front panel.

Explanation

These commands are invalid when waveform recording or waveform playback is turned on.

:SINGle

Syntax

:SINGle

Description

Set the oscilloscope to single trigger mode.

Explanation

- In single trigger mode, the oscilloscope triggers once the trigger conditions are met and then stops.
- In single trigger mode, using the :TFORce command can generate a trigger signal forcefully.
- You can use the :RUN and :STOP command to set the oscilloscope to Auto trigger mode and STOP state respectively.

:TFORce

Syntax

:TFORce

Description

Generate a trigger signal forcefully. The function of this command is the same with that of **FORCE** in the trigger control area at the front panel.

:TLHAlf

Syntax

:TLHAlf

Description

Set the trigger level to the vertical midpoint of the trigger signal amplitude.

IEEE 488.2 Common Commands

The IEEE 488.2 standard defines some common commands used for querying the basic information of the instrument or executing basic operations. These commands usually start with "*" and the keyword of the command is usually 3-character long.

- *CLS
- *ESE
- *ESR?
- *IDN?
- *OPC
- *RST
- *SRE
- *STB?
- *TST?

*CLS

Syntax

*CLS

Description

Clear all the event registers and clear the error queue.

*ESE

Syntax

*ESE <mask>

*ESE?

Description

Set or query the enable register for the standard event status register set.

Parameter

Name	Type	Range	Default
<mask>	Integer	0 to 255	0

Explanation

- <mask> is the sum of the binary weights (expressed in decimal) of all the bits between bit 0 and bit 7 that have already been set. If the bit has already been set, the corresponding binary bit is 1; otherwise, it is 0.
- Definitions of the bits in ESE register:

Bit	Weights	Name	Enable
7	128	PON	Power On
6	64	URQ	User Request
5	32	CME	Command Error
4	16	EXE	Execution Error
3	8	DDE	Dev. Dependent Error
2	4	QYE	Query Error
1	2	RQL	Request Control
0	1	OPC	Operation Complete

Return Format

The query returns an integer between 0 and 255 which equals the sum of the binary weights (expressed in decimal) of all the bits that have already been set in the register.

For example, the query returns 144 if bit 4 (16 in decimal) and bit 7 (128 in decimal) are enabled.

Example

```
*ESE 16      /*Bit 4 is enabled*/
*ESE?        /*The query returns 16*/
```

*ESR?

Syntax

*ESR?

Description

Query the event status register for the standard event register set.

Explanation

Definitions of the bits of ESE register:

Bit	Weights	Name	Enable
7	128	PON	Power On
6	64	URQ	User Request
5	32	CME	Command Error
4	16	EXE	Execution Error
3	8	DDE	Dev. Dependent Error
2	4	QYE	Query Error
1	2	RQL	Request Control
0	1	OPC	Operation Complete

Return Format

The query returns an integer between 0 and 255 which equals the sum of the binary weights (expressed in decimal) of all the bits that have already been set in the register. For example, the query returns 144 if bit 4 (16 in decimal) and bit 7 (128 in decimal) are enabled.

*IDN?

Syntax

*IDN?

Description

Query the current device information.

Return Format

The query returns RIGOL TECHNOLOGIES,<model>,<serial number>,XX.XX.XX. Wherein,
<model> is the model number of the instrument. <serial number> is the serial number of the instrument.
XX.XX.XX is the software version of the instrument.
For example, RIGOL TECHNOLOGIES,MSO2302A,DS2A0000000000,00.03.01.

*OPC

Syntax

*OPC

*OPC?

Description

Set the Operation Complete bit (bit 0) in the standard event status register to 1 after the current operation is finished.

Query whether the current operation is finished.

Return Format

The query returns 1 if the current operation is finished; otherwise, returns 0.

*RST

Syntax

*RST

Description

Restore the instrument to the factory setting.

*SRE

Syntax

*SRE <mask>

*SRE?

Description

Set or query the enable register for the state byte register set.

Parameter

Name	Type	Range	Default
<mask>	Integer	0 to 255	0

Explanation

- <mask> is the sum of the binary weights (expressed in decimal) of all the bits between bit 0 and bit 7 that have already been set. If the bit has already been set, the corresponding binary bit is 1; otherwise, it is 0.
- Definitions of the bits of SRE register:

Bit	Weights	Name	Enable
7	128	OPER	Operation Status Reg
6	64	--	Not used
5	32	ESB	Event Status Bit
4	16	MAV	Message Available
3	8	--	Not used
2	4	MSG	Message
1	2	USR	User
0	1	TRG	Trigger

Return Format

The query returns an integer between 0 and 255 which equals the sum of the binary weights (expressed in decimal) of all the bits that have already been set in the register. For example, the query returns 144 if bit 4 (16 in decimal) and bit 7 (128 in decimal) are enabled.

Example

```
*SRE 16      /*Bit 4 is enabled*/
*SRE?        /*The query returns 16*/
```

*STB?

Syntax

*STB?

Description

Query the condition register for the state byte register set.

Explanation

Definitions of the bits of SRE register:

Bit	Weights	Name	Enable
7	128	OPER	Operation Status Reg
6	64	--	Not used
5	32	ESB	Event Status Bit
4	16	MAV	Message Available
3	8	--	Not used
2	4	MSG	Message
1	2	USR	User
0	1	TRG	Trigger

Return Format

The query returns an integer between 0 and 255 which equals the sum of the binary weights (expressed in decimal) of all the bits that have already been set in the register. For example, the query returns 144 if bit 4 (16 in decimal) and bit 7 (128 in decimal) are enabled.

Example

*STB? /*The query returns 24 (bit 3 and bit 4 are enabled)*/

*TST?

Syntax

*TST?

Description

Perform a self-test and query the result.

Explanation

The self-test result is denoted by a 32-bit binary number. If the corresponding binary bit is 0, the self-test item passes the test; while 1 indicates a failure. The return value is the decimal integer corresponding to the binary number.

The self-test item represented by each bit is as shown below. The bit that is not used is always 0.

bit0: system voltage
bit1: analog voltage
bit2: storage system
bit3: digital core
bit4: digital IO
bit9: fan 1
bit10: fan 2
bit12: inlet temperature
bit13: outlet temperature
bit16: real-time clock

Return Format

The query returns a decimal integer.

Example

*TST? /*The query returns 0 (namely the 32 bits of the binary number are all 0*/

:ACQuire Commands

- :ACQuire:AVERages
- :ACQuire:MDEPth
- :ACQuire:SRATe?
- :ACQuire:TYPE
- :ACQuire:AALias

:ACQuire:AVERages

Syntax

:ACQuire:AVERages <count>

:ACQuire:AVERages?

Description

Set or query the number of averages in average acquisition mode.

Parameter

Name	Type	Range	Default
<count>	Discrete	2^n (n is an integer from 1 to 13)	2

Explanation

You can use the :ACQuire:TYPE command to select the average acquisition mode. In this mode, the oscilloscope averages the waveforms from multiple samples to reduce the random noise on the input signal and improve the vertical resolution. Greater number of averages can lower the noise and increase the vertical resolution; while at the same time, it will slower the response of the displayed waveform to the waveform changes.

Return Format

The query returns the number of averages in average acquisition mode in integer.

:ACQuire:MDEPth

Syntax

:ACQuire:MDEPth <mdep>

:ACQuire:MDEPth?

Description

Set or query the memory depth of the oscilloscope; namely the number of waveform points that can be stored in a single trigger sample. The default unit is pts (points).

Parameter

Name	Type	Range	Default
<mdep>	Discrete	Refer to the **Explanation**	AUTO

Explanation

Interweave: AUTO|14000|140000|1400000|14000000|56000000 (option).

Non-interweave: AUTO|7000|70000|700000|7000000|28000000 (option).

Return Format

The query returns the memory depth of the oscilloscope in integer.

:ACQuire:SRATe?

Syntax

:ACQuire:SRATe?

Description

Query the current sample rate. The default unit is Sa/s.

Return Format

The query returns the current sample rate in scientific notation. For example, 1.00000e+09; namely 1.000GSa/s.

:ACQuire:TYPE

Syntax

:ACQuire:TYPE <type>

:ACQuire:TYPE?

Description

Set or query the acquisition mode of the sample.

Parameter

Name	Type	Range	Default
<type>	Discrete	{NORMal|AVERages|PEAK|HRESolution}	NORMal

Explanation

- NORMal: the oscilloscope samples the signal at equal time interval. For most of waveforms, this mode can ensure the optimum display effect.
- AVERages: the oscilloscope averages the waveforms from multiple samples to reduce the random noise on the input signal and increase the vertical resolution. In this mode, you can use the :ACQuire:AVERages command to set the number of averages.
- PEAK: the oscilloscope samples the maximum and minimum values of the signal within the sample interval to acquire the envelop of the signal and narrow pulses that might be lost. But in this mode, the display noise is relatively larger.
- HRESolution: the oscilloscope averages the neighbouring points of the sampled waveform. This mode is usually used when the sample rate of the digital converter is greater than the storage rate of the sample storage.

Return Format

The query returns NORM, AVER, PEAK or HRES.

:ACQuire:AALias

Syntax

:ACQuire:AALias <bool>

:ACQuire:AALias?

Description

Enable or disable the antialiasing function of the oscilloscope; or query the current state of the antialiasing function of the oscilloscope.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:BUS<n> Commands

- :BUS<n>:MODE
- :BUS<n>:DISPlay
- :BUS<n>:FORMat
- :BUS<n>:EVENt
- :BUS<n>:EEXPort
- :BUS<n>:DATA?
- :BUS<n>:PARallel
- :BUS<n>:RS232 (Option)
- :BUS<n>:IIC (Option)
- :BUS<n>:SPI (Option)
- :BUS<n>:CAN (Option)

:BUS<n>:MODE

Syntax

:BUS<n>:MODE <mode>

:BUS<n>:MODE?

Description

Set or query the decoding mode of the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<mode>	Discrete	{PARallel|RS232|IIC|SPI|CAN}	PARallel

Explanation

RS232 decoding, I2C decoding, SPI decoding and CAN decoding are options and this command is only valid when the corresponding options are installed.

Return Format

The query returns PAR, RS232, IIC, SPI or CAN.

:BUS<n>:DISPlay

Syntax

:BUS<n>:DISPlay <bool>

:BUS<n>:DISPlay?

Description

Enable or disable the display of the specified bus; or query the current display status of the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:BUS<n>:FORMat

Syntax

:BUS<n>:FORMat <format>

:BUS<n>:FORMat?

Description

Set or query the display format of the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<format>	Discrete	{HEX|DEC|BIN|ASCii}	HEX

Explanation

- HEX: hexadecimal;
- DEC: decimal;
- BIN: binary;
- ASCii: ASCII.

Return Format

The query returns HEX, DEC, BIN or ASC.

:BUS<n>:EVENt

Syntax

:BUS<n>:EVENt <bool>

:BUS<n>:EVENt?

Description

Enable or disable the event table of the specified bus; or query the current status of the event table of the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

This command is only available when the displayof the specified bus is enabled (:BUS<n>:DISPlay).

Return Format

The query returns 1 or 0.

:BUS<n>:EEXPort

Syntax

:BUS<n>:EEXPort

Description

Export the event table of the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--

Explanation

The data list can be exported to an external USB storage device in CSV format if an USB storage device is currently connected.

:BUS<n>:DATA?

Syntax

:BUS<n>:DATA?

Description

Read the decoding event table data.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--

Return Format

The query returns the decoding event table data in the following format.

#9000000141RS232
Time,TX,TX ERR,
-6.1352322E-03,*,,
-4.0554402E-03,R,,
-1.9756482E-03,I,,
1.0414385E-04,G,,
2.1839839E-03,O,,
4.2637759E-03,L,,

Wherein, #9000000141 is the TMC data block header following which is the data in the event table. The figure behind #9 denotes the number of bytes of the effective data. RS232 denotes the decoding mode (it can also be Parallel, I2C, SPI or CAN). The data are separated by commas and will be displayed in different lines automatically according to the lines in the decoding table. The data value is related to the specified format (:BUS<n>:FORMat).

Note: You can save the data (except the TMC data block header and the decoding type; for example, #9000000141RS232) as a *.csv file and view the data in table form.

:BUS<n>:PARallel

- :BUS<n>:PARallel:CLK
- :BUS<n>:PARallel:SLOPe
- :BUS<n>:PARallel:BSET
- :BUS<n>:PARallel:THReshold
- :BUS<n>:PARallel:OFFSet

:BUS<n>:PARallel:CLK

Syntax

:BUS<n>:PARallel:CLK <sour>

:BUS<n>:PARallel:CLK?

Description

Set or query the clock channel source of parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|OFF}	CHANnel1

Explanation

When OFF is selected, no clock channel is set and the oscilloscope samples data once the channel data jumps. At this point, the edge set by the :BUS<n>:PARallel:SLOPe command can be ignored.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or OFF.

:BUS<n>:PARallel:SLOPe

Syntax

:BUS<n>:PARallel:SLOPe <pos>

:BUS<n>:PARallel:SLOPe?

Description

Set or query the edge of the clock on which the oscilloscope samples the channel data.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<pos>	Discrete	{POSitive|NEGative|BOTH}	POSitive

Explanation

- POSitive: rising edge
  NEGative: falling edge
  BOTH: rising/falling edge
- When no clock channel is set (refer to the :BUS<n>:PARallel:CLK command), the oscilloscope samples data once the channel data jumps and the edge set by this command will be ignored.

Return Format

The query returns POS, NEG or BOTH.

:BUS<n>:PARallel:BSET

Syntax

:BUS<n>:PARallel:BSET <b0>[,<b1>[,<b2>...[,<b17>]]]

:BUS<n>:PARallel:BSET?

Description

Set the data width of the specified bus in parallel decoding and the channel source for each bit; or query the channel source of each bit.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<b0>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	D0
.....	.....	.....	.....
<b15>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	D15
<b16>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<b17>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Explanation

This command sets the bus data width and the setting sequence of the bits is LSB. For example, when the parameter is set to CHAN2,CHAN1, the bus data width is set to 2, bit 0 is CHAN2 and bit 1 is CHAN1.

Return Format

The query returns the channel source of each bit in the current data channel. The number of the channel sources is determined by the current data width and multiple channels are separated by commas.

Example

```
:BUS1:PARallel:BSET CHANnel1,CHANnel2,D0,D1
                    /*Set the data width to 4 and the channel sources of the bits are
                     CH1,CH2,D0,D1 respectively*/
:BUS1:PARallel:BSET?    /*The query returns CHAN1,CHAN2,D0,D1*/
```

:BUS<n>:PARallel:THReshold

Syntax

:BUS<n>:PARallel:THReshold <sour>,<thre>

:BUS<n>:PARallel:THReshold? <sour>

Description

Set or query the analog channel threshold of parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{CHANnel1|CHANnel2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Return Format

The query returns the analog channel threshold of parallel decoding on the specified bus in scientific notation.

:BUS<n>:PARallel:OFFSet

Syntax

:BUS<n>:PARallel:OFFSet <val>

:BUS<n>:PARallel:OFFSet?

Description

Set or query the vertical offset in parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Integer	Normal[1]: -166 to 148 Statistic[2]: -163 to 143 Half screen[3]: -103 to 52	0

Note[1]: The screen display is normal and the statistic function is not enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[2]: The screen display is normal and the statistic function is enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[3]: The screen is divided into two windows (refer to the :TIMebase:DELay:ENABle and :CALCulate:FFT:SPLit commands).

Explanation

- Before using this command, enable the bus display (refer to the :BUS<n>:DISPlay command).
- When the data line locates at the middle of the screen, <val> is 0; when it locates at the upper side of the screen, <val> is positive; when it locates at the lower side of the screen, <val> is negative.

Return Format

The query returns the vertical offset in parallel decoding on the specified bus in integer.

:BUS<n>:RS232 (Option)

- :BUS<n>:RS232:TX
- :BUS<n>:RS232:RX
- :BUS<n>:RS232:POLarity
- :BUS<n>:RS232:ENDian
- :BUS<n>:RS232:BAUD
- :BUS<n>:RS232:BUSer
- :BUS<n>:RS232:DBITs
- :BUS<n>:RS232:SBITs
- :BUS<n>:RS232:PARity
- :BUS<n>:RS232:PACKet
- :BUS<n>:RS232:PEND
- :BUS<n>:RS232:TTHReshold
- :BUS<n>:RS232:RTHReshold
- :BUS<n>:RS232:OFFSet

:BUS<n>:RS232:TX

Syntax

:BUS<n>:RS232:TX <source>

:BUS<n>:RS232:TX?

Description

Set or query the TX channel source of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|OFF}	CHANnel1

Explanation

When OFF is selected, no TX channel source will be set. The TX channel source and RX channel source cannot both be set to OFF.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or OFF.

:BUS<n>:RS232:RX

Syntax

:BUS<n>:RS232:RX <source>

:BUS<n>:RS232:RX?

Description

Set or query the RX channel source of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|OFF}	OFF

Explanation

When OFF is selected, no RX channel source will be set. The TX channel source and RX channel source cannot both be set to OFF.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or OFF.

:BUS<n>:RS232:POLarity

Syntax

:BUS<n>:RS232:POLarity <pol>

:BUS<n>:RS232:POLarity?

Description

Set or query the polarity of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<pol>	Discrete	{POSitive|NEGative}	NEGative

Explanation

The RS232 standard uses negative logic; namely high level is 0 and low level is 1. Therefore, when <pol> is set to NEGative, the polarity is set to negative logic (namely “Normal” polarity); when <pol> is set to POSitive, the polarity is set to positive polarity (namely “Invert” polarity).

Return Format

The query returns POS or NEG.

:BUS<n>:RS232:ENDian

Syntax

:BUS<n>:RS232:ENDian <endian>

:BUS<n>:RS232:ENDian?

Description

Set or query the endian of data transmission of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<endian>	Discrete	{MSB|LSB}	LSB

Return Format

The query returns MSB or LSB.

:BUS<n>:RS232:BAUD

Syntax

:BUS<n>:RS232:BAUD <baud>

:BUS<n>:RS232:BAUD?

Description

Set or query the baud rate of data transmission of RS232 decoding on the specified bus. The default unit is bps.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<baud>	Discrete	{2400|4800|9600|19200|38400|57600|115200|USER}	9600

Note: When the baud rate is set to USER, you can set a specific baud rate using the :BUS<n>:RS232:BUSer command.

Return Format

The query returns the baud rate of data transmission of RS232 decoding on the specified bus in integer or returns USER.

:BUS<n>:RS232:BUSer

Syntax

:BUS<n>:RS232:BUSer <baud>

:BUS<n>:RS232:BUSer?

Description

Set or query the user-defined baud rate of data transmission in RS232 decoding on the specified bus. The default unit is bps.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<baud>	Integer	110 to 20000000	9600

Return Format

The query returns the user-defined baud rate of data transmission in RS232 decoding on the specified bus in integer.

:BUS<n>:RS232:DBITs

Syntax

:BUS<n>:RS232:DBITs <bits>

:BUS<n>:RS232:DBITs?

Description

Set or query the data width of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bits>	Discrete	{5|6|7|8|9}	8

Return Format

The query returns 5, 6, 7, 8 or 9.

:BUS<n>:RS232:SBITs

Syntax

:BUS<n>:RS232:SBITs <stop bits>

:BUS<n>:RS232:SBITs?

Description

Set or query the stop bit after each frame of data in RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<stop bits>	Discrete	{1|1.5|2}	1

Return Format

The query returns 1, 1.5 or 2.

:BUS<n>:RS232:PARity

Syntax

:BUS<n>:RS232:PARity <parity>

:BUS<n>:RS232:PARity?

Description

Set or query the even-odd check mode of data transmission of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<parity>	Discrete	{NONE|ODD|EVEN}	NONE

Return Format

The query returns NONE, ODD or EVEN.

:BUS<n>:RS232:PACKet

Syntax

:BUS<n>:RS232:PACKet <bool>

:BUS<n>:RS232:PACKet?

Description

Enable or disable the packet end in data transmission; or query the current status of the packet end in data transmission.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

When the packet end is enabled, several data blocks are combined according to the packet end.

Return Format

The query returns 1 or 0.

:BUS<n>:RS232:PEND

Syntax

:BUS<n>:RS232:PEND <package end>

:BUS<n>:RS232:PEND?

Description

Set or query the packet end of data transmission.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<package end>	Discrete	{NULL|LF|CR|SP|FF}	NULL

Explanation

The hexadecimal numbers corresponding to the parameters are as follows.

NULL: 00 LF: 0A CR: 0D SP: 20 FF: FF

Return Format

The query returns NULL, LF, CR, SP or FF.

:BUS<n>:RS232:TTHReshold

Syntax

:BUS<n>:RS232:TTHReshold <tthre>

:BUS<n>:RS232:TTHReshold?

Description

Set or query the TX channel threshold of R232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<tthre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the TX channel source is CH1 or CH2.

Return Format

The query returns the TX channel threshold of R232 decoding on the specified bus in scientific notation.

:BUS<n>:RS232:RTHReshold

Syntax

:BUS<n>:RS232:RTHReshold <rthre>

:BUS<n>:RS232:RTHReshold?

Description

Set or query the RX channel threshold of R232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<rthre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the RX channel source is CH1 or CH2.

Return Format

The query returns the RX channel threshold of R232 decoding on the specified bus in scientific notation.

:BUS<n>:RS232:OFFSet

Syntax

:BUS<n>:RS232:OFFSet <val>

:BUS<n>:RS232:OFFSet?

Description

Set or query the vertical offset in RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Integer	Normal[1]: -166 to 148 Statistic[2]: -163 to 143 Half screen[3]: -103 to 52	0

Note[1]: The screen display is normal and the statistic function is not enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[2]: The screen display is normal and the statistic function is enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[3]: The screen is divided into two windows (refer to the :TIMebase:DELay:ENABle and :CALCulate:FFT:SPLit commands).

Explanation

- Before using this command, enable the bus display (refer to the :BUS<n>:DISPlay command).
- When the data line locates at the middle of the screen, <val> is 0; when it locates at the upper side of the screen, <val> is positive; when it locates at the lower side of the screen, <val> is negative.

Return Format

The query returns the vertical offset in RS232 decoding on the specified bus in integer.

:BUS<n>:IIC (Option)

- :BUS<n>:IIC:SCLK:SOURce
- :BUS<n>:IIC:SCLK:THReshold
- :BUS<n>:IIC:SDA:SOURce
- :BUS<n>:IIC:SDA:THReshold
- :BUS<n>:IIC:OFFSet

:BUS<n>:IIC:SCLK:SOURce

Syntax

:BUS<n>:IIC:SCLK:SOURce <sour>

:BUS<n>:IIC:SCLK:SOURce?

Description

Set or query the clock channel source of I2C decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:BUS<n>:IIC:SCLK:THReshold

Syntax

:BUS<n>:IIC:SCLK:THReshold <thre>

:BUS<n>:IIC:SCLK:THReshold?

Description

Set or query the clock channel threshold of I2C decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the clock channel source is CH1 or CH2.

Return Format

The query returns the clock channel threshold of I2C decoding on the specified bus in scientific notation.

:BUS<n>:IIC:SDA:SOURce

Syntax

:BUS<n>:IIC:SDA:SOURce <sour>

:BUS<n>:IIC:SDA:SOURce?

Description

Set or query the data channel source of I2C decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:BUS<n>:IIC:SDA:THReshold

Syntax

:BUS<n>:IIC:SDA:THReshold <thre>

:BUS<n>:IIC:SDA:THReshold?

Description

Set or query the data channel threshold of I2C decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the data channel source is CH1 or CH2.

Return Format

The query returns the data channel threshold of I2C decoding on the specified bus in scientific notation.

:BUS<n>:IIC:OFFSet

Syntax

:BUS<n>:IIC:OFFSet <val>

:BUS<n>:IIC:OFFSet?

Description

Set or query the vertical offset in I2C decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Integer	Normal[1]: -166 to 148 Statistic[2]: -163 to 143 Half screen[3]: -103 to 52	0

Note[1]: The screen display is normal and the statistic function is not enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[2]: The screen display is normal and the statistic function is enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[3]: The screen is divided into two windows (refer to the :TIMebase:DELay:ENABle and :CALCulate:FFT:SPLit commands).

Explanation

- Before using this command, enable the bus display (refer to the :BUS<n>:DISPlay command).
- When the data line locates at the middle of the screen, <val> is 0; when it locates at the upper side of the screen, <val> is positive; when it locates at the lower side of the screen, <val> is negative.

Return Format

The query returns the vertical offset in I2C decoding on the specified bus in integer.

:BUS<n>:SPI (Option)

- :BUS<n>:SPI:SCLK:SOURce
- :BUS<n>:SPI:SCLK:SLOPe
- :BUS<n>:SPI:SCLK:THReshold
- :BUS<n>:SPI:SDA:SOURce
- :BUS<n>:SPI:SDA:POLarity
- :BUS<n>:SPI:SDA:THReshold
- :BUS<n>:SPI:DBITs
- :BUS<n>:SPI:ENDian
- :BUS<n>:SPI:OFFSet
- :BUS<n>:SPI:TIMeout:TIME

:BUS<n>:SPI:SCLK:SOURce

Syntax

:BUS<n>:SPI:SCLK:SOURce <sour>

:BUS<n>:SPI:SCLK:SOURce?

Description

Set or query the clock channel source of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:BUS<n>:SPI:SCLK:SLOPe

Syntax

:BUS<n>:SPI:SCLK:SLOPe <pos>

:BUS<n>:SPI:SCLK:SLOPe?

Description

Set or query the clock edge type in SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<pos>	Discrete	{POSitive|NEGative}	POSitive

Return Format

The query returns POS or NEG.

:BUS<n>:SPI:SCLK:THReshold

Syntax

:BUS<n>:SPI:SCLK:THReshold <thre>

:BUS<n>:SPI:SCLK:THReshold?

Description

Set or query the clock channel threshold of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the clock channel source is CH1 or CH2.

Return Format

The query returns the clock channel threshold of SPI decoding on the specified bus in scientific notation.

:BUS<n>:SPI:SDA:SOURce

Syntax

:BUS<n>:SPI:SDA:SOURce <sour>

:BUS<n>:SPI:SDA:SOURce?

Description

Set or query the data channel source of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:BUS<n>:SPI:SDA:POLarity

Syntax

:BUS<n>:SPI:SDA:POLarity <pos>

:BUS<n>:SPI:SDA:POLarity?

Description

Set or query the polarity of the SDA data line in SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<pos>	Discrete	{HIGH|LOW}	LOW

Explanation

HIGH: low level is 1; high level is 0. LOW: high level is 1; low level is 0.

Return Format

The query returns HIGH or LOW.

:BUS<n>:SPI:SDA:THReshold

Syntax

:BUS<n>:SPI:SDA:THReshold <thre>

:BUS<n>:SPI:SDA:THReshold?

Description

Set or query the data channel threshold of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the data channel source is CH1 or CH2.

Return Format

The query returns the data channel threshold of SPI decoding on the specified bus in scientific notation.

:BUS<n>:SPI:DBITs

Syntax

:BUS<n>:SPI:DBITs <width>

:BUS<n>:SPI:DBITs?

Description

Set or query the data width in SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<width>	Integer	4 to 32	8

Return Format

The query returns an integer between 4 and 32.

:BUS<n>:SPI:ENDian

Syntax

:BUS<n>:SPI:ENDian <endian>

:BUS<n>:SPI:ENDian?

Description

Set or query the endian of data transmission in SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<endian>	Discrete	{MSB|LSB}	MSB

Return Format

The query returns MSB or LSB.

:BUS<n>:SPI:OFFSet

Syntax

:BUS<n>:SPI:OFFSet <val>

:BUS<n>:SPI:OFFSet?

Description

Set or query the vertical offset in SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Integer	Normal[1]: -166 to 148 Statistic[2]: -163 to 143 Half screen[3]: -103 to 52	0

Note[1]: The screen display is normal and the statistic function is not enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[2]: The screen display is normal and the statistic function is enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[3]: The screen is divided into two windows (refer to the :TIMebase:DELay:ENABle and :CALCulate:FFT:SPLit commands).

Explanation

- Before using this command, enable the bus display (refer to the :BUS<n>:DISPlay command).
- When the data line locates at the middle of the screen, <val> is 0; when it locates at the upper side of the screen, <val> is positive; when it locates at the lower side of the screen, <val> is negative.

Return Format

The query returns the vertical offset in SPI decoding on the specified bus in integer.

:BUS<n>:SPI:TIMeout:TIME

Syntax

:BUS<n>:SPI:TIMeout:TIME <val>

:BUS<n>:SPI:TIMeout:TIME?

Description

Set or query the timeout time in SPI decoding on the specified bus. The default unit is s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Real	100ns to 1s	1us

Return Format

The query returns the timeout time in SPI decoding on the specified bus in scientific notation.

:BUS<n>:CAN (Option)

- :BUS<n>:CAN:SOURce
- :BUS<n>:CAN:STYPe
- :BUS<n>:CAN:BAUD
- :BUS<n>:CAN:BUSer
- :BUS<n>:CAN:SPOint
- :BUS<n>:CAN:THReshold
- :BUS<n>:CAN:OFFSet

:BUS<n>:CAN:SOURce

Syntax

:BUS<n>:CAN:SOURce <sour>

:BUS<n>:CAN:SOURce?

Description

Set or query the channel source of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:BUS<n>:CAN:STYPe

Syntax

:BUS<n>:CAN:STYPe <stype>

:BUS<n>:CAN:STYPe?

Description

Set or query the signal type of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<stype>	Discrete	{TX|RX|CANH|CANL|DIFFerential}	RX

Return Format

The query returns TX, RX, CANH, CANL or DIFF.

:BUS<n>:CAN:BAUD

Syntax

:BUS<n>:CAN:BAUD <baud>

:BUS<n>:CAN:BAUD?

Description

Set or query the signal rate of CAN decoding on the specified bus. The default unit is b/s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<baud>	Discrete	{100000|125000|250000|400000|500000|800000|1000000|USER}	500000

Note: When the signal rate is set to USER, you can use the :BUS<n>:CAN:BUSer command to set a user-defined signal rate.

Return Format

The query returns the signal rate of CAN decoding on the specified bus in integer or returns USER.

:BUS<n>:CAN:BUSer

Syntax

:BUS<n>:CAN:BUSer <baud>

:BUS<n>:CAN:BUSer?

Description

Set or query the user-defined signal rate of CAN decoding on the specified bus. The default unit is b/s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<baud>	Integer	10000 to 1000000	500000

Return Format

The query returns the user-defined signal rate of CAN decoding on the specified bus in integer.

:BUS<n>:CAN:SPOint

Syntax

:BUS<n>:CAN:SPOint <spo>

:BUS<n>:CAN:SPOint?

Description

Set or query the sample position (expressed in percentage) of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<spo>	Integer	5 to 95	50

Return Format

The query returns the sample position of CAN decoding on the specified bus in integer.

:BUS<n>:CAN:THReshold

Syntax

:BUS<n>:CAN:THReshold <thre>

:BUS<n>:CAN:THReshold?

Description

Set ro query the threshold of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<thre>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

This command is only available when the channel source is CH1 or CH2.

Return Format

The query returns the threshold of CAN decoding on the specified bus in scientific notation.

:BUS<n>:CAN:OFFSet

Syntax

:BUS<n>:CAN:OFFSet <val>

:BUS<n>:CAN:OFFSet?

Description

Set or query the vertical offset of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<val>	Integer	Normal[1]: -166 to 148 Statistic[2]: -163 to 143 Half screen[3]: -103 to 52	0

Note[1]: The screen display is normal and the statistic function is not enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[2]: The screen display is normal and the statistic function is enabled (refer to the :MEASure:STATistic:DISPlay command).

Note[3]: The screen is divided into two windows (refer to the :TIMebase:DELay:ENABle and :CALCulate:FFT:SPLit commands).

Explanation

- Before using this command, enable the bus display (refer to the :BUS<n>:DISPlay command).
- When the data line locates at the middle of the screen, <val> is 0; when it locates at the upper side of the screen, <val> is positive; when it locates at the lower side of the screen, <val> is negative.

Return Format

The query returns the vertical offset of CAN decoding on the specified bus in integer.

:CALCulate Commands

- :CALCulate:MODE
- :CALCulate:ADD
- :CALCulate:SUB
- :CALCulate:MULTiply
- :CALCulate:DIVision
- :CALCulate:FFT
- :CALCulate:LOGic
- :CALCulate:ADVanced

:CALCulate:MODE

Syntax

:CALCulate:MODE <mod>

:CALCulate:MODE?

Description

Set or query the math operation type.

Parameter

Name	Type	Range	Default
<mod>	Discrete	{ADD|SUB|MULTiply|DIVision|FFT|LOGic|ADVanced|OFF}	OFF

Return Format

The query returns ADD, SUB, MULT, DIV, FFT, LOG, ADV or OFF.

:CALCulate:ADD

- :CALCulate:ADD:SA
- :CALCulate:ADD:SB
- :CALCulate:ADD:INVert
- :CALCulate:ADD:VSCale
- :CALCulate:ADD:VOFFset

:CALCulate:ADD:SA
:CALCulate:ADD:SB

Syntax

:CALCulate:ADD:SA <source>

:CALCulate:ADD:SA?

:CALCulate:ADD:SB <source>

:CALCulate:ADD:SB?

Description

Set or query the channel source of signal source A or B of the addition operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:CALCulate:ADD:INVert

Syntax

:CALCulate:ADD:INVert <bool>

:CALCulate:ADD:INVert?

Description

Enable or disable the inverted display of the addition operation result; or query the current status of the inverted display of the addition operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:ADD:VSCale

Syntax

:CALCulate:ADD:VSCale <scale>

:CALCulate:ADD:VSCale?

Description

Set or query the vertical scale of the addition operation result. The unit is related to the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	The default range is from 0.02 to 500. The actual range is related to the vertical scale of the signal source channel.	2V

Note: For the channel vertical scale, refer to the :CHANnel<n>:SCALe command.

Return Format

The query returns the vertical scale of the addition operation result in scientific notation.

:CALCulate:ADD:VOFFset

Syntax

:CALCulate:ADD:VOFFset <offs>

:CALCulate:ADD:VOFFset?

Description

Set or query the vertical offset of the addition operation result. The unit is related to the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:ADD:VSCale command.

Return Format

The query returns the vertical offset of the addition operation result in scientific notation.

:CALCulate:SUB

- :CALCulate:SUB:SA
- :CALCulate:SUB:SB
- :CALCulate:SUB:INVert
- :CALCulate:SUB:VSCale
- :CALCulate:SUB:VOFFset

:CALCulate:SUB:SA
:CALCulate:SUB:SB

Syntax

:CALCulate:SUB:SA <source>

:CALCulate:SUB:SA?

:CALCulate:SUB:SB <source>

:CALCulate:SUB:SB?

Description

Set or query the channel source of signal source A or B of the subtraction operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:CALCulate:SUB:INVert

Syntax

:CALCulate:SUB:INVert <bool>

:CALCulate:SUB:INVert?

Description

Enable or disable the inverted display of the subtraction operation result; or query the current status of the inverted display of the subtraction operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:SUB:VSCale

Syntax

:CALCulate:SUB:VSCale <scale>

:CALCulate:SUB:VSCale?

Description

Set or query the vertical scale of the subtraction operation result. The unit is related to the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	The default range is from 1p to 200. The actual range is related to the vertical scale of the signal source channel.	2V

Note: For the channel vertical scale, refer to the :CHANnel<n>:SCALe command.

Return Format

The query returns the vertical scale of the subtraction operation result in scientific notation.

:CALCulate:SUB:VOFFset

Syntax

:CALCulate:SUB:VOFFset <offs>

:CALCulate:SUB:VOFFset?

Description

Set or query the vertical offset of the subtraction operation result. The unit is related to the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:SUB:VSCale command.

Return Format

The query returns the vertical offset of the subtraction operation result in scientific notation.

:CALCulate:MULTiply

- :CALCulate:MULTiply:SA
- :CALCulate:MULTiply:SB
- :CALCulate:MULTiply:INVert
- :CALCulate:MULTiply:VSCale
- :CALCulate:MULTiply:VOFFset

:CALCulate:MULTiply:SA
:CALCulate:MULTiply:SB

Syntax

:CALCulate:MULTiply:SA <source>
:CALCulate:MULTiply:SA?
:CALCulate:MULTiply:SB <source>
:CALCulate:MULTiply:SB?

Description

Set or query the channel source of signal source A or B of the multiplication operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:CALCulate:MULTiply:INVert

Syntax

:CALCulate:MULTiply:INVert <bool>
:CALCulate:MULTiply:INVert?

Description

Enable or disable the inverted display of the multiplication operation result; or query the current status of the inverted display of the multiplication operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:MULTiply:VSCale

Syntax

:CALCulate:MULTiply:VSCale <scale>

:CALCulate:MULTiply:VSCale?

Description

Set or query the vertical scale of the multiplication operation result.

Parameter

Name	Type	Range	Default
<scale>	Real	The default range is from 50nU to 10MU. The actual range is related to the vertical scale of the signal source channel.	2U

Note: For the channel vertical scale, refer to the :CHANnel<n>:SCALe command.

Return Format

The query returns the vertical scale of the multiplication operation result in scientific notation.

:CALCulate:MULTiply:VOFFset

Syntax

:CALCulate:MULTiply:VOFFset <offs>

:CALCulate:MULTiply:VOFFset?

Description

Set or query the vertical offset of the multiplication operation result.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:MULTiply:VSCale command.

Return Format

The query returns the vertical offset of the multiplication operation result in scientific notation.

:CALCulate:DIVision

- :CALCulate:DIVision:SA
- :CALCulate:DIVision:SB
- :CALCulate:DIVision:INVert
- :CALCulate:DIVision:VSCale
- :CALCulate:DIVision:VOFFset

:CALCulate:DIVision:SA
:CALCulate:DIVision:SB

Syntax

:CALCulate:DIVision:SA <source>

:CALCulate:DIVision:SA?

:CALCulate:DIVision:SB <source>

:CALCulate:DIVision:SB?

Description

Set or query the channel source of signal source A or B of the division operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:CALCulate:DIVision:INVert

Syntax

:CALCulate:DIVision:INVert <bool>

:CALCulate:DIVision:INVert?

Description

Enable or disable the inverted display of the division operation result; or query the current status of the inverted display of the division operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:DIVision:VSCale

Syntax

:CALCulate:DIVision:VSCale <scale>

:CALCulate:DIVision:VSCale?

Description

Set or query the vertical scale of the division operation result.

Parameter

Name	Type	Range	Default
<scale>	Real	The default range is from 50nU to 50MU. The actual range is related to the vertical scale of the signal source channel.	2U

Note: For the channel vertical scale, refer to the :CHANnel<n>:SCALe command.

Return Format

The query returns the vertical scale of the division operation result in scientific notation.

:CALCulate:DIVision:VOFFset

Syntax

:CALCulate:DIVision:VOFFset <offs>

:CALCulate:DIVision:VOFFset?

Description

Set or query the vertical offset of the division operation result.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:DIVision:VSCale command.

Return Format

The query returns the vertical offset of the division operation result in scientific notation.

:CALCulate:FFT

- :CALCulate:FFT:SOURce
- :CALCulate:FFT:WINDow
- :CALCulate:FFT:SPLit
- :CALCulate:FFT:VSMode
- :CALCulate:FFT:VSCale
- :CALCulate:FFT:VOFFset
- :CALCulate:FFT:HSCale
- :CALCulate:FFT:HOFFset
- :CALCulate:FFT:HSPan
- :CALCulate:FFT:HCENter

:CALCulate:FFT:SOURce

Syntax

:CALCulate:FFT:SOURce <source>

:CALCulate:FFT:SOURce?

Description

Set or query the signal source of FFT operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:CALCulate:FFT:WINDow

Syntax

:CALCulate:FFT:WINDow <window>

:CALCulate:FFT:WINDow?

Description

Set or query the window function of the FFT operation.

Parameter

Name	Type	Range	Default
<window>	Discrete	{RECTangle|HANNing|HAMMing|BLACkman}	RECTangle

Explanation

- The window function can effectively reduce the spectrum leakage effect.
- Different window function is suitable for measuring different waveform; therefore, please select the desired window function according to the waveform to be measured and its characteristics.

Return Format

The query returns RECT, HANN, HAMM or BLAC.

:CALCulate:FFT:SPLit

Syntax

:CALCulate:FFT:SPLit <bool>

:CALCulate:FFT:SPLit?

Description

Enable or disable the split display of the FFT operation; or query the current status of the split display of the FFT operation.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	1|ON

Explanation

- ON: the signal source channel waveform and the FFT operation results are displayed separately. The time domain and frequency domain signals are displayed clearly.
- OFF (Full Screen): the signal source channel waveform and the FFT operation results are displayed in the same window to view the frequency spectrum more clearly and to perform more precise measurement.

Return Format

The query returns 1 or 0.

:CALCulate:FFT:VSMode

Syntax

:CALCulate:FFT:VSMode <vmode>

:CALCulate:FFT:VSMode?

Description

Set or query the vertical scale type of the FFT operation result.

Parameter

Name	Type	Range	Default
<vmode>	Discrete	{VRMS|DB}	DB

Return Format

The query returns VRMS or DB.

:CALCulate:FFT:VSCale

Syntax

:CALCulate:FFT:VSCale <vscale>

:CALCulate:FFT:VSCale?

Description

Set or query the vertical scale of the FFT operation result. The unit is related to the current vertical scale type of FFT operation and the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<vscale>	Real	Related to the current vertical scale type of FFT operation: dB: 1 to 100 Vrms: the default range is from 0.01 to 200. The actual range is related to the vertical scale of the signal source channel.	20dB/div

Note: For the vertical scale type of FFT operation, refer to the :CALCulate:FFT:VSMode command. For the channel vertical scale, refer to the :CHANnel<n>:SCALe command. Once you change the channel vertical scale, the range of <vscale> will be changed only after the MATH channel is re-activated.

Return Format

The query returns the vertical scale of the FFT operation result in scientific notation.

:CALCulate:FFT:VOFFset

Syntax

:CALCulate:FFT:VOFFset <offs>

:CALCulate:FFT:VOFFset?

Description

Set or query the vertical offset of the FFT operation result. The unit is related to the current vertical scale type of FFT operation and the amplitude unit of the signal source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	60dBV

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:FFT:VSCale command.

Return Format

The query returns the vertical offset of the FFT operation result in scientifc notation.

:CALCulate:FFT:HSCale

Syntax

:CALCulate:FFT:HSCale <hscale>

:CALCulate:FFT:HSCale?

Description

Set or query the horizontal coefficient of FFT operation. This command indirectly sets the horizontal scale of FFT operation.

Parameter

Name	Type	Range	Default
<hscale>	Discrete	{1|2|3|4}	2

Note: You can use the :CALCulate:FFT:HSPan command to set the horizontal scale of FFT operation directly.

Explanation

- The FFT horizontal coefficient represents the relationship between the FFT horizontal scale (Hspan) and the current FFT sample rate of the screen (Sa).
  1: Hspan=Sa/20
  2: Hspan=Sa/40
  3: Hspan=Sa/100
  4: Hspan=Sa/200
- The current FFT sample rate of the screen=the number of pixels per grid horizontally/the horizontal timebase. The number of pixels per grid horizontally is related to the on/off status of the aunti-aliasing function; it is 50 when the anti-aliasing function is disabled and 100 when the anti-aliasing function is enabled. For the horizontal timebase, refer to the :TIMebase[:MAIN]:SCALe command.

Return Format

The query returns 1, 2, 3 or 4.

:CALCulate:FFT:HOFFset

Syntax

:CALCulate:FFT:HOFFset <offs>

:CALCulate:FFT:HOFFset?

Description

Set or query the horizontal offset of the FFT operation result. The unit is Hz.

Parameter

Name	Type	Range	Default
<offs>	Real	Refer to the **Explanation**	0

Explanation

- The range of <offs> is related to the on/off status of the anti-aliasing function, the current FFT sample rate of the screen (Sa) and the current FFT horizontal scale (Hspan).
  When the anti-aliasing function is disabled: max{-0.5*Sa, -14*Hspan} to 0.5*Sa
  When the anti-aliasing function is enabled: max{-0.4*Sa, -14*Hspan} to 0.4*Sa
  Note: max{A, B} means using the larger one of A and B.
- The current FFT sample rate of the screen=the number of pixels per grid horizontally/the horizontal timebase. The number of pixels per grid horizontally is related to the on/off status of the FFT anti-aliasing function; it is 50 when the ainti-aliasing function is disabled and 100 when the anti-aliasing function is enabled. For the horizontal timebase, refer to the :TIMebase[:MAIN]:SCALe command.
- The FFT horizontal scale is related to the current FFT sample rate of the screen and the FFT horizontal coefficient. Please refer to the :CALCulate:FFT:HSPan command.

Return Format

The query returns the horizontal offset of the FFT operation result in scientific notation.

:CALCulate:FFT:HSPan

Syntax

:CALCulate:FFT:HSPan

:CALCulate:FFT:HSPan?

Description

Set or query the horizontal scale of the FFT operation result. The unit is Hz/div.

Parameter

Name	Type	Range	Default
	Discrete	Refer to the **Explanation**	1.25MHz/div

Explanation

- The FFT horizontal scale is related to the current FFT sample rate of the screen (Sa). It can be Sa/20, Sa/40, Sa/100 and Sa/200.
- The current FFT sample rate of the screen = the number of pixels per grid horizontally/the horizontal timebase. The number of pixels per grid horizontally is related to the on/off status of the FFT anti-aliasing function; it is 50 when the ainti-aliasing function is disabled and 100 when the anti-aliasing function is enabled. For the horizontal timebase, refer to the :TIMebase[:MAIN]:SCALe command.
- You can set the horizontal scale of FFT operation indirectly by setting the FFT horizontal coefficient (:CALCulate:FFT:HSCale).

Return Format

The query returns the horizontal scale of the FFT operation result in scientific notation.

:CALCulate:FFT:HCENter

Syntax

:CALCulate:FFT:HCENter

:CALCulate:FFT:HCENter?

Description

Set or query the center frequency of the FFT operation result. The unit is Hz.

Parameter

Name	Type	Range	Default
	Real	Horizontal offset of the operation result +7*the current horizontal scale	8.75MHz

Note: For the horizontal offset, refer to the :CALCulate:FFT:HOFFset command; for the horizontal scale, refer to the :CALCulate:FFT:HSCale and :CALCulate:FFT:HSPan commands.

Return Format

The query returns the center frequency of the FFT operation result in scientific notation.

:CALCulate:LOGic

- :CALCulate:LOGic:SA
- :CALCulate:LOGic:SB
- :CALCulate:LOGic:INVert
- :CALCulate:LOGic:VSCale
- :CALCulate:LOGic:VOFFset
- :CALCulate:LOGic:OPERator
- :CALCulate:LOGic:ATHReshold
- :CALCulate:LOGic:BTHReshold

:CALCulate:LOGic:SA
:CALCulate:LOGic:SB

Syntax

:CALCulate:LOGic:SA <source>

:CALCulate:LOGic:SA?

:CALCulate:LOGic:SB <source>

:CALCulate:LOGic:SB?

Description

Set or query the channel source of signal source A or B of the logic operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Explanation

If the current logic operation type is NOT, only use the :CALCulate:LOGic:SA command to specify the channel source of signal source A.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:CALCulate:LOGic:INVert

Syntax

:CALCulate:LOGic:INVert <bool>

:CALCulate:LOGic:INVert?

Description

Enable or disable the inverted display of the logic operation result; or query the current status of the inverted display of the logic operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:LOGic:VSCale

Syntax

:CALCulate:LOGic:VSCale <scale>

:CALCulate:LOGic:VSCale?

Description

Set or query the vertical scale of the logic operation result.

Parameter

Name	Type	Range	Default
<scale>	Real	0.05U to 100U	1U

Return Format

The query returns the vertical scale of the logic operation result in scientific notation.

:CALCulate:LOGic:VOFFset

Syntax

:CALCulate:LOGic:VOFFset <offs>

:CALCulate:LOGic:VOFFset?

Description

Set or query the vertical offset of the logic operation result.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:LOGic:VSCale command.

Return Format

The query returns the vertical offset of the logic operation result in scientifc notation.

:CALCulate:LOGic:OPERator

Syntax

:CALCulate:LOGic:OPERator <oper>

:CALCulate:LOGic:OPERator?

Description

Set or query the operator of logic operation.

Parameter

Name	Type	Range	Default
<oper>	Discrete	{AND|OR|NOT|XOR}	AND

Return Format

The query returns AND, OR, NOT or XOR.

:CALCulate:LOGic:ATHReshold
:CALCulate:LOGic:BTHReshold

Syntax

:CALCulate:LOGic:ATHReshold <thre>

:CALCulate:LOGic:ATHReshold?

:CALCulate:LOGic:BTHReshold <thre>

:CALCulate:LOGic:BTHReshold?

Description

Set or query the threshold of signal source A or B of logic operation.

Parameter

Name	Type	Range	Default
<thre>	Real	-4×VerticalScale-OFFSet to 4×VerticalScale-OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- This command is only available when signal source A or B is CH1 or CH2.
- If the current logic operation type is NOT, you only need to set the threshold of signal source A.

Return Format

The query returns the threshold of signal source A or B of logic operation in scientific notation.

:CALCulate:ADVanced

- :CALCulate:ADVanced:EXPRession
- :CALCulate:ADVanced:INVert
- :CALCulate:ADVanced:VARiable1
- :CALCulate:ADVanced:VARiable2
- :CALCulate:ADVanced:VSCale
- :CALCulate:ADVanced:VOFFset

:CALCulate:ADVanced:EXPRession

Syntax

:CALCulate:ADVanced:EXPRession <expression>

:CALCulate:ADVanced:EXPRession?

Description

Set or query the expression of advanced operation.

Parameter

Name	Type	Range	Default
<expression>	ASCII string	Refer to the **Explanation**	CH1+CH2

Explanation

Input valid expressions using the characters as shown in the figure below.

Note: The length of the expression should be no greater than 64 bytes.

Return Format

The query returns the current expression in string.

:CALCulate:ADVanced:INVert

Syntax

:CALCulate:ADVanced:INVert <bool>

:CALCulate:ADVanced:INVert?

Description

Enable or disable the inverted display of the advanced operation result; or query the current status of the inverted display of the advanced operation result.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CALCulate:ADVanced:VARiable1
:CALCulate:ADVanced:VARiable2

Syntax

:CALCulate:ADVanced:VARiable1 <numeric_value>

:CALCulate:ADVanced:VARiable1?

:CALCulate:ADVanced:VARiable2 <numeric_value>

:CALCulate:ADVanced:VARiable2?

Description

Set or query the variable1 or variable2 in the advanced operation expression.

Parameter

Name	Type	Range	Default
<numeric_value>	Real	Refer to the **Explanation**	0

Explanation

- The format of <numeric_value> is AeB. The range of A (mantissa) is from -9.9999 to 9.9999 (the minimum step is 0.0001; namely the number can contain at most 4 decimal places). B (exponent, its base is 10) is an integer from -9 to 9. For example, 1.2037e5 denotes setting the viariable to 1.2037×10^5. <numeric_value> can also be expressed in decimal format; its range corresponds to that in AeB format.
- This command sets the value of variable1 or variable2 which might be used in the :CALCulate:ADVanced:EXPRession command.

Return Format

The query returns the value of variable1 or variable2 in the advanced operation expression in scientific notation.

:CALCulate:ADVanced:VSCale

Syntax

:CALCulate:ADVanced:VSCale <numeric_value>

:CALCulate:ADVanced:VSCale?

Description

Set or query the vertical scale of the advanced operation result. The unit is related to the advanced operation expression.

Parameter

Name	Type	Range	Default
<numeric_value>	Real	The default range is from 0.02 to 500. The actual range is related to the advanced operation expression.	2V

Note: For the advanced operation expression, refer to the :CALCulate:ADVanced:EXPRession command. The expression might include CH1 or CH2; at this point, the actual range of <numeric_value> ia also related to the channel vertical scale. For the channel vertical scale, refer to the :CHANnel<n>:SCALe command.

Return Format

The query returns the vertical scale of the advanced operation result in scientific notation.

:CALCulate:ADVanced:VOFFset

Syntax

:CALCulate:ADVanced:VOFFset <offs>

:CALCulate:ADVanced:VOFFset?

Description

Set or query the vertical offset of the advanced operation result. The unit is related to the advanced operation expression.

Parameter

Name	Type	Range	Default
<offs>	Real	-40×VScale to 40×VScale	0

Note: For the VScale (the vertical scale of MATH), refer to the :CALCulate:ADVanced:VSCale command.

Return Format

The query returns the vertical offset of the advanced operation result in scientific notation.

:CALibrate Commands

- :CALibrate:DATE?
- :CALibrate:STARt
- :CALibrate:TIME?
- :CALibrate:QUIT

:CALibrate:DATE?

Syntax

:CALibrate:DATE?

Description

Query the date of the last calibration.

Return Format

The query returns the date in <year>,<month>,<day> format. Wherein, <day> and <month> are double-digit figures and <year> is a four-digit figure. For example, 2013,10,27.

:CALibrate:STARt

Syntax

:CALibrate:STARt

Description

The oscilloscope starts to execute self-calibration.

Explanation

- The self-calibration can make the oscilloscope quickly reach its optimum working state to obtain the most accurate measurement values.
- The functions of most of the keys are disabled during the self-calibration.

:CALibrate:TIME?

Syntax

:CALibrate:TIME?

Description

Query the time of the last calibration.

Return Format

The query returns the time in <hours>,<minutes>,<seconds> format. Wherein, <hours>, <minutes> and <seconds> are all double-digit figures. For example, 15,19,25.

:CALibrate:QUIT

Syntax

:CALibrate:QUIT

Description

Exit the self-calibration at any time.

:CHANnel<n> Commands

- :CHANnel<n>:BWLimit
- :CHANnel<n>:COUPling
- :CHANnel<n>:DISPlay
- :CHANnel<n>:INVert
- :CHANnel<n>:IMPedance
- :CHANnel<n>:OFFSet
- :CHANnel<n>:SCALe
- :CHANnel<n>:PROBe
- :CHANnel<n>:UNITs
- :CHANnel<n>:VERNier
- :CHANnel<n>:TCAL

:CHANnel<n>:BWLimit

Syntax

:CHANnel<n>:BWLimit <type>

:CHANnel<n>:BWLimit?

Description

Set or query bandwidth limit of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<type>	Discrete	{20M|100M|OFF}	OFF

Note: For 100MHz and 70MHz oscilloscopes, the bandwidth limit can only be 20MHz.

Return Format

The query returns 20M, 100M or OFF.

:CHANnel<n>:COUPling

Syntax

:CHANnel<n>:COUPling <coupling>

:CHANnel<n>:COUPling?

Description

Set or query the coupling mode of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<coupling>	Discrete	{AC|DC|GND}	DC

Explanation

- AC: the DC components of the signal under test are blocked.
- DC: the DC and AC components of the signal under test can both pass the channel.
- GND: the DC and AC components of the signal under test are both blocked.

Return Format

The query returns AC, DC or GND.

:CHANnel<n>:DISPlay

Syntax

:CHANnel<n>:DISPlay <bool>

:CHANnel<n>:DISPlay?

Description

Enable or disable the specified analog channel; or query the current status of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	1|ON

Return Format

The query returns 1 or 0.

:CHANnel<n>:INVert

Syntax

:CHANnel<n>:INVert <bool>

:CHANnel<n>:INVert?

Description

Enable or disable the inverted display of the specified analog channel; or query the current status of the inverted display of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:CHANnel<n>:IMPedance

Syntax

:CHANnel<n>:IMPedance <impedance>

:CHANnel<n>:IMPedance?

Description

Set or query the input impedance of the specified analog channel. The default unit is Ω.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<type>	Discrete	{OMEG|FIFTy}	OMEG

Explanation

OMEG: 1MΩ; FIFTy: 50Ω

Return Format

The query returns OMEG or FIFT.

:CHANnel<n>:OFFSet

Syntax

:CHANnel<n>:OFFSet <offset>

:CHANnel<n>:OFFSet?

Description

Set or query the vertical offset of the specified analog channel. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<offset>	Real	When the input impedance is 50Ω and the probe ratio is 1X: 500μV/div to 50mV/div: -2V to 2V 51mV/div to 200mV/div: -10V to 10V 205mV/div to 1V/div: -12V to 12V When the input impedance is 1MΩ and the probe ratio is 1X: 500μV/div to 50mV/div: -2V to 2V 51mV/div to 200mV/div: -10V to 10V 205mV/div to 2V/div: -50V to 50V 2.05V/div to 10V/div: -100V to 100V	CHANnel1: 2V CHANnel2: -2V

Note: The range of the vertical offset is related to the vertical scale, probe ratio and input impedance currently set. For the vertical scale, refer to the :CHANnel<n>:SCALe command. For the probe ratio, refer to the :CHANnel<n>:PROBe command. For the input impedance, refer to the :CHANnel<n>:IMPedance command.

Return Format

The query returns the vertical offset of the specified analog channel in scientific notation.

:CHANnel<n>:SCALe

Syntax

:CHANnel<n>:SCALe <scale>

:CHANnel<n>:SCALe?

Description

Set or query the vertical scale of the specified analog channel. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<scale>	Real	When the input impedance is 50Ω and the probe ratio is 1X: 500μV/div to 1V/div When the input impedance is 1MΩ and the probe ratio is 1X: 500μV/div to 10V/div	1V

Note: The range of the vertical scale is related to the probe ratio and input impedance currently set. For the setting of the probe ratio, refer to the :CHANnel<n>:PROBe command. For the input impedance, refer to the :CHANnel<n>:IMPedance command.

Return Format

The query returns the vertical scale of the specified analog channel in scientific notation.

:CHANnel<n>:PROBe

Syntax

:CHANnel<n>:PROBe <atten>

:CHANnel<n>:PROBe?

Description

Set or query the probe attenuation ratio of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<atten>	Discrete	{0.01|0.02|0.05|0.1|0.2|0.5|1|2|5|10|20|50|100|200|500|1000}	1

Explanation

- After setting the probe ratio, multiply the sampled signal by the specified multiple and then display the result (the actual amplitude of the signal will not be affected).
- Setting the probe ratio affects the range of the vertical scale.

Return Format

The query returns the attenuation ratio currently set.

:CHANnel<n>:UNITs

Syntax

:CHANnel<n>:UNITs <units>

:CHANnel<n>:UNITs?

Description

Set or query the amplitude display unit of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<units>	Discrete	{VOLTage|WATT|AMPere|UNKNown}	VOLTage

Return Format

The query returns VOLT, WATT, AMP or UNKN.

:CHANnel<n>:VERNier

Syntax

:CHANnel<n>:VERNier <bool>

:CHANnel<n>:VERNier?

Description

Enable or disable the fine adjustment function of the vertical scale of the specified analog channel; or query the current status of the fine adjustment function of the vertical scale of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

By default, the fine adjustment function is disabled. At this point, you can only set the vertical scale in 1-2-5 step; namely 500uV, 1mV, 2mV, 5mV, 10mV...10V. When the fine adjustment function is enabled, you can further adjust the vertical scale within a relatively smaller range to improve vertical resolution. If the amplitude of the input waveform is a little bit greater than the full scale under the current scale and the amplitude would be a little bit lower if the next scale is used, fine adjustment can be used to improve the amplitude of waveform display to view signal details.

Return Format

The query returns 1 or 0.

:CHANnel<n>:TCAL

Syntax

:CHANnel<n>:TCAL <time>

:CHANnel<n>:TCAL?

Description

Set or query the delay calibration time of the specified analog channel. The default unit is s.

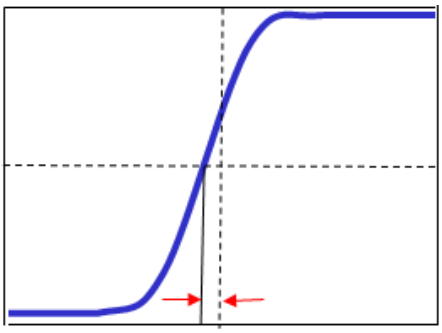
Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<time>	Real	-200ns to 200ns	0s

Note: When the horizontal timebase is greater than or equal to 10us, the delay calibration time cannot be adjusted.

Explanation

When using an oscilloscope for actual measurement, the transmission delay of the probe cable may bring relatively greater error (zero offset). Zero offset is defined as the offset of the crossing point of the waveform and trigger level line relative to the trigger position, as shown in the figure below.



Return Format

The query returns the delay calibration time of the specified analog channel in scientific notation.

:CURSor Commands

- :CURSor:MODE
- :CURSor:MANual
- :CURSor:TRACk

:CURSor:MODE

Syntax

:CURSor:MODE <mode>

:CURSor:MODE?

Description

Set or query the cursor measurement mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{OFF|MANual|TRACk|AUTO|XY}	OFF

Explanation

- OFF: disable the cursor measurement.
- MANual: enable the manual measurement with cursor.
- TRACk: enable the track measurement with cursor.
- AUTO: enable the auto measurement with cursor.
- XY: enable the X-Y cursor measurement. This mode is only valid when the horizontal time base mode is X-Y (please refer to the :TIMebase:MODE command).

Return Format

The query returns OFF, MAN, TRAC, AUTO or XY.

:CURSor:MANual

- :CURSor:MANual:TYPE
- :CURSor:MANual:SOURce
- :CURSor:MANual:TUNit
- :CURSor:MANual:VUNit
- :CURSor:MANual:CAX
- :CURSor:MANual:CBX
- :CURSor:MANual:CAY
- :CURSor:MANual:CBY
- :CURSor:MANual:AXValue?
- :CURSor:MANual:BXValue?
- :CURSor:MANual:AYValue?
- :CURSor:MANual:BYValue?
- :CURSor:MANual:XDELta?
- :CURSor:MANual:IXDelta?
- :CURSor:MANual:YDELta?

:CURSor:MANual:TYPE

Syntax

:CURSor:MANual:TYPE <type>

:CURSor:MANual:TYPE?

Description

Set or query the cursor type of manual measurement with cursor.

Parameter

Name	Type	Range	Default
<type>	Discrete	{TIME|AMPLitude}	TIME

Explanation

- TIME: X cursors which are usually used to measure time parameters.
- AMPLitude: Y cursors which are usually used to measure voltage parameters.

Return Format

The query returns TIME or AMPL.

:CURSor:MANual:SOURce

Syntax

:CURSor:MANual:SOURce <source>

:CURSor:MANual:SOURce?

Description

Set or query the channel source of manual measurement with cursor.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2|MATH|LA|NONE}	CHANnel1

Note: Only channels currently enabled can be selected as the channel source.

Return Format

The query returns CHAN1, CHAN2, MATH, LA or NONE.

:CURSor:MANual:TUNit

Syntax

:CURSor:MANual:TUNit <unit>

:CURSor:MANual:TUNit?

Description

Set or query the horizontal unit in manual measurement with cursor.

Parameter

Name	Type	Range	Default
<unit>	Discrete	{SECond|HZ|PERCent|DEGRee}	SECond

Explanation

- SECond: in the measurement results, A->X, B->X and △X are in “s” and 1/△X is in “Hz”.
- HZ: in the measurement results, A->X, B->X and △X are in “Hz” and 1/△X is in “s”.
- PERCent: in the measurement results, A->X, B->X and △X are expressed in percentage.
- DEGRee: in the measurement results, A->X, B->X and △X are in “°”.

Return Format

The query returns SEC, HZ, PERC or DEGR.

:CURSor:MANual:VUNit

Syntax

:CURSor:MANual:VUNit <unit>

:CURSor:MANual:VUNit?

Description

Set or query vertical unit in manual measurement with cursor.

Parameter

Name	Type	Range	Default
<unit>	Discrete	{SUNit|PERCent}	SUNit

Explanation

- SUNit: in the measurement results, the units of A->Y, B->Y and △Y will be automatically set to the unit of the current source.
- PERCent: in the measurement results, A->Y, B->Y and △X are expressed in percentage.

Return Format

The query returns SUN or PERC.

:CURSor:MANual:CAX
:CURSor:MANual:CBX

Syntax

:CURSor:MANual:CAX <ax>

:CURSor:MANual:CAX?

:CURSor:MANual:CBX <bx>

:CURSor:MANual:CBX?

Description

Set or query the horizontal position of cursor A or cursor B (X cursor) in manual measurement with cursor.

Parameter

Name	Type	Range	Default
<ax>	Integer	0 to 699	150
<bx>	Integer	0 to 699	550

Explanation

The horizontal and vertical positions of the cursor are defined by the pixel coordinate of the screen. The pixel coordinate of the screen ranges from (0,0) to (700,400). Wherein, (0,0) is located at the left top corner of the screen and (700,400) is located at the right bottom corner of the screen. The horizontal pixel range is from 0 to 699 and the vertical pixel range is from 0 to 399.

Return Format

The query returns an integer between 0 and 699.

:CURSor:MANual:CAY
:CURSor:MANual:CBY

Syntax

:CURSor:MANual:CAY <ay>

:CURSor:MANual:CAY?

:CURSor:MANual:CBY <by>

:CURSor:MANual:CBY?

Description

Set or query the vertical position of cursor A or cursor B (Y cursor) in manual measurement with cursor.

Parameter

Name	Type	Range	Default
<ay>	Integer	0 to 399	100
<by>	Integer	0 to 399	300

Explanation

- The horizontal and vertical positions of the cursor are defined by the pixel coordinate of the screen. The pixel coordinate of the screen ranges from (0,0) to (700,400). Wherein, (0,0) is located at the left top corner of the screen and (700,400) is located at the right bottom corner of the screen. The horizontal pixel range is from 0 to 699 and the vertical pixel range is from 0 to 399.
- When the measurement source is LA (:CURSor:MANual:SOURce), this command is invalid.

Return Format

The query returns an integer between 0 and 399.

:CURSor:MANual:AXValue?
:CURSor:MANual:BXValue?

Syntax

:CURSor:MANual:AXValue?

:CURSor:MANual:BXValue?

Description

Query the X value at cursor A or cursor B (X cursor) in manual measurement with cursor.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:MANual:CAX command. The unit is determined by the horizontal unit currently selected (refer to the :CURSor:MANual:TUNit command).
- For the horizontal position of cursor B, refer to the :CURSor:MANual:CBX command. The unit is determined by the horizontal unit currently selected (refer to the :CURSor:MANual:TUNit command).

Return Format

The query returns the X value at cursor A or cursor B in manual measurement with cursor in scientific notation.

:CURSor:MANual:AYValue?
:CURSor:MANual:BYValue?

Syntax

:CURSor:MANual:AYValue?

:CURSor:MANual:BYValue?

Description

Query the Y value at cursor A or cursor B (Y cursor) in manual measurement with cursor.

Explanation

- For the vertical position of cursor A, refer to the :CURSor:MANual:CAY command. The unit is determined by the vertical unit currently selected (refer to the :CURSor:MANual:VUNit command).
- For the vertical position of cursor B, refer to the :CURSor:MANual:CBY command. The unit is determined by the vertical unit currently selected (refer to the :CURSor:MANual:VUNit command).

Return Format

The query returns the Y value at cursor A or cursor B in manual measurement with cursor in scientific notation. When the current measurement source is LA (:CURSor:MANual:SOURce), the query returns a decimal integer (corresponding to the sum of the binary wights of D15 to D0 at cursor A or cursor B; for channel that is not turned on, the value is 0 by default).

:CURSor:MANual:XDELta?

Syntax

:CURSor:MANual:XDELta?

Description

Query the difference △X between the X values at cursor A and cursor B in manual measurement with cursor.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:MANual:CAX command.
- For the horizontal position of cursor B, refer to the :CURSor:MANual:CBX command.
- The unit is determined by the horizontal unit currently selected (refer to the :CURSor:MANual:TUNit command).

Return Format

The query returns the difference △X between the X values at cursor A and cursor B in manual measurement with cursor in scientific notation.

:CURSor:MANual:IXDelta?

Syntax

:CURSor:MANual:IXDelta?

Description

Query the reciprocal (1/△X) of the difference between the X values at cursor A and cursor B in manual measurement with cursor.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:MANual:CAX command.
- For the horizontal position of cursor B, refer to the :CURSor:MANual:CBX command.
- The unit is determined by the reciprocal of the horizontal unit currently selected (refer to the :CURSor:MANual:TUNit command).

Return Format

The query returns the reciprocal (1/△X) of the difference between the X values at cursor A and cursor B in manual measurement with cursor in scientific notation. When △X is 0s, the query returns 9.9E37.

:CURSor:MANual:YDELta?

Syntax

:CURSor:MANual:YDELta?

Description

Query the difference △Y between the Y values at cursor A and cursor B in manual measurement with cursor.

Explanation

- For the vertical position of cursor A, refer to the :CURSor:MANual:CAY command.
- For the vertical position of cursor B, refer to the :CURSor:MANual:CBY command.
- The unit is determined by the vertical unit currently selected (refer to the :CURSor:MANual:VUNit command).
- This command is invalid when the measurement source is LA (:CURSor:MANual:SOURce).

Return Format

The query returns the difference △Y between the Y values at cursor A and cursor B in manual measurement with cursor in scientific notation. When the current measurement source is LA (:CURSor:MANual:SOURce), the query returns 4294967295.

:CURSor:TRACk

- :CURSor:TRACk:SOURce1
- :CURSor:TRACk:SOURce2
- :CURSor:TRACk:CAX
- :CURSor:TRACk:CBX
- :CURSor:TRACk:CAY?
- :CURSor:TRACk:CBY?
- :CURSor:TRACk:AXValue?
- :CURSor:TRACk:AYValue?
- :CURSor:TRACk:BXValue?
- :CURSor:TRACk:BYValue?
- :CURSor:TRACk:XDELta?
- :CURSor:TRACk:YDELta?
- :CURSor:TRACk:IXDelta?

:CURSor:TRACk:SOURce1
:CURSor:TRACk:SOURce2

Syntax

:CURSor:TRACk:SOURce1 <source>

:CURSor:TRACk:SOURce1?

:CURSor:TRACk:SOURce2 <source>

:CURSor:TRACk:SOURce2?

Description

Set or query the channel source of cursor A or cursor B in track measurement with cursor.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2|MATH|NONE}	CHANnel1

Note: Only channels currently enabled can be selected as the channel source.

Return Format

The query returns CHAN1, CHAN2, MATH or NONE.

:CURSor:TRACk:CAX
:CURSor:TRACk:CBX

Syntax

:CURSor:TRACk:CAX <ax>
:CURSor:TRACk:CAX?
:CURSor:TRACk:CBX <bx>
:CURSor:TRACk:CBX?

Description

Set or query the horizontal position of cursor A or cursor B in track measurement with cursor.

Parameter

Name	Type	Range	Default
<ax>	Integer	0 to 699	150
<bx>	Integer	0 to 699	550

Explanation

The horizontal and vertical positions of the cursor are defined by the pixel coordinate of the screen. The pixel coordinate of the screen ranges from (0,0) to (700,400). Wherein, (0,0) is located at the left top corner of the screen and (700,400) is located at the right bottom corner of the screen. The horizontal pixel range is from 0 to 699.

Return Format

The query returns an integer between 0 and 699.

:CURSor:TRACk:CAY?
:CURSor:TRACk:CBY?

Syntax

:CURSor:TRACk:CAY?
:CURSor:TRACk:CBY?

Description

Query the vertical position of cursor A or cursor B in track measurement with cursor.

Return Format

The query returns the vertical position of cursor A or cursor B in integer.

:CURSor:TRACk:AXValue?
:CURSor:TRACk:AYValue?

Syntax

:CURSor:TRACk:AXValue?

:CURSor:TRACk:AYValue?

Description

Query the X or Y value at cursor A in track measurement with cursor.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:TRACk:CAX command.
- For the vertical position of cursor A, refer to the :CURSor:TRACk:CAY? command. The unit is determined by the unit (refer to the :CHANnel<n>:UNITs command) selected by the signal source (refer to the :CURSor:TRACk:SOURce1 command) of cursor A.

Return Format

The query returns the X or Y value at cursor A in track measurement with cursor in scientific notation. When the Y value at cursor A exceeds the screen region, the :CURSor:TRACk:AYValue? command returns 9.9E37.

:CURSor:TRACk:BXValue?
:CURSor:TRACk:BYValue?

Syntax

:CURSor:TRACk:BXValue?

:CURSor:TRACk:BYValue?

Description

Query the X or Y value at cursor B in track measurement with cursor.

Explanation

- For the horizontal position of cursor B, refer to the :CURSor:TRACk:CBX command.
- For the vertical position of cursor B, refer to the :CURSor:TRACk:CBY? command. The unit is determined by the unit (refer to the :CHANnel<n>:UNITs command) selected by the signal source (refer to the :CURSor:TRACk:SOURce2 command) of cursor B.

Return Format

The query returns the X or Y value at cursor B in track measurement with cursor in scientific notation. When the Y value at cursor B exceeds the screen region, the :CURSor:TRACk:BYValue? command returns 9.9E37.

:CURSor:TRACk:XDELta?

Syntax

:CURSor:TRACk:XDELta?

Description

Query the difference △X between the X values at cursor A and cursor B in track measurement with cursor and the unit is s.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:TRACk:CAX command.
- For the horizontal position of cursor B, refer to the :CURSor:TRACk:CBX command.

Return Format

The query returns the difference △X between the X values at cursor A and cursor B in track measurement with cursor in scientific notation.

:CURSor:TRACk:YDELta?

Syntax

:CURSor:TRACk:YDELta?

Description

Query the difference △Y between the Y values at cursor A and cursor B in track measurement with cursor.

Explanation

- For the vertical position of cursor A, refer to the :CURSor:TRACk:CAY? command.
- For the vertical position of cursor B, refer to the :CURSor:TRACk:CBY? command.
- The unit is determined by the unit (refer to the :CHANnel<n>:UNITs command) of the current signal source.

Return Format

The query returns the difference △Y between the Y values at cursor A and cursor B in track measurement with cursor in scientific notation. When the Y value at cursor A and/or cursor B exceeds the screen region, the query returns 9.9e37.

:CURSor:TRACk:IXDelta?

Syntax

:CURSor:TRACk:IXDelta?

Description

Query the reciprocal (1/△X) of the difference between the X values at cursor A and cursor B in track measurement with cursor and the unit is Hz.

Explanation

- For the horizontal position of cursor A, refer to the :CURSor:TRACk:CAX command.
- For the horizontal position of cursor B, refer to the :CURSor:TRACk:CBX command.

Return Format

The query returns the reciprocal (1/△X) of the difference between the X values at cursor A and cursor B in track measurement with cursor in scientific notation. When △X is 0s, the query returns 9.9E37.

:DISPlay Commands

- :DISPlay:CLEar
- :DISPlay:TYPE
- :DISPlay:GRADing:TIME
- :DISPlay:WBRightness
- :DISPlay:GRID
- :DISPlay:GBRightness
- :DISPlay:MPERsistence
- :DISPlay:DATA?

:DISPlay:CLEar

Syntax

:DISPlay:CLEar

Description

Clear all the waveforms on the screen. The function of this command is the same with that of **CLEAR** at the front panel.

Explanation

- If the oscilloscope is in RUN state (refer to the :RUN command), new waveforms will still be displayed.
- You can also use the :CLEar command to clear all the waveforms on the screen.

:DISPlay:TYPE

Syntax

:DISPlay:TYPE <type>

:DISPlay:TYPE?

Description

Set or query the display type of the waveform on the screen.

Parameter

Name	Type	Range	Default
<type>	Discrete	{VECTors|DOTS}	VECTors

Explanation

- VECTors: the sample points are connected by lines and displayed. Normally, this mode can provide the most vivid waveform to view the steep edge of the waveform (such as square waveform).
- DOTS: display the sample points directly. You can directly view each sample point and use the cursor to measure the X and Y values of the sample point.

Return Format

The query returns VECT or DOTS.

:DISPlay:GRADing:TIME

Syntax

:DISPlay:GRADing:TIME <time>

:DISPlay:GRADing:TIME?

Description

Set or query the persistence time and the unit is s.

Parameter

Name	Type	Range	Default
<time>	Discrete	{MIN|0.05|0.1|0.2|0.5|1|2|5|10|20|INFinite}	MIN

Explanation

- MIN: set the persistence time to its minimum to view the waveform changing in high refresh rate.
- Specific Values: a certain value between 0.05s and 20s, enable to observe glitch that changes relatively slowly or glitch with low occurrence probability.
- INFinite: in this mode, the oscilloscope displays the newly acquired waveform without clearing the waveform formerly acquired. Enable to measure noise and jitter as well as capture incidental events.

Return Format

The query returns the persistence time set.

:DISPlay:WBRightness

Syntax

:DISPlay:WBRightness <time>

:DISPlay:WBRightness?

Description

Set or query the waveform brightness and the unit is %.

Parameter

Name	Type	Range	Default
<time>	Integer	0 to 100	50

Return Format

The query returns an integer between 0 and 100.

:DISPlay:GRID

Syntax

:DISPlay:GRID <grid>

:DISPlay:GRID?

Description

Set or query the grid type of screen display.

Parameter

Name	Type	Range	Default
<grid>	Discrete	{FULL|HALF|NONE}	FULL

Explanation

- FULL: turn the background grid and coordinate on.
- HALF: turn the background grid off and coordinate on.
- NONE: turn the background grid and coordinate off.

Return Format

The query returns FULL, HALF or NONE.

:DISPlay:GBRightness

Syntax

:DISPlay:GBRightness <brightness>

:DISPlay:GBRightness?

Description

Set or query the brightness of the screen grid and the unit is %.

Parameter

Name	Type	Range	Default
<brightness>	Integer	0 to 100	50

Return Format

The query returns an integer between 0 and 100.

:DISPlay:MPERsistence

Syntax

:DISPlay:MPERsistence <time>

:DISPlay:MPERsistence?

Description

Set or query the menu display time and the unit is s.

Parameter

Name	Type	Range	Default
<time>	Discrete	{1|2|5|10|20|INFinite}	INFinite

Return Format

The query returns the menu display time set.

:DISPlay:DATA?

Syntax

:DISPlay:DATA?

Description

Read the bitmap data stream of the image currently displayed.

Explanation

The command is sent from the PC to the instrument through the VISA interface. The instrument responds to the command and directly returns the bitmap data stream of the image currently displayed to the buffer area of the PC.

Return Format

Th format of the bitmap data stream:

Component	TMC Blockheader	BMP Data
Size (length)	N[1]+2	800*480*3+54=1152054[2]
Example	#9001152054	BM...
Explanation	TMC Blockheader ::= #NX...X is used to describe the length of the data stream. Wherein, # is the start denoter of the data stream; N is less than or equal to 9 and the N figures following it denotes the length of the data stream in bytes. For example, #9001152054; wherein, N is 9 and 001152054 denotes that the data stream contains 1152054 bytes of effective data.	Specific bitmap data.

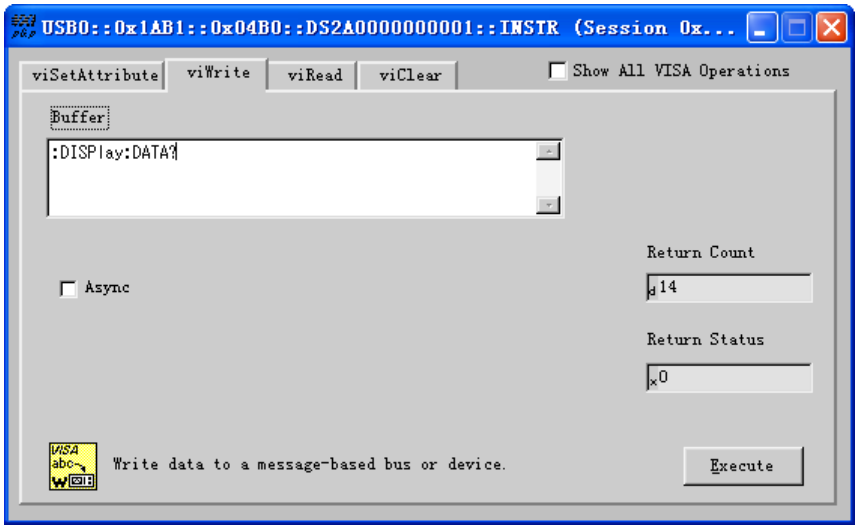
Note[1]: N is the width used to describe the data length in the TMC header. For example, #9001152054.

Note[2]: The width is 800, the height is 480, the bit depth is 24Bit=3Byte, 54 is the size of the bitmap file header.

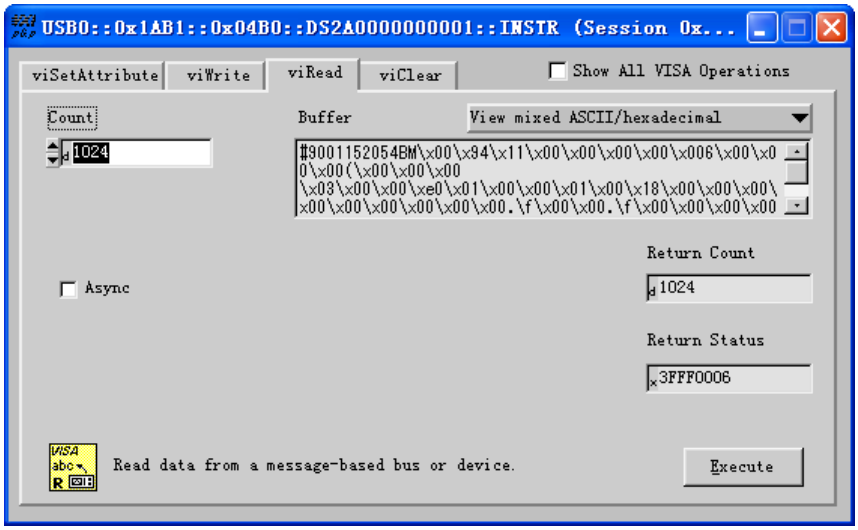
Example

1. Make sure that the buffer is large enough to receive the data stream; otherwise the program might be abnormal when reading the data stream.
2. The returned data stream contains TMC data header and you need to remove the data header to make the data stream a standard bitmap data stream.
3. When the data size is larger than 1 M and the communication speed of the interface is not fast enough, you need to set an appropriate timeout time
4. The terminator '\n'(0X0A) at the end of the data should be removed.

Sending:



Reading:



:FUNCtion Commands

- :FUNCtion:WRMode
- :FUNCtion:WRECord
- :FUNCtion:WREPlay
- :FUNCtion:WANalyze

:FUNCtion:WRMode

Syntax

:FUNCtion:WRMode <mode>

:FUNCtion:WRMode?

Description

Set or query the mode of waveform record.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{OFF|RECord|PLAY|KEEP|ANALyze}	OFF

Explanation

- RECord: recording mode;
  PLAY: playback mode;
  KEEP: constant on mode;
  ANALyze: analysis mode.
- PLAY and ANALyze are only available when the waveform recording is finished.

Return Format

The query returns OFF, REC, PLAY, KEEP or ANAL.

:FUNCtion:WRECord

- :FUNCtion:WRECord:FEND
- :FUNCtion:WRECord:FMAX?
- :FUNCtion:WRECord:INTerval
- :FUNCtion:WRECord:OPERate

:FUNCtion:WRECord:FEND

Syntax

:FUNCtion:WRECord:FEND <frame>

:FUNCtion:WRECord:FEND?

Description

Set or query the end frame of waveform record.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the maximum number of frames can be recorded currently	4064

Explanation

You can use the :FUNCtion:WRECord:FMAX? command to query the maximum number of frames can be recorded currently.

Return Format

The query returns the end frame of waveform record in integer.

:FUNCtion:WRECord:FMAX?

Syntax

:FUNCtion:WRECord:FMAX?

Description

Query the maximum number of frames that can be recorded currently.

Explanation

- The maximum number of frames that can be recorded refers to the maximum end frame of waveform recording that can be set (please refer to the :FUNCtion:WRECord:FEND command).
- The maximum number of frames that can be recorded currently depends on the current memory depth (refer to the :ACQuire:MDEPth command), as shown in the table below. When the memory depth is set to “Auto”, the maximum number of frames that can be recorded currently is related to the current “horizontal timebase” (please refer to the :TIMebase[:MAIN]:SCALe command).

Memory Depth	Maximum End Frame
Interweave: 14k points; non-interweave: 7k points	8128
Interweave: 140k points; non-interweave: 70k points	508
Interweave: 1.4M points; non-interweave: 700k points	63
Interweave: 14M points; non-interweave: 7M points	7
Interweave: 56M points (option); non-interweave: 28M points (option)	2

Return Format

The query returns the maximum number of frames that can be recorded in integer.

:FUNCtion:WRECord:INTerval

Syntax

:FUNCtion:WRECord:INTerval <interval>

:FUNCtion:WRECord:INTerval?

Description

Set or query the time interval between frames in waveform recording and the unit is s.

Parameter

Name	Type	Range	Default
<interval>	Real	100ns to 10s	100ns

Return Format

The query returns the time interval between frames in waveform recording in scientific notation.

:FUNCtion:WRECord:OPERate

Syntax

:FUNCtion:WRECord:OPERate <oper>

:FUNCtion:WRECord:OPERate?

Description

Start or stop the waveform recording; or query the current status of the waveform recording.

Parameter

Name	Type	Range	Default
<oper>	Discrete	{RECord|STOP}	STOP

Return Format

The query returns REC or STOP.

:FUNCtion:WREPlay

- :FUNCtion:WREPlay:MODE
- :FUNCtion:WREPlay:INTerval
- :FUNCtion:WREPlay:FSTart
- :FUNCtion:WREPlay:FCURrent
- :FUNCtion:WREPlay:FEND
- :FUNCtion:WREPlay:FMAX?
- :FUNCtion:WREPlay:OPERate
- :FUNCtion:WREPlay:TTAG
- :FUNCtion:WREPlay:CTAG?

:FUNCtion:WREPlay:MODE

Syntax

:FUNCtion:WREPlay:MODE <mode>

:FUNCtion:WREPlay:MODE?

Description

Set or query the mode of waveform playback.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{REPeat|SINGle}	SINGle

Explanation

- REPeat: cycle playback. Play from the start frame to the end frame and then repeat until you stop it.
- SINGle: single playback. Play from the start frame to the end frame and then stop.

Return Format

The query returns REP or SING.

:FUNCtion:WREPlay:INTerval

Syntax

:FUNCtion:WREPlay:INTerval <interval>

:FUNCtion:WREPlay:INTerval?

Description

Set or query the time interval in waveform playback and the unit is s.

Parameter

Name	Type	Range	Default
<interval>	Real	100ns to 10s	100ns

Return Format

The query returns the time interval in waveform playback in scientific notation.

:FUNCtion:WREPlay:FSTart

Syntax

:FUNCtion:WREPlay:FSTart <frame>

:FUNCtion:WREPlay:FSTart?

Description

Set or query the start frame of waveform playback.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames recorded	1

Explanation

- For the number of frames recorded, please refer to the :FUNCtion:WREPlay:FMAX? command.
- The start frame of waveform playback should be lower than or equal to the end frame of waveform playback (please refer to the :FUNCtion:WREPlay:FEND command).

Return Format

The query returns the start frame of waveform playback in integer.

:FUNCtion:WREPlay:FCURrent

Syntax

:FUNCtion:WREPlay:FCURrent <frame>

:FUNCtion:WREPlay:FCURrent?

Description

Set or query the current frame in waveform playback.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames recorded	The number of frames recorded

Explanation

- For the number of frames recorded, please refer to the :FUNCtion:WREPlay:FMAX? command.
- The current frame of waveform playback should be greater than or equal to the start frame of wavefrom playback (please refer to the :FUNCtion:WREPlay:FSTart command) and be lower than or equal to the end frame of waveform playback (please refer to the :FUNCtion:WREPlay:FEND command).

Return Format

The query returns the current frame in waveform playback in integer.

:FUNCtion:WREPlay:FEND

Syntax

:FUNCtion:WREPlay:FEND <frame>

:FUNCtion:WREPlay:FEND?

Description

Set or query the end frame of waveform playback.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames recorded	The number of frames recorded

Explanation

- For the number of frames recorded, please refer to the :FUNCtion:WREPlay:FMAX? command.
- The end frame of waveform playback should be greater than or equal to the start frame of waveform playback (please refer to the :FUNCtion:WREPlay:FSTart command).

Return Format

The query returns the end frame of waveform playback in integer.

:FUNCtion:WREPlay:FMAX?

Syntax

:FUNCtion:WREPlay:FMAX?

Description

Query the maximum end frame (namely the maximum number of frames of waveform recorded) in waveform playback.

Return Format

The query returns the maximum end frame in waveform playback in integer.

:FUNCtion:WREPlay:OPERate

Syntax

:FUNCtion:WREPlay:OPERate <oper>
:FUNCtion:WREPlay:OPERate?

Description

Execute waveform playback; stop or pause waveform playback; or query the current status of waveform playback.

Parameter

Name	Type	Range	Default
<oper>	Discrete	{PLAY|STOP|PAUSe}	STOP

Return Format

The query returns PLAY, STOP or PAUS.

:FUNCtion:WREPlay:TTAG

Syntax

:FUNCtion:WREPlay:TTAG <bool>

:FUNCtion:WREPlay:TTAG?

Description

Enable or disable the time tag in waveform playback; or query the current status of the time tag in waveform playback.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:FUNCtion:WREPlay:CTAG?

Syntax

:FUNCtion:WREPlay:CTAG?

Description

Query the record time difference of the waveform currently displayed relative to the first frame of waveform.

Return Format

The query returns the record time difference in scientific notation.

:FUNCtion:WANalyze

- :FUNCtion:WANalyze:MODE
- :FUNCtion:WANalyze:SOURce
- :FUNCtion:WANalyze:FCURrent
- :FUNCtion:WANalyze:TDISp
- :FUNCtion:WANalyze:SETup:SSTart
- :FUNCtion:WANalyze:SETup:SSENd
- :FUNCtion:WANalyze:SETup:SFRame
- :FUNCtion:WANalyze:SETup:EFRame
- :FUNCtion:WANalyze:SETup:THReshold
- :FUNCtion:WANalyze:SETup:XMASk
- :FUNCtion:WANalyze:SETup:YMASk
- :FUNCtion:WANalyze:STEMplate
- :FUNCtion:WANalyze:CMASk
- :FUNCtion:WANalyze:STARt
- :FUNCtion:WANalyze:CANCel
- :FUNCtion:WANalyze:PREVious
- :FUNCtion:WANalyze:NEXT
- :FUNCtion:WANalyze:EFCount?
- :FUNCtion:WANalyze:ECURrent
- :FUNCtion:WANalyze:ECDiff?

:FUNCtion:WANalyze:MODE

Syntax

:FUNCtion:WANalyze:MODE <mode>

:FUNCtion:WANalyze:MODE?

Description

Set or query the mode of waveform analysis.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{TRACe|MASK}	TRACe

Explanation

- TRACe: trace mode. Analyze on the basis of the template selected by users.
- MASK: pass/fail test. Analyze on the basis of the pass/fail test mask created by users.

Return Format

The query returns TRAC or MASK.

:FUNCtion:WANalyze:SOURce

Syntax

:FUNCtion:WANalyze:SOURce <sour>

:FUNCtion:WANalyze:SOURce?

Description

Set or query the channel source for the waveform analysis.

Parameter

Name	Type	Range	Default
<sour>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Note: Only channel currently enabled can be selected as the channel source.

Return Format

The query returns CHAN1 or CHAN2.

:FUNCtion:WANalyze:FCURrent

Syntax

:FUNCtion:WANalyze:FCURrent <NR1>

:FUNCtion:WANalyze:FCURrent?

Description

Set or query the current frame of waveform analysis.

Parameter

Name	Type	Range	Default
<NR1>	Integer	1 to the number of frames recorded	1

Explanation

For the number of frames recorded, please refer to the :FUNCtion:WREPlay:FMAX? command.

Return Format

The query returns the current frame of waveform analysis in integer.

:FUNCtion:WANalyze:TDISp

Syntax

:FUNCtion:WANalyze:TDISp <bool>

:FUNCtion:WANalyze:TDISp?

Description

Enable or disable the template display; or query the current status of template display.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	1|ON

Return Format

The query returns 1 or 0.

:FUNCtion:WANalyze:SETup:SSTart
:FUNCtion:WANalyze:SETup:SSENd

Syntax

:FUNCtion:WANalyze:SETup:SSTart <start>

:FUNCtion:WANalyze:SETup:SSTart?

:FUNCtion:WANalyze:SETup:SSENd <end>

:FUNCtion:WANalyze:SETup:SSENd?

Description

Set or query the screen start point or end point in waveform analysis.

Parameter

Name	Type	Range	Default
<start>	Integer	5 to 685	5
<end>	Integer	15 to 695	695

Explanation

- The screen start point set should be less than the “screen end-10”.
- The screen end point set should be greater than the “screen start+10”.

Return Format

The query returns the screen start point or end point in waveform analysis in integer.

:FUNCtion:WANalyze:SETup:SFRame
:FUNCtion:WANalyze:SETup:EFRame

Syntax

:FUNCtion:WANalyze:SETup:SFRame <sframe>

:FUNCtion:WANalyze:SETup:SFRame?

:FUNCtion:WANalyze:SETup:EFRame <eframe>

:FUNCtion:WANalyze:SETup:EFRame?

Description

Set or query the start frame or end frame of waveform analysis.

Parameter

Name	Type	Range	Default
<sframe>	Integer	1 to the number of frames recorded	1
<eframe>	Integer	1 to the number of frames recorded	The number of frames recorded

Explanation

- The commands are only valid when the waveform recording is finished.
- For the number of frames recorded, please refer to the :FUNCtion:WREPlay:FMAX? command.
- The start frame (end frame) of waveform analysis should be lower than or equal to (greater than or equal to) the end frame (start frame) of waveform analysis.

Return Format

The query returns the start frame or end frame of waveform analysis in integer.

:FUNCtion:WANalyze:SETup:THReshold

Syntax

:FUNCtion:WANalyze:SETup:THReshold <NR1>
:FUNCtion:WANalyze:SETup:THReshold?

Description

Set or query the threshold of waveform analysis and the unit is %.

Parameter

Name	Type	Range	Default
<NR1>	Integer	1 to 99	10

Explanation

The threshold is used to judge whether the data frame is an error frame. The data frame will be judged as an error frame if the (relative) difference between it and the template is greater than or equal to the threshold currently set.

Return Format

The query returns an integer between 1 and 99.

:FUNCtion:WANalyze:SETup:XMASk
:FUNCtion:WANalyze:SETup:YMASk

Syntax

:FUNCtion:WANalyze:SETup:XMASk <x>
:FUNCtion:WANalyze:SETup:XMASk?
:FUNCtion:WANalyze:SETup:YMASk <y>
:FUNCtion:WANalyze:SETup:YMASk?

Description

Set or query the horizontal or vertical adjustment parameter in analysis based on the pass/fail mask and the unit is div.

Parameter

Name	Type	Range	Default
<x>	Real	0.02 to 4, the step is 0.02	0.24
<y>	Real	0.04 to 5.12, the step is 0.04	0.48

Return Format

The query returns the horizontal or vertical adjustment parameter in analysis based on the pass/fail mask in scientific notation.

:FUNCtion:WANalyze:STEMplate

Syntax

:FUNCtion:WANalyze:STEMplate

Description

Set the waveform analysis template when the analysis mode is trace.

Explanation

After the analysis starts, the oscilloscope compares each frame of data measured with the data in the template to determine whether error frame exists according to the threshold set.

:FUNCtion:WANalyze:CMASk

Syntax

:FUNCtion:WANalyze:CMASk

Description

Apply the mask currently created.

Explanation

- For the setting of the horizontal adjustment parameter, refer to the :FUNCtion:WANalyze:SETup:XMASk command.
- For the setting of the vertical adjustment parameter, refer to the :FUNCtion:WANalyze:SETup:YMASk command.

:FUNCtion:WANalyze:STARt

Syntax

:FUNCtion:WANalyze:STARt

Description

Start the waveform analysis.

Explanation

During the analysis process, the progress bar is displayed and the parameters cannot be modified. After the analysis finishes, the analysis results of “Error Frames”, “Current Error” and “CurFrame Diff” are displayed; at the same time, the first error frame is located.

:FUNCtion:WANalyze:CANCel

Syntax

:FUNCtion:WANalyze:CANCel

Description

Give up the waveform analysis.

Explanation

After stopping the waveform analysis, you can use the :FUNCtion:WANalyze:STARt command to restart the waveform analysis.

:FUNCtion:WANalyze:PREVious

Syntax

:FUNCtion:WANalyze:PREVious

Description

Locate the error frame previous to the current error frame.

:FUNCtion:WANalyze:NEXT

Syntax

:FUNCtion:WANalyze:NEXT

Description

Locate the error frame next to the current error frame.

:FUNCtion:WANalyze:EFCount?

Syntax

:FUNCtion:WANalyze:EFCount?

Description

Query the total number of error frames discovered in the current analysis.

Explanation

The number of error frames is related to the error frame threshold currently set.

Return Format

The query returns the total number of error frames in integer.

:FUNCtion:WANalyze:ECURrent

Syntax

:FUNCtion:WANalyze:ECURrent <NR1>

:FUNCtion:WANalyze:ECURrent?

Description

Set or query the number of the current error frame.

Parameter

Name	Type	Range	Default
<NR1>	Integer	1 to the total number of error frames	--

Return Format

The query returns the number of the current error frame in integer.

:FUNCtion:WANalyze:ECDiff?

Syntax

:FUNCtion:WANalyze:ECDiff?

Description

Query the current frame difference.

Explanation

- During the analysis based on trace, the oscilloscope compares each frame with the templet to compute the difference value and normalizes each value using the maximum one; then, compares the normalized value of each frame with the threshold selected to judge whether the frame is an error frame. “CurFrame Diff” (relative difference) is the normalized value of the difference between the current frame and templet.
- During the analysis based on pass/fail mask, the oscilloscope compares each frame with the mask to compute the difference value and recognizes the frame whose difference value is equal to or larger than the threshold selected as an error frame and the corresponding “CurFrame Diff” is 100%; otherwise, the frame is juged as correct and the “CurFrame Diff” is 0%.

  Note: There are only two “CurFrame Diff” values (100% and 0%) under the analysis based on pass/fail mask.

:LA Commands (For MSO2000A/MSO2000A-S)

- :LA:STATe
- :LA:ACTive
- :LA:DISPlay
- :LA:AUTosort
- :LA:DELete
- :LA:SIZE
- :LA:DIGital<n>:DISPlay
- :LA:DIGital<n>:POSition
- :LA:DIGital<n>:LABel
- :LA:POD<n>:DISPlay
- :LA:POD<n>:THReshold
- :LA:GROup<n>:APPend
- :LA:BUS<n>:CURRent
- :LA:BUS<n>:DISPlay
- :LA:BUS<n>:CHANnel
- :LA:BUS<n>:FORMat

:LA:STATe

Syntax

:LA:STATe <bool>

:LA:STATe?

Description

Enable or disable the LA function; or query the status of the LA function.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:LA:ACTive

Syntax

:LA:ACTive {<digital>|<group>|none}

:LA:ACTive?

Description

Set or query the current active channel or channel group.

Parameter

Name	Type	Range	Default
<digital>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15}	D0
<group>	Discrete	{GROup1|GROup2|GROup3|GROup4}	--

Explanation

- <digital> is used to select any of channels D0-D15. The channel label and waveform corresponding to the channel selected are displayed in red.
- <group> is used to select any of user-defined channel groups (GROup1-GROup4). All the channel labels of the channels in the channel group selected are displayed in red and the waveform of the first channel in this channel group is displayed in red. You can use the :LA:GROup<n>:APPend command to add digital channels into the 4 user-defined digital channel groups.
- When none is sent, no channel/group will be selected.
- Only channels or user-defined channel groups currently turned on can be selected. Please refer to the :LA:DIGital<n>:DISPlay or :LA:DISPlay command to turn on the desired channel or channel group.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, GRO1, GRO2, GRO3, GRO4 or NONE.

:LA:DISPlay

Syntax

:LA:DISPlay {<digital>|<group>|<pod>},<bool>
:LA:DISPlay? {<digital>|<group>|<pod>}

Description

Turn on or off the specified digital channel, user-defined channel group or default channel group; or query the status of the specified digital channel or channel group.

Parameter

Name	Type	Range	Default
<digital>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15}	--
<group>	Discrete	{GROup1|GROup2|GROup3|GROup4}	--
<pod>	Discrete	{POD1|POD2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

- <group> denotes the user-defined channel groups. You can use the :LA:GROup<n>:APPend command to add digital channels into the 4 user-defined digital channel groups.
- <pod> denotes the default channel groups: POD1 (D0~D7) and POD2 (D8~D15).
- You can use the :LA:ACTive command to set the digital channels or user-defined channel groups currently turn on as the active channel or channel group.

Return Format

The query returns 1 or 0.

:LA:AUTosort

Syntax

:LA:AUTosort <n>

Description

Digital channel auto ordering mode.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1}	1

Explanation

- n=0: digital channel waveforms on the screen are D015-D0 from top to bottom
- n=1: digital channel waveforms on the screen are D0-D15 from top to bottom

:LA:DELete

Syntax

:LA:DELete {<digital>|<group>}

Description

Undo the grouping setting of any of the 16 digital channels; or undo the channel setting of any of GROup1 to GROup4.

Parameter

Name	Type	Range	Default
<digital>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9| D10|D11|D12|D13|D14|D15}	--
<group>	Discrete	{GROup1|GROup2|GROup3|GROup4}	--

Explanation

- This command is only applicable to grouped channels or channel groups that contains channels.
- You can use the :LA:GROup<n>:APPend command to add digital channels into the 4 user-defined digital channel groups. A digital channel can only be added into a single channel group.

:LA:SIZE

Syntax

:LA:SIZE <size>

:LA:SIZE?

Description

Set or query the display size of the digital channel waveforms.

Parameter

Name	Type	Range	Default
<size>	Discrete	SMALl|LARGe|MEDium	MEDium

Explanation

- The LARGe display mode is only available when the number of digital channels currently turned on is no more than 8.
- When split display is enabled (such as delay sweep and FFT), the SMALl display mode is not available.

Return Format

The query returns SMAL, LARG or MED.

:LA:DIGital<n>:DISPlay

Syntax

:LA:DIGital<n>:DISPlay <bool>

:LA:DIGital<n>:DISPlay?

Description

Turn on or off the specified digital channel; or query the status of the specified digital channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

You can set the channels or user-defined channel groups currently turned on as the active channel or channel group using the :LA:ACTive command.

Return Format

The query returns 1 or 0.

:LA:DIGital<n>:POSition

Syntax

:LA:DIGital<n>:POSition <position>

:LA:DIGital<n>:POSition?

Description

Set or query the display position of the specified digital channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15}	--
<position>	Integer	When the waveform display mode is SMALl or MEDium: 0 to 15 When the waveform display mode is LARGe: 0 to 7	--

Explanation

For the waveform display size, refer to the :LA:SIZE command.

Return Format

The query returns an integer from 0 to 15 or from 0 to 7.

:LA:DIGital<n>:LABel

Syntax

:LA:DIGital<n>:LABel <label>

:LA:DIGital<n>:LABel?

Description

Set or query the label of the specified digital channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15}	--
<label>	ASCII string	It can include English uppercase letters (A to Z) and numbers (0 to 9). It cannot exceed 4 characters.	--

Return Format

The query returns the label of the specified digital channel in ASCII string. If the current channel has no label, the query returns “No Label!”.

:LA:POD<n>:DISPlay

Syntax

:LA:POD<n>:DISPlay <bool>

:LA:POD<n>:DISPlay?

Description

Turn on or off the specified default channel group; or query the status of the specified default channel group.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:LA:POD<n>:THReshold

Syntax

:LA:POD<n>:THReshold <threshold>

:LA:POD<n>:THReshold?

Description

Set or query the threshold of the specified default channel group. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	--
<threshold>	Real	-20.0V to +20.0V	1.4V

Return Format

The query returns the threshold of the specified default channel group in scientific notation.

:LA:GROup<n>:APPend

Syntax

:LA:GROup<n>:APPend <digital>[,<digital>[,<digital>]...]

Description

Add channels into the specified user-defined channel group.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	--
<digital>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15}	--

:LA:BUS<n>:CURRent

Syntax

:LA:BUS<n>:CURRent

:LA:BUS<n>:CURRent?

Description

Set the specified digital bus as the current bus; or query whether the specified digital bus is the current bus.

Parameter

Name	Type	Range	Default
<n>	Integer	{1|2}	--

Return Format

The query returns TURE or FALSE.

:LA:BUS<n>:DISPlay

Syntax

:LA:BUS<n>:DISPlay <bool>

:LA:BUS<n>:DISPlay?

Description

Turn on or off the specified digital bus; or query whether the specified digital bus is turned on.

Parameter

Name	Type	Range	Default
<n>	Integer	{1|2}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:LA:BUS<n>:CHANnel

Syntax

:LA:BUS<n>:CHANnel <channel>

:LA:BUS<n>:CHANnel?

Description

Set or query the channels of the specified digital bus.

Parameter

Name	Type	Range	Default
<n>	Integer	{1|2}	--
<channel>	Discrete	{L|H|HL}	BUS1: L BUS2: H

Explanation

- L: the channels of the digital bus are D7-D0;
- H: the channels of the digital bus are D15-D8;
- HL: the channels of the digital bus are D15-D0.

Return Format

The query returns L, H or HL.

:LA:BUS<n>:FORMat

Syntax

:LA:BUS<n>:FORMat <format>

:LA:BUS<n>:FORMat?

Description

Set or query the display format of the specified digital bus.

Parameter

Name	Type	Range	Default
<n>	Integer	{1|2}	--
<format>	Discrete	{HEX|DECimal|BINary|ASCii}	HEX

Explanation

- HEX: hexadecimal;
- DECimal: decimal;
- BINary: binary;
- ASCii: ASCII.

Return Format

The query returns HEX, DEC, BIN or ASC.

:LAN Commands

- :LAN:DHCP
- :LAN:AUToip
- :LAN:GATeway
- :LAN:DNS
- :LAN:MAC?
- :LAN:MANual
- :LAN:INITiate
- :LAN:IPADdress
- :LAN:SMASk
- :LAN:STATus?
- :LAN:VISA?
- :LAN:APPLy

:LAN:DHCP

Syntax

:LAN:DHCP <bool>

:LAN:DHCP?

Description

Enable or disable the DHCP configuration mode; or query the current status of the DHCP configuration mode.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	1|ON

Explanation

- When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is “DHCP”, “Auto IP” and “Static IP”. The three IP configuration types cannot be all turned off at the same time.
- When the DHCP configuration mode is valid, the DHCP server in the current network will assign the network parameters (such as the IP address) for the oscilloscope.

Return Format

The query returns 1 or 0.

:LAN:AUToip

Syntax

:LAN:AUToip <bool>

:LAN:AUToip?

Description

Enable or disable the auto IP configuration mode; or query the current status of the auto IP configuration mode.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	1|ON

Explanation

- When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is “DHCP”, “Auto IP” and “Static IP”. The three IP configuration types cannot be all turned off at the same time.
- When the Auto IP configuration mode is valid, disable DHCP manually and users can set the gateway and DNS server address of the oscilloscope.
- For the setting of the gateway, refer to the :LAN:GATeway command. For the setting of the DNS server, refer to the :LAN:DNS command.

Return Format

The query returns 1 or 0.

:LAN:GATeway

Syntax

:LAN:GATeway <string>

:LAN:GATeway?

Description

Set or query the gateway.

Parameter

Name	Type	Range	Default
<string>	ASCII string	Refer to the **Explanation**	--

Explanation

- The format of <string> is nnn,nnn,nnn,nnn. Wherein, the range of the first nnn is from 0 to 223 (except 127) and the ranges of the other three nnn are from 0 to 255.
- When using this command, the IP configuration mode should be Auto IP (refer to the :LAN:AUToip command) or Static IP (refer to the :LAN:MANual command).

Return Format

The query returns the current gateway in string.

:LAN:DNS

Syntax

:LAN:DNS <string>

:LAN:DNS?

Description

Set or query the DNS address.

Parameter

Name	Type	Range	Default
<string>	ASCII string	Refer to the **Explanation**	--

Explanation

- The format of <string> is nnn,nnn,nnn,nnn. Wherein, the range of the first nnn is from 0 to 223 (except 127) and the ranges of the other three nnn are from 0 to 255.
- When using this command, the IP configuration mode should be Auto IP (refer to the :LAN:AUToip command) or Static IP (refer to the :LAN:MANual command).

Return Format

The query returns the current DNS address in string.

:LAN:MAC?

Syntax

:LAN:MAC?

Description

Query the MAC address of the instrument. This address is displayed on the oscilloscope in "00-19-AF-30-00-00" format.

Return Format

The query returns the MAC address in string. For example, 0019af300000.

:LAN:MANual

Syntax

:LAN:MANual <bool>
:LAN:MANual?

Description

Enable or disable the static IP configuration mode; or query the current status of the static IP configuration mode.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

- When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is "DHCP", "Auto IP" and "Static IP". The three IP configuration types cannot be all turned off at the same time.
- When the static IP configuration mode is valid, disable DHCP and Auto IP manually and users can set the network parameters such as the IP address, subnet mask, gateway and DNS. For the setting of the IP address, refer to the :LAN:IPADdress command. For the setting of the subnet mask, refer to the :LAN:SMASk command. For the setting of the gateway, refer to the :LAN:GATeway command. For the setting of DNS, refer to the :LAN:DNS command.

Return Format

The query returns 1 or 0.

:LAN:INITiate

Syntax

:LAN:INITiate

Description

Initialize the network parameters. Before using this command, make sure that the oscilloscope has been connected to the network correctly.

:LAN:IPADdress

Syntax

:LAN:IPADdress <string>
:LAN:IPADdress?

Description

Set or query the IP address of the instrument.

Parameter

Name	Type	Range	Default
<string>	ASCII string	Refer to the **Explanation**	--

Explanation

- The format of <string> is nnn,nnn,nnn,nnn. Wherein, the range of the first nnn is from 0 to 223 (except 127) and the ranges of the other three nnn are from 0 to 255.
- When using this command, the IP configuration mode should be Static IP mode (refer to the :LAN:MANual command) and DHCP and Auto IP are disabled.

Return Format

The query returns the current IP address in string.

:LAN:SMASk

Syntax

:LAN:SMASk <string>

:LAN:SMASk?

Description

Set or query the subnet mask.

Parameter

Name	Type	Range	Default
<string>	ASCII string	Refer to the **Explanation**	--

Explanation

- The format of <string> is nnn,nnn,nnn,nnn. Wherein, the range of the nnn is from 0 to 255.
- When using this command, the IP configuration mode should be Static IP (refer to the :LAN:MANual command) and the DHCP and Auto IP are disabled.

Return Format

The query returns the current subnet mask in string.

:LAN:STATus?

Syntax

:LAN:STATus?

Description

Query the current status of the network configuration.

Return Format

The query returns UNLINK, INIT, IPCONFLICT, CONFIGURED or DHCPFAILED.

:LAN:VISA?

Syntax

:LAN:VISA?

Description

Query the VISA address of the instrument.

Return Format

The query returns the VISA address in string. For example, TCPIP::172.16.3.119::INSTR.

:LAN:APPLy

Syntax

:LAN:APPLy

Description

Apply the network configuration.

:MASK Commands

- :MASK:ENABle
- :MASK:SOURce
- :MASK:OPERate
- :MASK:MDISplay
- :MASK:SOOutput
- :MASK:OUTPut
- :MASK:X
- :MASK:Y
- :MASK:CREate
- :MASK:PASSed?
- :MASK:FAILed?
- :MASK:TOTal?
- :MASK:RESet
- :MASK:DATA

:MASK:ENABle

Syntax

:MASK:ENABle <bool>

:MASK:ENABle?

Description

Enable or disable the pass/fail test function; or query the current status of the pass/fail test function.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

In the following states, the pass/fail test function cannot be enabled and this command is invalid.

- In the X-Y time base mode.
- In the ROLL time base mode.
- In the Y-T time base mode, when the horizontal time base is set to 200ms/div or slower and the instrument enters the slow sweep mode.
- When the waveform recording is enabled.

Return Format

The query returns 1 or 0.

:MASK:SOURce

Syntax

:MASK:SOURce <source>

:MASK:SOURce?

Description

Set or query the measurement source of the pass/fail test.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Explanation

Only the channel enabled can be selected as the measurement source of the pass/fail test.

Return Format

The query returns CHAN1 or CHAN2.

:MASK:OPERate

Syntax

:MASK:OPERate <oper>

:MASK:OPERate?

Description

Run or stop the pass/fail test; or query the current status of the pass/fail test.

Parameter

Name	Type	Range	Default
<oper>	Discrete	{RUN|STOP}	STOP

Explanation

Before executing this command, use the :MASK:ENABle command to enable the pass/fail test.

Return Format

The query returns RUN or STOP.

:MASK:MDISplay

Syntax

:MASK:MDISplay <bool>

:MASK:MDISplay?

Description

When the pass/fail test is enabled, enable or disable the message display; or query the current status of the message display.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

To enable the message display, first use the :MASK:ENABle command to enable the pass/fail test.

Return Format

The query returns 1 or 0.

:MASK:SOOutput

Syntax

:MASK:SOOutput <bool>

:MASK:SOOutput?

Description

Enable or disable the “Stop On Fail” function; or query the current status of the “Stop On Fail” function.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

- ON: when failed waveform is detected, the oscilloscope stops the test and enters the “STOP” state. At this point, the results of the last statistic are displayed on the screen (if display is enabled) and only a single pulse is output from the **[Trigger Out]** (if enabled) at the rear panel.
- OFF: the oscilloscope continues with the test even when failed waveform is detected. The test results on the screen will update continuously and a pulse is output from **[Trigger Out]** at the rear panel each time a failed waveform is detected.

Return Format

The query returns 1 or 0.

:MASK:OUTPut

Syntax

:MASK:OUTPut <type>

:MASK:OUTPut?

Description

Set or query the output mode when the test fails.

Parameter

Name	Type	Range	Default
<type>	Discrete	{FAIL|FSOund}	FAIL

Explanation

- FAIL: when a failed waveform is detected, the oscilloscope displays the statistic results and outputs a pulse; but the beeper does not sound.
- FSOund: when a failed waveform is detected, the oscilloscope displays the statistic results and outputs a pulse; while at the same time, the beeper sounds (not related to the on/off state of the sound).

Return Format

The query returns FAIL or FSO.

:MASK:X

:MASK:Y

Syntax

:MASK:X <x>

:MASK:X?

:MASK:Y <y>

:MASK:Y?

Description

Set or query the horizontal or vertical adjustment parameter of the pass/fail test mask.

Parameter

Name	Type	Range	Default
<x>	Real	0.02 to 4, the step is 0.02	0.24
<y>	Real	0.04 to 5.12, the step is 0.04	0.48

Return Format

The query returns the horizontal or vertical adjustment parameter of the pass/fail test mask in scientific notation.

:MASK:CREate

Syntax

:MASK:CREate

Description

Create the mask of the pass/fail test using the horizontal adjustment parameter and the vertical adjustment parameter currently set.

Explanation

- This command is valid only when the pass/fail test function is enabled (:MASK:ENABle) and is in running state (:MASK:OPERate).
- For the setting of the horizontal adjustment parameter, refer to the :MASK:X command. For the setting of the vertical adjustment parameter, refer to the :MASK:Y command.

:MASK:PASSed?

Syntax

:MASK:PASSed?

Description

Query the number of frames that pass the pass/fail test.

Return Format

The query returns the number of frames that pass the pass/fail test in integer.

:MASK:FAILed?

Syntax

:MASK:FAILed?

Description

Query the number of failed frames in the pass/fail test.

Return Format

The query returns the number of failed frames in the pass/fail test in integer.

:MASK:TOTal?

Syntax

:MASK:TOTal?

Description

Query the total number of frames of the pass/fail test.

Return Format

The query returns the total number of frames of the pass/fail test in integer.

:MASK:RESet

Syntax

:MASK:RESet

Description

Reset the number of passed frames, the number of failed frames and the total number of frames.

Explanation

- After sending this command, the number of passed frames, the number of failed frames and the total number of frames are all set to 0.
- To query the number of passed frames, refer to the :MASK:PASSed? command.
- To query the number of failed frames, refer to the :MASK:FAILed? command.
- To query the total number of frames of the test, refer to the :MASK:TOTal? command.

:MASK:DATA

Syntax

:MASK:DATA <mask>

:MASK:DATA?

Description

Send or read the mask of the pass/fail test.

Parameter

Name	Type	Range	Default
<mask>	Refer to the **Explanation**		

Explanation

- <mask> is binary data block. Directly place the data stream behind the command string to finish the sending in one operation.
- Make sure that the buffer is large enough to receive the data stream; otherwise the program might be abnormal when reading the data.

Return Format

The data returned consists of two parts (the TMC data description header and the MASK data). The format of the TMC data description header is #NX...X; wherein, # is the denoter, N is less than or equal to 9 and the N figures following it denotes the length of the data stream in bytes. For example, #9000001408; wherein, N is 9 and 000001408 denotes that the data strem contains 1408 bytes of effective data. The MASK data is denoted in ASCII format.

:MEASure Commands

- :MEASure:SOURce
- :MEASure:COUNter:SOURce
- :MEASure:COUNter:VALue?
- :MEASure:CLEar
- :MEASure:RECover
- :MEASure:ADISplay
- :MEASure:AMSource
- :MEASure:STATistic:DISPlay
- :MEASure:STATistic:MODE
- :MEASure:STATistic:RESet
- :MEASure:SETup:TYPE
- :MEASure:SETup:MAX
- :MEASure:SETup:MID
- :MEASure:SETup:MIN
- :MEASure:SETup:PSA
- :MEASure:SETup:PSB
- :MEASure:SETup:DSA
- :MEASure:SETup:DSB
- :MEASure:AREA
- :MEASure:CREGion:CAX
- :MEASure:CREGion:CBX
- :MEASure:HISTory:DISPlay
- :MEASure:HISTory:DMODe
- :MEASure:FDELay
- :MEASure:F2RDelay
- :MEASure:FPHase
- :MEASure:F2RPhase
- :MEASure:FREQuency
- :MEASure:FTIMe
- :MEASure:NDUTy
- :MEASure:NWIDth
- :MEASure:OVERshoot
- :MEASure:PDUTy
- :MEASure:PERiod
- :MEASure:PREShoot
- :MEASure:PWIDth
- :MEASure:RTIMe
- :MEASure:RDELay
- :MEASure:R2FDelay
- :MEASure:RPHase
- :MEASure:R2FPhase

- :MEASure:VAMP
- :MEASure:VAVG
- :MEASure:VBASe
- :MEASure:VMAX
- :MEASure:VMIN
- :MEASure:VPP
- :MEASure:VRMS
- :MEASure:PVRMs
- :MEASure:VTOP
- :MEASure:MARea
- :MEASure:MPARea

:MEASure:SOURce

Syntax

:MEASure:SOURce <sour>

:MEASure:SOURce?

Description

Set or query the signal source of the current measurement parameter.

Parameter

Name	Type	Range	Default
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	CHANnel1

Explanation

This command sets the signal source of all the measurement parameters except delay and phase. The delay and phase measurements require two signal sources which can be set by the :MEASure:SETup:DSA and :MEASure:SETup:DSB, :MEASure:SETup:PSA and :MEASure:SETup:PSB commands respectively.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or MATH.

:MEASure:COUNter:SOURce

Syntax

:MEASure:COUNter:SOURce <sour>

:MEASure:COUNter:SOURce?

Description

Set or query the measurement source of the frequency counter or disable the frequency counter measurement.

Parameter

Name	Type	Range	Default
<sour>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|EXT|OFF}	OFF

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2, EXT or OFF.

:MEASure:COUNter:VALue?

Syntax

:MEASure:COUNter:VALue?

Description

Query the measuremenmt result of the frequency counter. The unit is Hz.

Explanation

Before using this command, enable the frequency counter (refer to the :MEASure:COUNter:SOURce command).

Return Format

The query returns the measuremenmt result of the frequency counter in scientific notation. When the frequency counter is not turned on, the query returns 9.9e37.

:MEASure:CLEar

Syntax

:MEASure:CLEar <item>

Description

Clear any or all of the last five measurement items that are enabled.

Parameter

Name	Type	Range	Default
<item>	Discrete	{ITEM1|ITEM2|ITEM3|ITEM4|ITEM5|ALL}	--

Explanation

The last five measurement items are derermined according to the order in which they are enabled and they will not change as you delete one or more measurement items. The last item enabled is ITEM5. You can also use the :MEASure:RECover command to recover one or more measurement items that you have cleared.

:MEASure:RECover

Syntax

:MEASure:RECover <item>

Description

Recover the measurement items that have been cleared.

Parameter

Name	Type	Range	Default
<item>	Discrete	{ITEM1|ITEM2|ITEM3|ITEM4|ITEM5|ALL}	--

Explanation

The last five measurement items are derermined according to the order in which they are enabled and they will not change as you delete one or more measurement items. The last item enabled is ITEM5. You can also use the :MEASure:CLEar command to clear one or more measurement items that you have recovered.

:MEASure:ADISplay

Syntax

:MEASure:ADISplay <bool>

:MEASure:ADISplay?

Description

Enable or disable all measurement; or query the current status of all measurement.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

- All measurement can measure all the time and voltage parameters of the current measurement source. Each measurement source has 21 measurement parameters and you can measure the three measurement sources (CH1, CH2 and MATH) at the same time.
- 11 voltage measurement items: maximum, minimum, peak-peak, top, bottom, amplitude, average, RMS, period RMS, overshoot and preshoot.
- 8 time measurement items: period, frequency, rise time, fall time, positive pulse width, negative pulse width, positive duty cycle and negative duty cycle.
- 2 other measurement items: area and period area.

Return Format

The query returns 1 or 0.

:MEASure:AMSource

Syntax

:MEASure:AMSource <chan>[,<chan>[,<chan>]]

:MEASure:AMSource?

Description

Set or query the signal source of the all measurement parameters.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	CHANnel1

Return Format

The query returns one or more of CHAN1, CHAN2 and MATH. Multiple signal sources are separated by commas.

:MEASure:STATistic:DISPlay

Syntax

:MEASure:STATistic:DISPlay <bool>

:MEASure:STATistic:DISPlay?

Description

Enable or disable the statistic function; or query the current status of the statistic function.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

When the statistic function is enabled, the system will make statistics and display the measurement results of at most five measurement items that are enabled last. When the statistic type is extrum, the statistic results include the current value, average, minimum and maximum. When the statistic type is difference, the statistic results include the current value, average, count and standard deviation.

Return Format

The query returns 1 or 0.

:MEASure:STATistic:MODE

Syntax

:MEASure:STATistic:MODE <mode>

:MEASure:STATistic:MODE?

Description

Set or query the statistic mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{DIFFerence|EXTRemum}	EXTRemum

Explanation

- EXTRemum: display the maximum and minimum values.
- DIFFerence: display the standard deviation and count.
- Before using thoes command, enable the statistic function (refer to the :MEASure:STATistic:DISPlay command).

Return Format

The query returns DIFF or EXTR.

:MEASure:STATistic:RESet

Syntax

:MEASure:STATistic:RESet

Description

Clear the history statistic data and make statistic again.

:MEASure:SETup:TYPE

Syntax

:MEASure:SETup:TYPE <type>

:MEASure:SETup:TYPE?

Description

Set or query the type of measurement setting.

Parameter

Name	Type	Range	Default
<type>	Discrete	{DELay|PHASe|THReshold}	DELay

Return Format

The query returns DEL, PHAS or THR.

:MEASure:SETup:MAX

:MEASure:SETup:MID

:MEASure:SETup:MIN

Syntax

:MEASure:SETup:MAX <max>
:MEASure:SETup:MAX?
:MEASure:SETup:MID <mid>
:MEASure:SETup:MID?
:MEASure:SETup:MIN <min>
:MEASure:SETup:MIN?

Description

Set or query the threshold level upper limit, middle value or lower limit of the auto measurement of the analog channels. The unit is %.

Parameter

Name	Type	Range	Default
<max>	Integer	7 to 95	90
<mid>	Integer	6 to 94	50
<min>	Integer	5 to 93	10

Explanation

- The upper limit, middle value and lower limit of the threshold level are expressed in percentage of the amplitude and are used to define the time, delay and phase parameters. Setting the threshold will affect all the time, delay and phase parameters. You can also use the :MEASure:SETup:TYPE command to select the threshold measurement setting.
- The middle value set must be lower than the upper limit currently set and greater than the lower limit currently set.

Return Format

The query returns the threshold level upper limit, middle value or lower limit in integer.

:MEASure:SETup:PSA

:MEASure:SETup:PSB

Syntax

:MEASure:SETup:PSA <sourceA>

:MEASure:SETup:PSA?

:MEASure:SETup:PSB <sourceB>

:MEASure:SETup:PSB?

Description

Set or query the channel source of source A or B in phase deviation measurements.

Parameter

Name	Type	Range	Default
<sourceA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<sourceB>	Discrete	When <sourceA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <sourceA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	CHANnel2

Explanation

You can use the phase deviation measurement function to measure 4 kinds of phase deviations between tow channels: source A rising edge-source B rising edge (:MEASure:RPHase), source A rising edge-source B falling edge (:MEASure:R2FPhase), source A falling edge-source B falling edge (:MEASure:FPHase) and source A falling edge-source B rising edge (:MEASure:F2RPhase).

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:MEASure:SETup:DSA

:MEASure:SETup:DSB

Syntax

:MEASure:SETup:DSA <sourceA>

:MEASure:SETup:DSA?

:MEASure:SETup:DSB <sourceB>

:MEASure:SETup:DSB?

Description

Set or query the channel source of source A or B in delay time measurements.

Parameter

Name	Type	Range	Default
<sourceA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2 }	CHANnel1
<sourceB>	Discrete	When <sourceA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <sourceA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	CHANnel2

Explanation

You can use the delay measurement function to measure 4 kinds of delay times between two channels: source A rising edge-source B rising edge (:MEASure:RDELay), source A rising edge-source B falling edge (:MEASure:R2FDelay), source A falling edge-source B falling edge (:MEASure:FDELay) and source A falling edge-source B rising edge (:MEASure:F2RDelay).

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:MEASure:AREA

Syntax

:MEASure:AREA <area>

:MEASure:AREA?

Description

Set or query the measurement range.

Parameter

Name	Type	Range	Default
<area>	Discrete	{SCReen|CREGion}	SCReen

Explanation

- SCReen: waveforms within the screen region.
- CREGion: region specified by cursor A (refer to the :MEASure:CREGion:CAX command) and cursor B (refer to the :MEASure:CREGion:CBX command).

Return Format

The query returns SCR or CREG.

:MEASure:CREGion:CAX

:MEASure:CREGion:CBX

Syntax

:MEASure:CREGion:CAX <cax>

:MEASure:CREGion:CAX?

:MEASure:CREGion:CBX <cbx>

:MEASure:CREGion:CBX?

Description

When the measurement range is set to cursor region, use this command to set the position of cursor A or B.

Parameter

Name	Type	Range	Default
<cax>	Integer	0 to (the current position of cursor B - 6)	300
<cbx>	Integer	(The current position of cursor A + 6) to 697	400

Explanation

You can use the :MEASure:AREA command to set the measurement range to cursor region.

Return Format

The query returns the position of cursor A or B in integer.

:MEASure:HISTory:DISPlay

Syntax

:MEASure:HISTory:DISPlay <bool>
:MEASure:HISTory:DISPlay?

Description

Enable or disable the measurement history; or query the current on/off status of the measurement history.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

- The measurement history cannot be enabled when there is not any measured item.
- When the measurement history is enabled, the latest 10 measurement results of at most 5 measurement items turned on last can be displayed.

Return Format

The query returns 1 or 0.

:MEASure:HISTory:DMODe

Syntax

:MEASure:HISTory:DMODe <mod>
:MEASure:HISTory:DMODe?

Description

Set or query the display mode of the history measurement data.

Parameter

Name	Type	Range	Default
<mod>	Discrete	{TABLe|GRAPh}	GRAPh

Explanation

- TABLe: display the measurement results of the last 10 measurements of at most 5 measurement items that are enabled last in table mode.
- GRAPh: display the measurement results of the last 10 measurements of at most 5 measurement items that are enabled last in graph mode. The measurement points are connected using linear interpolation.

Return Format

The query returns TABL or GRAP.

:MEASure:FDELay

Syntax 1

:MEASure:FDELay <chanA>,<chanB>

Description 1

Enable the delay (falling edge-falling edge) measurement function between the two specified channels.

Syntax 2

:MEASure:FDELay? <chanA>,<chanB>

Description 2

Enable the delay (falling edge-falling edge) measurement function between the two specified channels and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the delay (falling edge-falling edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:FDELay CHANnel1,CHANnel2

:MEASure:FDELay? CHANnel1,CHANnel2

You can use the following commands to enable the delay (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the delay (falling edge-falling edge) measurement results.

- :MEASure:FDELay:SMAXimum
- :MEASure:FDELay:SMINimum
- :MEASure:FDELay:SCURrent
- :MEASure:FDELay:SAVerage
- :MEASure:FDELay:SDEViation

:MEASure:FDELay:SMAXimum
:MEASure:FDELay:SMINimum
:MEASure:FDELay:SCURrent
:MEASure:FDELay:SAVerage
:MEASure:FDELay:SDEViation

Syntax 1

:MEASure:FDELay:SMAXimum <chanA>,<chanB>
:MEASure:FDELay:SMINimum <chanA>,<chanB>
:MEASure:FDELay:SCURrent <chanA>,<chanB>
:MEASure:FDELay:SAVerage <chanA>,<chanB>
:MEASure:FDELay:SDEViation <chanA>,<chanB>

Description 1

Enable the delay (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:FDELay:SMAXimum? <chanA>,<chanB>
:MEASure:FDELay:SMINimum? <chanA>,<chanB>
:MEASure:FDELay:SCURrent? <chanA>,<chanB>
:MEASure:FDELay:SAVerage? <chanA>,<chanB>
:MEASure:FDELay:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (falling edge-falling edge) measurement results when the delay (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (falling edge-falling edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RDelay

Syntax 1

:MEASure:F2RDelay <chanA>,<chanB>

Description 1

Enable the delay (falling edge-rising edge) measurement function between the two specified channels.

Syntax 2

:MEASure:F2RDelay? <chanA>,<chanB>

Description 2

Enable the delay (falling edge-rising edge) measurement function between the two specified channels and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the delay (falling edge-rising edge) measurement results in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:F2RDelay CHANnel1,CHANnel2

:MEASure:F2RDelay? CHANnel1,CHANnel2

You can use the following commands to enable the delay (falling edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the delay (falling edge-rising edge) measurement results.

- :MEASure:F2RDelay:SMAXimum
- :MEASure:F2RDelay:SMINimum
- :MEASure:F2RDelay:SCURrent
- :MEASure:F2RDelay:SAVerage
- :MEASure:F2RDelay:SDEViation

:MEASure:F2RDelay:SMAXimum
:MEASure:F2RDelay:SMINimum
:MEASure:F2RDelay:SCURrent
:MEASure:F2RDelay:SAVerage
:MEASure:F2RDelay:SDEViation

Syntax 1

:MEASure:F2RDelay:SMAXimum <chanA>,<chanB>
:MEASure:F2RDelay:SMINimum <chanA>,<chanB>
:MEASure:F2RDelay:SCURrent <chanA>,<chanB>
:MEASure:F2RDelay:SAVerage <chanA>,<chanB>
:MEASure:F2RDelay:SDEViation <chanA>,<chanB>

Description 1

Enable the delay (falling edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:F2RDelay:SMAXimum? <chanA>,<chanB>
:MEASure:F2RDelay:SMINimum? <chanA>,<chanB>
:MEASure:F2RDelay:SCURrent? <chanA>,<chanB>
:MEASure:F2RDelay:SAVerage? <chanA>,<chanB>
:MEASure:F2RDelay:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (falling edge-rising edge) measurement results when the delay (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (falling edge- rising edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FPHase

Syntax 1

:MEASure:FPHase <chanA>,<chanB>

Description 1

Enable the phase deviation (falling edge-falling edge) measurement function between the two specified channels.

Syntax 2

:MEASure:FPHase? <chanA>,<chanB>

Description 2

Enable the phase deviation (falling edge-falling edge) measurement function between the two specified channels and return the measurement result (the unit is degree).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the phase deviation (falling edge-falling edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:FPHase CHANnel1,CHANnel2
:MEASure:FPHase? CHANnel1,CHANnel2

You can use the following commands to enable the phase deviation (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the phase deviation (falling edge-falling edge) measurement results.

- :MEASure:FPHase:SMAXimum
- :MEASure:FPHase:SMINimum
- :MEASure:FPHase:SCURrent
- :MEASure:FPHase:SAVerage
- :MEASure:FPHase:SDEViation

:MEASure:FPHase:SMAXimum
:MEASure:FPHase:SMINimum
:MEASure:FPHase:SCURrent
:MEASure:FPHase:SAVerage
:MEASure:FPHase:SDEViation

Syntax 1

:MEASure:FPHase:SMAXimum <chanA>,<chanB>
:MEASure:FPHase:SMINimum <chanA>,<chanB>
:MEASure:FPHase:SCURrent <chanA>,<chanB>
:MEASure:FPHase:SAVerage <chanA>,<chanB>
:MEASure:FPHase:SDEViation <chanA>,<chanB>

Description 1

Enable the phase deviation (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:FPHase:SMAXimum? <chanA>,<chanB>
:MEASure:FPHase:SMINimum? <chanA>,<chanB>
:MEASure:FPHase:SCURrent? <chanA>,<chanB>
:MEASure:FPHase:SAVerage? <chanA>,<chanB>
:MEASure:FPHase:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (falling edge-falling edge) measurement results when the phase deviation (falling edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (falling edge-falling edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RPhase

Syntax 1

:MEASure:F2RPhase <chanA>,<chanB>

Description 1

Enable the phase deviation (falling edge-rising edge) measurement function between the two specified channels.

Syntax 2

:MEASure:F2RPhase? <chanA>,<chanB>

Description 2

Enable the phase deviation (falling edge-rising edge) measurement function between the two specified channels and return the measurement result (the unit is degree).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the phase deviation (falling edge-rising edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:F2RPhase CHANnel1,CHANnel2

:MEASure:F2RPhase? CHANnel1,CHANnel2

You can use the following commands to enable the phase deviation (falling edge- rising edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the phase deviation (falling edge-rising edge) measurement results.

- :MEASure:F2RPhase:SMAXimum
- :MEASure:F2RPhase:SMINimum
- :MEASure:F2RPhase:SCURrent
- :MEASure:F2RPhase:SAVerage
- :MEASure:F2RPhase:SDEViation

:MEASure:F2RPhase:SMAXimum
:MEASure:F2RPhase:SMINimum
:MEASure:F2RPhase:SCURrent
:MEASure:F2RPhase:SAVerage
:MEASure:F2RPhase:SDEViation

Syntax 1

:MEASure:F2RPhase:SMAXimum <chanA>,<chanB>
:MEASure:F2RPhase:SMINimum <chanA>,<chanB>
:MEASure:F2RPhase:SCURrent <chanA>,<chanB>
:MEASure:F2RPhase:SAVerage <chanA>,<chanB>
:MEASure:F2RPhase:SDEViation <chanA>,<chanB>

Description 1

Enable the phase deviation (falling edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:F2RPhase:SMAXimum? <chanA>,<chanB>
:MEASure:F2RPhase:SMINimum? <chanA>,<chanB>
:MEASure:F2RPhase:SCURrent? <chanA>,<chanB>
:MEASure:F2RPhase:SAVerage? <chanA>,<chanB>
:MEASure:F2RPhase:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (falling edge-rising edge) measurement results when the phase deviation (falling edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (falling edge-rising edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FREQuency

Syntax 1

:MEASure:FREQuency <chan>

Description 1

Enable the frequency measurement function of the specified channel.

Syntax 2

:MEASure:FREQuency? <chan>

Description 2

Enable the frequency measurement function of the specified channel and return the measurement result (the unit is Hz).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the frequency measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:FREQuency CHANnel1

:MEASure:FREQuency? CHANnel1

You can use the following commands to enable the frequnecy measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the frequency measurement results.

- :MEASure:FREQuency:SMAXimum
- :MEASure:FREQuency:SMINimum
- :MEASure:FREQuency:SCURrent
- :MEASure:FREQuency:SAVerage
- :MEASure:FREQuency:SDEViation

:MEASure:FREQuency:SMAXimum
:MEASure:FREQuency:SMINimum
:MEASure:FREQuency:SCURrent
:MEASure:FREQuency:SAVerage
:MEASure:FREQuency:SDEViation

Syntax 1

:MEASure:FREQuency:SMAXimum <chan>
:MEASure:FREQuency:SMINimum <chan>
:MEASure:FREQuency:SCURrent <chan>
:MEASure:FREQuency:SAVerage <chan>
:MEASure:FREQuency:SDEViation <chan>

Description 1

Enable the frequency measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:FREQuency:SMAXimum? <chan>
:MEASure:FREQuency:SMINimum? <chan>
:MEASure:FREQuency:SCURrent? <chan>
:MEASure:FREQuency:SAVerage? <chan>
:MEASure:FREQuency:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the frequency measurement results when the frequency measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the frequency measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FTIMe

Syntax 1

:MEASure:FTIMe <chan>

Description 1

Enable the fall time measurement function of the specified channel.

Syntax 2

:MEASure:FTIMe? <chan>

Description 2

Enable the fall time measurement function of the specified channel and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the fall time measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:FTIMe CHANnel1

:MEASure:FTIMe? CHANnel1

You can use the following commands to enable the fall time measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the fall time measurement results.

- :MEASure:FTIMe:SMAXimum
- :MEASure:FTIMe:SMINimum
- :MEASure:FTIMe:SCURrent
- :MEASure:FTIMe:SAVerage
- :MEASure:FTIMe:SDEViation

:MEASure:FTIMe:SMAXimum
:MEASure:FTIMe:SMINimum
:MEASure:FTIMe:SCURrent
:MEASure:FTIMe:SAVerage
:MEASure:FTIMe:SDEViation

Syntax 1

:MEASure:FTIMe:SMAXimum <chan>
:MEASure:FTIMe:SMINimum <chan>
:MEASure:FTIMe:SCURrent <chan>
:MEASure:FTIMe:SAVerage <chan>
:MEASure:FTIMe:SDEViation <chan>

Description 1

Enable the fall time measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:FTIMe:SMAXimum? <chan>
:MEASure:FTIMe:SMINimum? <chan>
:MEASure:FTIMe:SCURrent? <chan>
:MEASure:FTIMe:SAVerage? <chan>
:MEASure:FTIMe:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the fall time measurement results when the fall time measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the fall time measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NDUTy

Syntax 1

:MEASure:NDUTy <chan>

Description 1

Enable the negative duty cycle measurement function of the specified channel.

Syntax 2

:MEASure:NDUTy? <chan>

Description 2

Enable the negative duty cycle measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the negative duty cycle measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:NDUTy CHANnel1

:MEASure:NDUTy? CHANnel1

You can use the following commands to enable the negative duty cycle measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the negative duty cycle measurement results.

- :MEASure:NDUTy:SMAXimum
- :MEASure:NDUTy:SMINimum
- :MEASure:NDUTy:SCURrent
- :MEASure:NDUTy:SAVerage
- :MEASure:NDUTy:SDEViation

:MEASure:NDUTy:SMAXimum
:MEASure:NDUTy:SMINimum
:MEASure:NDUTy:SCURrent
:MEASure:NDUTy:SAVerage
:MEASure:NDUTy:SDEViation

Syntax 1

:MEASure:NDUTy:SMAXimum <chan>
:MEASure:NDUTy:SMINimum <chan>
:MEASure:NDUTy:SCURrent <chan>
:MEASure:NDUTy:SAVerage <chan>
:MEASure:NDUTy:SDEViation <chan>

Description 1

Enable the negative duty cycle measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:NDUTy:SMAXimum? <chan>
:MEASure:NDUTy:SMINimum? <chan>
:MEASure:NDUTy:SCURrent? <chan>
:MEASure:NDUTy:SAVerage? <chan>
:MEASure:NDUTy:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the negative duty cycle measurement results when the negative duty cycle measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the negative duty cycle measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NWIDth

Syntax 1

:MEASure:NWIDth <chan>

Description 1

Enable the negative pulse width measurement function of the specified channel.

Syntax 2

:MEASure:NWIDth? <chan>

Description 2

Enable the negative pulse width measurement function of the specified channel and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the negative pulse width measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:NWIDth CHANnel1

:MEASure:NWIDth? CHANnel1

You can use the following commands to enable the negative pulse width measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the negative pulse width measurement results.

- :MEASure:NWIDth:SMAXimum
- :MEASure:NWIDth:SMINimum
- :MEASure:NWIDth:SCURrent
- :MEASure:NWIDth:SAVerage
- :MEASure:NWIDth:SDEViation

:MEASure:NWIDth:SMAXimum
:MEASure:NWIDth:SMINimum
:MEASure:NWIDth:SCURrent
:MEASure:NWIDth:SAVerage
:MEASure:NWIDth:SDEViation

Syntax 1

:MEASure:NWIDth:SMAXimum <chan>
:MEASure:NWIDth:SMINimum <chan>
:MEASure:NWIDth:SCURrent <chan>
:MEASure:NWIDth:SAVerage <chan>
:MEASure:NWIDth:SDEViation <chan>

Description 1

Enable the negative pulse width measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:NWIDth:SMAXimum? <chan>
:MEASure:NWIDth:SMINimum? <chan>
:MEASure:NWIDth:SCURrent? <chan>
:MEASure:NWIDth:SAVerage? <chan>
:MEASure:NWIDth:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the negative pulse width measurement results when the negative pulse width measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the negative pulse width measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:OVERshoot

Syntax 1

:MEASure:OVERshoot <chan>

Description 1

Enable the overshoot measurement function of the specified channel.

Syntax 2

:MEASure:OVERshoot? <chan>

Description 2

Enable the overshoot measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the overshoot measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:OVERshoot CHANnel1

:MEASure:OVERshoot? CHANnel1

You can use the following commands to enable the overshoot measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the overshoot measurement results.

- :MEASure:OVERshoot:SMAXimum
- :MEASure:OVERshoot:SMINimum
- :MEASure:OVERshoot:SCURrent
- :MEASure:OVERshoot:SAVerage
- :MEASure:OVERshoot:SDEViation

:MEASure:OVERshoot:SMAXimum
:MEASure:OVERshoot:SMINimum
:MEASure:OVERshoot:SCURrent
:MEASure:OVERshoot:SAVerage
:MEASure:OVERshoot:SDEViation

Syntax 1

:MEASure:OVERshoot:SMAXimum <chan>
:MEASure:OVERshoot:SMINimum <chan>
:MEASure:OVERshoot:SCURrent <chan>
:MEASure:OVERshoot:SAVerage <chan>
:MEASure:OVERshoot:SDEViation <chan>

Description 1

Enable the overshoot measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:OVERshoot:SMAXimum? <chan>
:MEASure:OVERshoot:SMINimum? <chan>
:MEASure:OVERshoot:SCURrent? <chan>
:MEASure:OVERshoot:SAVerage? <chan>
:MEASure:OVERshoot:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the overshoot measurement results when the overshoot measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the overshoot measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PDUTy

Syntax 1

:MEASure:PDUTy <chan>

Description 1

Enable the positive duty cycle measurement function of the specified channel.

Syntax 2

:MEASure:PDUTy? <chan>

Description 2

Enable the positive duty cycle measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the positive duty cycle measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:PDUTy CHANnel1

:MEASure:PDUTy? CHANnel1

You can use the following commands to enable the positive duty cycle measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the positive duty cycle measurement results.

- :MEASure:PDUTy:SMAXimum
- :MEASure:PDUTy:SMINimum
- :MEASure:PDUTy:SCURrent
- :MEASure:PDUTy:SAVerage
- :MEASure:PDUTy:SDEViation

:MEASure:PDUTy:SMAXimum
:MEASure:PDUTy:SMINimum
:MEASure:PDUTy:SCURrent
:MEASure:PDUTy:SAVerage
:MEASure:PDUTy:SDEViation

Syntax 1

:MEASure:PDUTy:SMAXimum <chan>
:MEASure:PDUTy:SMINimum <chan>
:MEASure:PDUTy:SCURrent <chan>
:MEASure:PDUTy:SAVerage <chan>
:MEASure:PDUTy:SDEViation <chan>

Description 1

Enable the positive duty cycle measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:PDUTy:SMAXimum? <chan>
:MEASure:PDUTy:SMINimum? <chan>
:MEASure:PDUTy:SCURrent? <chan>
:MEASure:PDUTy:SAVerage? <chan>
:MEASure:PDUTy:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the positive duty cycle measurement results when the positive duty cycle measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the positive duty cycle measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PERiod

Syntax 1

:MEASure:PERiod <chan>

Description 1

Enable the period measurement function of the specified channel.

Syntax 2

:MEASure:PERiod? <chan>

Description 2

Enable the period measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the period measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:PERiod CHANnel1

:MEASure:PERiod? CHANnel1

You can use the following commands to enable the period measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the period measurement results.

- :MEASure:PERiod:SMAXimum
- :MEASure:PERiod:SMINimum
- :MEASure:PERiod:SCURrent
- :MEASure:PERiod:SAVerage
- :MEASure:PERiod:SDEViation

:MEASure:PERiod:SMAXimum
:MEASure:PERiod:SMINimum
:MEASure:PERiod:SCURrent
:MEASure:PERiod:SAVerage
:MEASure:PERiod:SDEViation

Syntax 1

:MEASure:PERiod:SMAXimum <chan>
:MEASure:PERiod:SMINimum <chan>
:MEASure:PERiod:SCURrent <chan>
:MEASure:PERiod:SAVerage <chan>
:MEASure:PERiod:SDEViation <chan>

Description 1

Enable the period measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:PERiod:SMAXimum? <chan>
:MEASure:PERiod:SMINimum? <chan>
:MEASure:PERiod:SCURrent? <chan>
:MEASure:PERiod:SAVerage? <chan>
:MEASure:PERiod:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the period measurement results when the period measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the period measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PREShoot

Syntax 1

:MEASure:PREShoot <chan>

Description 1

Enable the preshoot measurement function of the specified channel.

Syntax 2

:MEASure:PREShoot? <chan>

Description 2

Enable the preshoot measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the preshoot measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:PREShoot CHANnel1

:MEASure:PREShoot? CHANnel1

You can use the following commands to enable the preshoot measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the preshoot measurement results.

- :MEASure:PREShoot:SMAXimum
- :MEASure:PREShoot:SMINimum
- :MEASure:PREShoot:SCURrent
- :MEASure:PREShoot:SAVerage
- :MEASure:PREShoot:SDEViation

:MEASure:PREShoot:SMAXimum
:MEASure:PREShoot:SMINimum
:MEASure:PREShoot:SCURrent
:MEASure:PREShoot:SAVerage
:MEASure:PREShoot:SDEViation

Syntax 1

:MEASure:PREShoot:SMAXimum <chan>
:MEASure:PREShoot:SMINimum <chan>
:MEASure:PREShoot:SCURrent <chan>
:MEASure:PREShoot:SAVerage <chan>
:MEASure:PREShoot:SDEViation <chan>

Description 1

Enable the preshoot measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:PREShoot:SMAXimum? <chan>
:MEASure:PREShoot:SMINimum? <chan>
:MEASure:PREShoot:SCURrent? <chan>
:MEASure:PREShoot:SAVerage? <chan>
:MEASure:PREShoot:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the preshoot measurement results when the preshoot measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the preshoot measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PWIDth

Syntax 1

:MEASure:PWIDth <chan>

Description 1

Enable the positive pulse width measurement function of the specified channel.

Syntax 2

:MEASure:PWIDth? <chan>

Description 2

Enable the positive pulse width measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the positive pulse width measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:PWIDth CHANnel1

:MEASure:PWIDth? CHANnel1

You can use the following commands to enable the positive pulse width measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the positive pulse width measurement results.

- :MEASure:PWIDth:SMAXimum
- :MEASure:PWIDth:SMINimum
- :MEASure:PWIDth:SCURrent
- :MEASure:PWIDth:SAVerage
- :MEASure:PWIDth:SDEViation

:MEASure:PWIDth:SMAXimum
:MEASure:PWIDth:SMINimum
:MEASure:PWIDth:SCURrent
:MEASure:PWIDth:SAVerage
:MEASure:PWIDth:SDEViation

Syntax 1

:MEASure:PWIDth:SMAXimum <chan>
:MEASure:PWIDth:SMINimum <chan>
:MEASure:PWIDth:SCURrent <chan>
:MEASure:PWIDth:SAVerage <chan>
:MEASure:PWIDth:SDEViation <chan>

Description 1

Enable the positive pulse width measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:PWIDth:SMAXimum? <chan>
:MEASure:PWIDth:SMINimum? <chan>
:MEASure:PWIDth:SCURrent? <chan>
:MEASure:PWIDth:SAVerage? <chan>
:MEASure:PWIDth:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the positive pulse width measurement results when the positive pulse width measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the positive pulse width measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RTIMe

Syntax 1

:MEASure:RTIMe <chan>

Description 1

Enable the rise time measurement function of the specified channel.

Syntax 2

:MEASure:RTIMe? <chan>

Description 2

Enable the rise time measurement function of the specified channel and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the rise time measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:RTIMe CHANnel1

:MEASure:RTIMe? CHANnel1

You can use the following commands to enable the rise time measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the rise time measurement results.

- :MEASure:RTIMe:SMAXimum
- :MEASure:RTIMe:SMINimum
- :MEASure:RTIMe:SCURrent
- :MEASure:RTIMe:SAVerage
- :MEASure:RTIMe:SDEViation

:MEASure:RTIMe:SMAXimum
:MEASure:RTIMe:SMINimum
:MEASure:RTIMe:SCURrent
:MEASure:RTIMe:SAVerage
:MEASure:RTIMe:SDEViation

Syntax 1

:MEASure:RTIMe:SMAXimum <chan>
:MEASure:RTIMe:SMINimum <chan>
:MEASure:RTIMe:SCURrent <chan>
:MEASure:RTIMe:SAVerage <chan>
:MEASure:RTIMe:SDEViation <chan>

Description 1

Enable the rise time measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:RTIMe:SMAXimum? <chan>
:MEASure:RTIMe:SMINimum? <chan>
:MEASure:RTIMe:SCURrent? <chan>
:MEASure:RTIMe:SAVerage? <chan>
:MEASure:RTIMe:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the rise time measurement results when the rise time measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the rise time measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RDELay

Syntax 1

:MEASure:RDELay <chanA>,<chanB>

Description 1

Enable the delay (rising edge-rising edge) measurement function between the two specified channels.

Syntax 2

:MEASure:RDELay? <chanA>,<chanB>

Description 2

Enable the delay (rising edge-rising edge) measurement function between the two specified channels and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the delay (rising edge-rising edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:RDELay CHANnel1,CHANnel2

:MEASure:RDELay? CHANnel1,CHANnel2

You can use the following commands to enable the delay (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the delay (rising edge-rising edge) measurement results.

- :MEASure:RDELay:SMAXimum
- :MEASure:RDELay:SMINimum
- :MEASure:RDELay:SCURrent
- :MEASure:RDELay:SAVerage
- :MEASure:RDELay:SDEViation

:MEASure:RDELay:SMAXimum
:MEASure:RDELay:SMINimum
:MEASure:RDELay:SCURrent
:MEASure:RDELay:SAVerage
:MEASure:RDELay:SDEViation

Syntax 1

:MEASure:RDELay:SMAXimum <chanA>,<chanB>
:MEASure:RDELay:SMINimum <chanA>,<chanB>
:MEASure:RDELay:SCURrent <chanA>,<chanB>
:MEASure:RDELay:SAVerage <chanA>,<chanB>
:MEASure:RDELay:SDEViation <chanA>,<chanB>

Description 1

Enable the delay (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:RDELay:SMAXimum? <chanA>,<chanB>
:MEASure:RDELay:SMINimum? <chanA>,<chanB>
:MEASure:RDELay:SCURrent? <chanA>,<chanB>
:MEASure:RDELay:SAVerage? <chanA>,<chanB>
:MEASure:RDELay:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (rising edge-rising edge) measurement results when the delay (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (rising edge-rising edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FDelay

Syntax1

:MEASure:R2FDelay <chanA>,<chanB>

Description1

Enable the delay (rising edge-falling edge) measurement function between the two specified channels.

Syntax2

:MEASure:R2FDelay? <chanA>,<chanB>

Description2

Enable the delay (rising edge-falling edge) measurement function between the two specified channels and return the measurement result (the unit is s).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the delay (rising edge-falling edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:R2FDelay CHANnel1,CHANnel2

:MEASure:R2FDelay? CHANnel1,CHANnel2

You can use the following commands to enable the delay (rising edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the delay (rising edge-falling edge) measurement results.

- :MEASure:R2FDelay:SMAXimum
- :MEASure:R2FDelay:SMINimum
- :MEASure:R2FDelay:SCURrent
- :MEASure:R2FDelay:SAVerage
- :MEASure:R2FDelay:SDEViation

:MEASure:R2FDelay:SMAXimum
:MEASure:R2FDelay:SMINimum
:MEASure:R2FDelay:SCURrent
:MEASure:R2FDelay:SAVerage
:MEASure:R2FDelay:SDEViation

Syntax 1

:MEASure:R2FDelay:SMAXimum <chanA>,<chanB>
:MEASure:R2FDelay:SMINimum <chanA>,<chanB>
:MEASure:R2FDelay:SCURrent <chanA>,<chanB>
:MEASure:R2FDelay:SAVerage <chanA>,<chanB>
:MEASure:R2FDelay:SDEViation <chanA>,<chanB>

Description 1

Enable the delay (rising edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:R2FDelay:SMAXimum? <chanA>,<chanB>
:MEASure:R2FDelay:SMINimum? <chanA>,<chanB>
:MEASure:R2FDelay:SCURrent? <chanA>,<chanB>
:MEASure:R2FDelay:SAVerage? <chanA>,<chanB>
:MEASure:R2FDelay:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (rising edge-falling edge) measurement results when the delay (rising edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the delay (rising edge-falling edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RPHase

Syntax 1

:MEASure:RPHase <chanA>,<chanB>

Description 1

Enable the phase deviation (rising edge-rising edge) measurement function between the two specified channels.

Syntax 2

:MEASure:RPHase? <chanA>,<chanB>

Description 2

Enable the phase deviation (rising edge-rising edge) measurement function between the two specified channels and return the measurement result (the unit is degree).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the phase deviation (rising edge-rising edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:RPHase CHANnel1,CHANnel2
:MEASure:RPHase? CHANnel1,CHANnel2

You can use the following commands to enable the phase deviation (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the phase deviation (rising edge-rising edge) measurement results.

- :MEASure:RPHase:SMAXimum
- :MEASure:RPHase:SMINimum
- :MEASure:RPHase:SCURrent
- :MEASure:RPHase:SAVerage
- :MEASure:RPHase:SDEViation

:MEASure:RPHase:SMAXimum
:MEASure:RPHase:SMINimum
:MEASure:RPHase:SCURrent
:MEASure:RPHase:SAVerage
:MEASure:RPHase:SDEViation

Syntax 1

:MEASure:RPHase:SMAXimum <chanA>,<chanB>
:MEASure:RPHase:SMINimum <chanA>,<chanB>
:MEASure:RPHase:SCURrent <chanA>,<chanB>
:MEASure:RPHase:SAVerage <chanA>,<chanB>
:MEASure:RPHase:SDEViation <chanA>,<chanB>

Description 1

Enable the phase deviation (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:RPHase:SMAXimum? <chanA>,<chanB>
:MEASure:RPHase:SMINimum? <chanA>,<chanB>
:MEASure:RPHase:SCURrent? <chanA>,<chanB>
:MEASure:RPHase:SAVerage? <chanA>,<chanB>
:MEASure:RPHase:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (rising edge-rising edge) measurement results when the phase deviation (rising edge-rising edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (rising edge-rising edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FPhase

Syntax 1

:MEASure:R2FPhase <chanA>,<chanB>

Description 1

Enable the phase deviation (rising edge-falling edge) measurement function between the two specified channels.

Syntax 2

:MEASure:R2FPhase? <chanA>,<chanB>

Description 2

Enable the phase deviation (rising edge-falling edge) measurement function between the two specified channels and return the measurement result (the unit is degree).

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the phase deviation (rising edge-falling edge) measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:R2FPhase CHANnel1,CHANnel2
:MEASure:R2FPhase? CHANnel1,CHANnel2

You can use the following commands to enable the phase deviation (rising edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the phase deviation (rising edge-falling edge) measurement results.

- :MEASure:R2FPhase:SMAXimum
- :MEASure:R2FPhase:SMINimum
- :MEASure:R2FPhase:SCURrent
- :MEASure:R2FPhase:SAVerage
- :MEASure:R2FPhase:SDEViation

:MEASure:R2FPhase:SMAXimum
:MEASure:R2FPhase:SMINimum
:MEASure:R2FPhase:SCURrent
:MEASure:R2FPhase:SAVerage
:MEASure:R2FPhase:SDEViation

Syntax 1

:MEASure:R2FPhase:SMAXimum <chanA>,<chanB>
:MEASure:R2FPhase:SMINimum <chanA>,<chanB>
:MEASure:R2FPhase:SCURrent <chanA>,<chanB>
:MEASure:R2FPhase:SAVerage <chanA>,<chanB>
:MEASure:R2FPhase:SDEViation <chanA>,<chanB>

Description 1

Enable the phase deviation (rising edg-falling edge) measurement function between the two specified channels and the statistic function of the measurement results.

Syntax 2

:MEASure:R2FPhase:SMAXimum? <chanA>,<chanB>
:MEASure:R2FPhase:SMINimum? <chanA>,<chanB>
:MEASure:R2FPhase:SCURrent? <chanA>,<chanB>
:MEASure:R2FPhase:SAVerage? <chanA>,<chanB>
:MEASure:R2FPhase:SDEViation? <chanA>,<chanB>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (rising edge-falling edge) measurement results when the phase deviation (rising edge-falling edge) measurement function between the two specified channels and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15|CHANnel1|CHANnel2}	--
<chanB>	Discrete	When <chanA> is D0-D15: {D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11| D12|D13|D14|D15} When <chanA> is CHANnel1 or CHANnel2: {CHANnel1|CHANnel2}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the phase deviation (rising edge-falling edge) measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VAMP

Syntax 1

:MEASure:VAMP <chan>

Description 1

Enable the amplitude measurement function of the specified channel.

Syntax 2

:MEASure:VAMP? <chan>

Description 2

Enable the amplitude measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VAMP CHANnel1
:MEASure:VAMP? CHANnel1

You can use the following commands to enable the amplitude measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude measurement results.

- :MEASure:VAMP:SMAXimum
- :MEASure:VAMP:SMINimum
- :MEASure:VAMP:SCURrent
- :MEASure:VAMP:SAVerage
- :MEASure:VAMP:SDEViation

:MEASure:VAMP:SMAXimum
:MEASure:VAMP:SMINimum
:MEASure:VAMP:SCURrent
:MEASure:VAMP:SAVerage
:MEASure:VAMP:SDEViation

Syntax 1

:MEASure:VAMP:SMAXimum <chan>
:MEASure:VAMP:SMINimum <chan>
:MEASure:VAMP:SCURrent <chan>
:MEASure:VAMP:SAVerage <chan>
:MEASure:VAMP:SDEViation <chan>

Description 1

Enable the amplitude measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VAMP:SMAXimum? <chan>
:MEASure:VAMP:SMINimum? <chan>
:MEASure:VAMP:SCURrent? <chan>
:MEASure:VAMP:SAVerage? <chan>
:MEASure:VAMP:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude measurement results when the amplitude measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VAVG

Syntax 1

:MEASure:VAVG <chan>

Description 1

Enable the amplitude average measurement function of the specified channel.

Syntax 2

:MEASure:VAVG? <chan>

Description 2

Enable the amplitude average measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude average measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VAVG CHANnel1

:MEASure:VAVG? CHANnel1

You can use the following commands to enable the amplitude average measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude average measurement results.

- :MEASure:VAVG:SMAXimum
- :MEASure:VAVG:SMINimum
- :MEASure:VAVG:SCURrent
- :MEASure:VAVG:SAVerage
- :MEASure:VAVG:SDEViation

:MEASure:VAVG:SMAXimum
:MEASure:VAVG:SMINimum
:MEASure:VAVG:SCURrent
:MEASure:VAVG:SAVerage
:MEASure:VAVG:SDEViation

Syntax 1

:MEASure:VAVG:SMAXimum <chan>
:MEASure:VAVG:SMINimum <chan>
:MEASure:VAVG:SCURrent <chan>
:MEASure:VAVG:SAVerage <chan>
:MEASure:VAVG:SDEViation <chan>

Description 1

Enable the amplitude average measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VAVG:SMAXimum? <chan>
:MEASure:VAVG:SMINimum? <chan>
:MEASure:VAVG:SCURrent? <chan>
:MEASure:VAVG:SAVerage? <chan>
:MEASure:VAVG:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude average measurement results when the amplitude average measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude average measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VBASe

Syntax 1

:MEASure:VBASe <chan>

Description 1

Enable the amplitude base value measurement function of the specified channel.

Syntax 2

:MEASure:VBASe? <chan>

Description 2

Enable the amplitude base value measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude base value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VBASe CHANnel1

:MEASure:VBASe? CHANnel1

You can use the following commands to enable the amplitude base measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude base measurement results.

- :MEASure:VBASe:SMAXimum
- :MEASure:VBASe:SMINimum
- :MEASure:VBASe:SCURrent
- :MEASure:VBASe:SAVerage
- :MEASure:VBASe:SDEViation

:MEASure:VBASe:SMAXimum
:MEASure:VBASe:SMINimum
:MEASure:VBASe:SCURrent
:MEASure:VBASe:SAVerage
:MEASure:VBASe:SDEViation

Syntax 1

:MEASure:VBASe:SMAXimum <chan>
:MEASure:VBASe:SMINimum <chan>
:MEASure:VBASe:SCURrent <chan>
:MEASure:VBASe:SAVerage <chan>
:MEASure:VBASe:SDEViation <chan>

Description 1

Enable the amplitude base value measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VAVG:SMAXimum? <chan>
:MEASure:VAVG:SMINimum? <chan>
:MEASure:VAVG:SCURrent? <chan>
:MEASure:VAVG:SAVerage? <chan>
:MEASure:VAVG:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude base value measurement results when the amplitude base value measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude base value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMAX

Syntax 1

:MEASure:VMAX <chan>

Description 1

Enable the amplitude maximum value measurement function of the specified channel.

Syntax 2

:MEASure:VMAX? <chan>

Description 2

Enable the amplitude maximum value measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude maximum value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VMAX CHANnel1

:MEASure:VMAX? CHANnel1

You can use the following commands to enable the amplitude maximum measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude maximum measurement results.

- :MEASure:VMAX:SMAXimum
- :MEASure:VMAX:SMINimum
- :MEASure:VMAX:SCURrent
- :MEASure:VMAX:SAVerage
- :MEASure:VMAX:SDEViation

:MEASure:VMAX:SMAXimum
:MEASure:VMAX:SMINimum
:MEASure:VMAX:SCURrent
:MEASure:VMAX:SAVerage
:MEASure:VMAX:SDEViation

Syntax 1

:MEASure:VMAX:SMAXimum <chan>
:MEASure:VMAX:SMINimum <chan>
:MEASure:VMAX:SCURrent <chan>
:MEASure:VMAX:SAVerage <chan>
:MEASure:VMAX:SDEViation <chan>

Description 1

Enable the amplitude maximum value measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VMAX:SMAXimum? <chan>
:MEASure:VMAX:SMINimum? <chan>
:MEASure:VMAX:SCURrent? <chan>
:MEASure:VMAX:SAVerage? <chan>
:MEASure:VMAX:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude maximum value measurement results when the amplitude maximum value measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude maximum value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMIN

Syntax 1

:MEASure:VMIN <chan>

Description 1

Enable the amplitude minimum value measurement function of the specified channel.

Syntax 2

:MEASure:VMIN? <chan>

Description 2

Enable the amplitude minimum value measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude minimum value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VMIN CHANnel1

:MEASure:VMIN? CHANnel1

You can use the following commands to enable the amplitude minimum measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude minimum measurement results.

- :MEASure:VMIN:SMAXimum
- :MEASure:VMIN:SMINimum
- :MEASure:VMIN:SCURrent
- :MEASure:VMIN:SAVerage
- :MEASure:VMIN:SDEviation

:MEASure:VMIN:SMAXimum
:MEASure:VMIN:SMINimum
:MEASure:VMIN:SCURrent
:MEASure:VMIN:SAVerage
:MEASure:VMIN:SDEviation

Syntax 1

:MEASure:VMIN:SMAXimum <chan>
:MEASure:VMIN:SMINimum <chan>
:MEASure:VMIN:SCURrent <chan>
:MEASure:VMIN:SAVerage <chan>
:MEASure:VMIN:SDEViation <chan>

Description 1

Enable the amplitude minimum value measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VMIN:SMAXimum? <chan>
:MEASure:VMIN:SMINimum? <chan>
:MEASure:VMIN:SCURrent? <chan>
:MEASure:VMIN:SAVerage? <chan>
:MEASure:VMIN:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude minimum value measurement results when the amplitude minimum value measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude minimum value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VPP

Syntax 1

:MEASure:VPP <chan>

Description 1

Enable the peak-peak value measurement function of the specified channel.

Syntax 2

:MEASure:VPP? <chan>

Description 2

Enable the peak-peak value measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the peak-peak value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VPP CHANnel1
:MEASure:VPP? CHANnel1

You can use the following commands to enable the peak-peak value measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the peak-peak value measurement results.

- :MEASure:VPP:SMAXimum
- :MEASure:VPP:SMINimum
- :MEASure:VPP:SCURrent
- :MEASure:VPP:SAVerage
- :MEASure:VPP:SDEViation

:MEASure:VPP:SMAXimum
:MEASure:VPP:SMINimum
:MEASure:VPP:SCURrent
:MEASure:VPP:SAVerage
:MEASure:VPP:SDEViation

Syntax 1

:MEASure:VPP:SMAXimum <chan>
:MEASure:VPP:SMINimum <chan>
:MEASure:VPP:SCURrent <chan>
:MEASure:VPP:SAVerage <chan>
:MEASure:VPP:SDEViation <chan>

Description 1

Enable the peak-peak value measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VPP:SMAXimum? <chan>
:MEASure:VPP:SMINimum? <chan>
:MEASure:VPP:SCURrent? <chan>
:MEASure:VPP:SAVerage? <chan>
:MEASure:VPP:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the peak-peak value measurement results when the peak-peak value measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the peak-peak value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VRMS

Syntax 1

:MEASure:VRMS <chan>

Description 1

Enable the RMS value measurement function on the whole signal of the specified channel.

Syntax 2

:MEASure:VRMS? <chan>

Description 2

Enable the RMS value measurement function on the whole signal of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the RMS value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VRMS CHANnel1

:MEASure:VRMS? CHANnel1

You can use the following commands to enable the RMS value measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the RMS value measurement results.

- :MEASure:VRMS:SMAXimum
- :MEASure:VRMS:SMINimum
- :MEASure:VRMS:SCURrent
- :MEASure:VRMS:SAVerage
- :MEASure:VRMS:SDEViation

:MEASure:VRMS:SMAXimum
:MEASure:VRMS:SMINimum
:MEASure:VRMS:SCURrent
:MEASure:VRMS:SAVerage
:MEASure:VRMS:SDEViation

Syntax 1

:MEASure:VRMS:SMAXimum <chan>
:MEASure:VRMS:SMINimum <chan>
:MEASure:VRMS:SCURrent <chan>
:MEASure:VRMS:SAVerage <chan>
:MEASure:VRMS:SDEViation <chan>

Description 1

Enable the RMS value measurement function on the whole signal of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VRMS:SMAXimum? <chan>
:MEASure:VRMS:SMINimum? <chan>
:MEASure:VRMS:SCURrent? <chan>
:MEASure:VRMS:SAVerage? <chan>
:MEASure:VRMS:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the RMS value measurement results when the amplitude RMS value measurement function on the whole signal of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the RMS value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PVRMs

Syntax 1

:MEASure:PVRMs <chan>

Description 1

Enable the RMS value measurement function within a single period of the specified channel.

Syntax 2

:MEASure:PVRMs? <chan>

Description 2

Enable the RMS value measurement function within a single period of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the RMS value measurement results within a single period in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:PVRMs CHANnel1

:MEASure:PVRMs? CHANnel1

You can use the following commands to enable the RMS value measurement function within a single period of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the RMS value measurement results within a single period.

- :MEASure:PVRMs:SMAXimum
- :MEASure:PVRMs:SMINimum
- :MEASure:PVRMs:SCURrent
- :MEASure:PVRMs:SAVerage
- :MEASure:PVRMs:SDEViation

:MEASure:PVRMs:SMAXimum
:MEASure:PVRMs:SMINimum
:MEASure:PVRMs:SCURrent
:MEASure:PVRMs:SAVerage
:MEASure:PVRMs:SDEViation

Syntax 1

:MEASure:PVRMs:SMAXimum <chan>
:MEASure:PVRMs:SMINimum <chan>
:MEASure:PVRMs:SCURrent <chan>
:MEASure:PVRMs:SAVerage <chan>
:MEASure:PVRMs:SDEViation <chan>

Description 1

Enable the RMS value measurement function within a single period of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:PVRMs:SMAXimum? <chan>
:MEASure:PVRMs:SMINimum? <chan>
:MEASure:PVRMs:SCURrent? <chan>
:MEASure:PVRMs:SAVerage? <chan>
:MEASure:PVRMs:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the RMS value measurement results within a single period when the RMS value measurement function within a single period of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the RMS value measurement results within a single period in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VTOP

Syntax 1

:MEASure:VTOP <chan>

Description 1

Enable the amplitude top value measurement function of the specified channel.

Syntax 2

:MEASure:VTOP? <chan>

Description 2

Enable the amplitude top value measurement function of the specified channel and return the measurement result.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the amplitude top value measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:VTOP CHANnel1

:MEASure:VTOP? CHANnel1

You can use the following commands to enable the amplitude top value measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the amplitude top measurement results.

- :MEASure:VTOP:SMAXimum
- :MEASure:VTOP:SMINimum
- :MEASure:VTOP:SCURrent
- :MEASure:VTOP:SAVerage
- :MEASure:VTOP:SDEViation

:MEASure:VTOP:SMAXimum
:MEASure:VTOP:SMINimum
:MEASure:VTOP:SCURrent
:MEASure:VTOP:SAVerage
:MEASure:VTOP:SDEViation

Syntax 1

:MEASure:VTOP:SMAXimum <chan>
:MEASure:VTOP:SMINimum <chan>
:MEASure:VTOP:SCURrent <chan>
:MEASure:VTOP:SAVerage <chan>
:MEASure:VTOP:SDEViation <chan>

Description 1

Enable the amplitude top value measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:VTOP:SMAXimum? <chan>
:MEASure:VTOP:SMINimum? <chan>
:MEASure:VTOP:SCURrent? <chan>
:MEASure:VTOP:SAVerage? <chan>
:MEASure:VTOP:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude top value measurement results when the amplitude top value measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Explanation

The unit is determined by the unit selected for the signal source channel (refer to the :CHANnel<n>:UNITs command).

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the amplitude top value measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:MARea

Syntax 1

:MEASure:MARea <chan>

Description 1

Enable the area measurement function of the specified channel.

Syntax 2

:MEASure:MARea? <chan>

Description 2

Enable the area measurement function of the specified channel and return the measurement result (the unit is Vs).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the area measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:MARea CHANnel1

:MEASure:MARea? CHANnel1

You can use the following commands to enable the area measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the area measurement results.

- :MEASure:MARea:SMAXimum
- :MEASure:MARea:SMINimum
- :MEASure:MARea:SCURrent
- :MEASure:MARea:SAVerage
- :MEASure:MARea:SDEViation

:MEASure:MARea:SMAXimum
:MEASure:MARea:SMINimum
:MEASure:MARea:SCURrent
:MEASure:MARea:SAVerage
:MEASure:MARea:SDEViation

Syntax 1

:MEASure:MARea:SMAXimum <chan>
:MEASure:MARea:SMINimum <chan>
:MEASure:MARea:SCURrent <chan>
:MEASure:MARea:SAVerage <chan>
:MEASure:MARea:SDEViation <chan>

Description 1

Enable the area measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:MARea:SMAXimum? <chan>
:MEASure:MARea:SMINimum? <chan>
:MEASure:MARea:SCURrent? <chan>
:MEASure:MARea:SAVerage? <chan>
:MEASure:MARea:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the area measurement results when the area measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the area measurementresults in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:MPARea

Syntax 1

:MEASure:MPARea <chan>

Description 1

Enable the period area measurement function of the specified channel.

Syntax 2

:MEASure:MPARea? <chan>

Description 2

Enable the period area measurement function of the specified channel and return the measurement result (the unit is Vs).

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the period area measurement result in scientific notation. When the measurement result is invalid, the query returns 9.9e37.

Example

:MEASure:MPARea CHANnel1

:MEASure:MPARea? CHANnel1

You can use the following commands to enable the period area measurement function of the specified channel and the statistic function of the measurement results as well as query the statistic maximum value, minimum value, current value, average value and standard deviation of the period area measurement results.

- :MEASure:MPARea:SMAXimum
- :MEASure:MPARea:SMINimum
- :MEASure:MPARea:SCURrent
- :MEASure:MPARea:SAVerage
- :MEASure:MPARea:SDEViation

:MEASure:MPARea:SMAXimum
:MEASure:MPARea:SMINimum
:MEASure:MPARea:SCURrent
:MEASure:MPARea:SAVerage
:MEASure:MPARea:SDEViation

Syntax 1

:MEASure:MPARea:SMAXimum <chan>
:MEASure:MPARea:SMINimum <chan>
:MEASure:MPARea:SCURrent <chan>
:MEASure:MPARea:SAVerage <chan>
:MEASure:MPARea:SDEViation <chan>

Description 1

Enable the period area measurement function of the specified channel and the statistic function of the measurement results.

Syntax 2

:MEASure:MPARea:SMAXimum? <chan>
:MEASure:MPARea:SMINimum? <chan>
:MEASure:MPARea:SCURrent? <chan>
:MEASure:MPARea:SAVerage? <chan>
:MEASure:MPARea:SDEViation? <chan>

Description 2

Query the statistic maximum value, minimum value, current value, average value or standard deviation of the period area measurement results when the period area measurement function of the specified channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2|MATH}	--

Return Format

The query returns the statistic maximum value, minimum value, current value, average value or standard deviation of the period area measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:OUTPut<n> Commands (For MSO2000A-S/DS2000A-S)

The :OUTPut<n> commands are used to enable or disable the output of the built-in signal source as well as set its output impedance.

- :OUTPut[<n>][:STATe]
- :OUTPut[<n>]:IMPedance

:OUTPut[<n>][:STATe]

Syntax

:OUTPut[<n>][:STATe] <bool>

:OUTPut[<n>][:STATe]?

Description

Enable or disable the output of the specified signal source channel; or query the output status of the specified signal source channel.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF
<n>	Discrete	{1|2}	1

Return Format

The query returns 1 or 0.

:OUTPut[<n>]:IMPedance

Syntax

:OUTPut[<n>]:IMPedance <impedance>

:OUTPut[<n>]:IMPedance?

Description

Set or query the output impedance of the signal source channel.

Parameter

Name	Type	Range	Default
<impedance>	Discrete	{OMEG|FIFTy}	OMEG
<n>	Discrete	{1|2}	1

Explanation

OMEG: HighZ; FIFTy: 50Ω.

Return Format

The query returns OMEG or FIFT.

:RECall Commands

- :RECall:SETup
- :RECall:TRACe
- :RECall:WAVeform

:RECall:SETup

Syntax

:RECall:SETup <file_spec>

Description

Recall the setup file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- Beforing recalling the setup file, use the :SAVE:SETup[:STARt] command to store the corresponding file into the external memory.
- <file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\.

Example

:RECall:SETup D:\123.stp /*Recall the setup file 123.stp stored in the D disk*/

:RECall:TRACe

Syntax

:RECall:TRACe <file_spec>

Description

Recall the trace file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- Beforing recalling the trace file, use the :SAVE:TRACe[:STARt] command to store the corresponding file into the external memory.
- <file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\.

Example

:RECall:TRACe D:\123.trc /*Recall the waveform trace file 123.trc stored in the D disk*/

:RECall:WAVeform

Syntax

:RECall:WAVeform <file_spec>

Description

Recall the waveform file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- Beforing recalling the waveform file, use the :SAVE:WAVeform[:STARt] command to store the corresponding file into the external memory.
- <file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\.

Example

:RECall:WAVeform D:\123.wfm /*Recall the waveform file 123.wfm stored in the D disk*/

:REFerence Commands

- :REFerence<n>:CURRent
- :REFerence<n>:ENABle
- :REFerence:COLor
- :REFerence:CURRent?
- :REFerence:DISPlay
- :REFerence:RESet
- :REFerence:SAVe
- :REFerence:SOURce
- :REFerence:VSCale
- :REFerence:VOFFset

:REFerence<n>:CURRent

Syntax

:REFerence<n>:CURRent

Description

Select the current reference channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4|5|6|7|8|9|10}	1

Explanation

Only reference channels currently turned on can be selected as the current channel. Refer to the :REFerence<n>:ENABle command to turn on or off the reference channels.

:REFerence<n>:ENABle

Syntax

:REFerence<n>:ENABle <bool>

:REFerence<n>:ENABle?

Description

Turn on or off the specified reference channel; or query the status of the specified reference channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4|5|6|7|8|9|10}	--
<bool>	Bool	{{1|ON}|{0|OFF}}	Ref1: 1|ON Ref2 to Ref10: 0|OFF

Return Format

The query returns 1 or 0.

:REFerence:COLor

Syntax

:REFerence:COLor <color>

:REFerence:COLor?

Description

Set or query the color of the current reference channel waveform.

Parameter

Name	Type	Range	Default
<color>	Discrete	{GRAY|GREEn|LBLue|MAGenta|ORANge}	GRAY

Explanation

The reference waveform color can be set to GRAY, GREEn, LBLue (light blue), MAGenta or ORANge.

Return Format

The query returns GRAY, GREE, LBL, MAG or ORAN.

:REFerence:CURRent?

Syntax

:REFerence:CURRent?

Description

Query the current REF channel.

Return Format

The query returns REFn; wherein, n is an integer from 1 to 10.

:REFerence:DISPlay

Syntax

:REFerence:DISPlay <bool>

:REFerence:DISPlay?

Description

Turn on or off the REF control menu; or query whether the REF control menu is turned on.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:REFerence:RESet

Syntax

:REFerence:RESet

Description

Reset the vertical scale and vertical position of the reference waveform of the current channel to the settings of the signal source channel when storing the reference waveform.

Explanation

Before using this command, use the :REFerence:SAVe command to store the waveform (screen region) of the specified signal source to the internal memory.

:REFerence:SAVe

Syntax

:REFerence:SAVe

Description

Store the waveform (screen region) of the specified signal source to the internal memory as the reference waveform of the current reference channel and display the waveform on the screen.

Explanation

This operation can only store the reference waveform in the volatile memory and the waveform will be cleared at power-off.

:REFerence:SOURce

Syntax

:REFerence:SOURce <source>

:REFerence:SOURce?

Description

Set or query the reference source of the current reference channel.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|MATH}	CHANnel1

Explanation

- Only channels currently turned on can be selected as the reference source of the current channel.
- You can use the :REFerence<n>:CURRent command to selected the current channel.

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or MATH.

:REFerence:VSCale

Syntax

:REFerence:VSCale <vscale>

:REFerence:VSCale?

Description

Set or query the vertical scale of the current refrence channel waveform. The unit is the same with that of the current signal source.

Parameter

Name	Type	Range	Default
<vscale>	Integer	1 to 10	5

Explanation

Define the vertical scale of the reference channel waveform when performing the store operation as “Vscale0” and the vertical scale of the reference channel waveform currently set as “Vscale1”. Different <vscale> values are used to represent different ratio relations between Vscale0 and Vscale1, as shown in the table below.

<vscale>	Vscale1/Vscale0
1	0.05
2	0.1
3	0.2
4	0.5
5	1
6	2
7	5
8	10
9	20
10	50

Return Format

The query returns an integer from 1 to 10. If the REF function is currently disabled or no reference waveform is stored for the current reference channel, the query returns Null.

:REFerence:VOFFset

Syntax

:REFerence:VOFFset <voffset>

:REFerence:VOFFset?

Description

Set or query the vertical offset of the current reference channel waveform. The unit is the same with that of the current signal source.

Parameter

Name	Type	Range	Default
<voffset>	Integer	-150 to +150	0

Note: When <voffset> is 0, the vertical position of the reference waveform is the same with that of the original waveform. When the parameter increases or decreases by 1, the reference waveform moves upward or downward by 1/25*vertical scale of the original waveform relative to the vertical position of the original waveform.

Return Format

The query returns the vertical offset of the current reference channel waveform in integer.

:SAVE Commands

- :SAVE:CSV[:STARt]
- :SAVE:CSV:FACTors
- :SAVE:CSV:LENGth
- :SAVE:FORMat
- :SAVE:IMAGe[:STARt]
- :SAVE:IMAGe:TYPE
- :SAVE:IMAGe:FACTors
- :SAVE:SETup[:STARt]
- :SAVE:TRACe[:STARt]
- :SAVE:WAVeform[:STARt]
- :SAVE:REFerence[:STARt]
- :SAVE:MTESt[:STARt]
- :SAVE:ARB[:STARt]

:SAVE:CSV[:STARt]

Syntax

:SAVE:CSV[:STARt] <file_spec>

Description

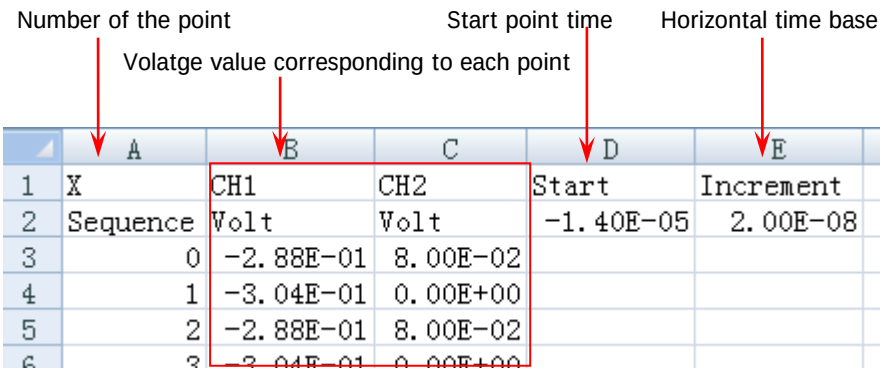
Save the waveform data on the screen into the external memory in "*.csv" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- <file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.
- The "*.csv" file stored includes the current horizontal time base, start point time and volatge value corresponding to each point of the channel turned on as shown in the figure below. You can open and edit the file via Excel.



Example

:SAVE:CSV D:\123.csv /*Store the waveform data on the screen into the external memory with the filename 123.csv*/

:SAVE:CSV:FACTors

Syntax

:SAVE:CSV:FACTors <bool>

:SAVE:CSV:FACTors?

Description

Enable or disable the parameter storage function of CSV storage; or query whether the parameter storage function of CSV storage is enabled.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

When this function is enabled, a TXT file with the same filename will also be stored when sending the :SAVE:CSV[:STARt] command to store the CSV file. This file includes the model, serial number, hardware and software version numbers as well as the current parameter configurations of the oscilloscope.

Return Format

The query returns 1 or 0.

:SAVE:CSV:LENGth

Syntax

:SAVE:CSV:LENGth <len>

:SAVE:CSV:LENGth?

Description

Set or query the data length type of CSV storage.

Parameter

Name	Type	Range	Default
<len>	Discrete	{DISPlay|MAXimum}	DISPlay

Explanation

- DISPlay: only store the points (1400 points) within the screen region.
- MAXimum: store all the points (equal to the current memory depth) in the internal memory.

Return Format

The query returns DISP or MAX.

:SAVE:FORMat

Syntax

:SAVE:FORMat <format>

:SAVE:FORMat?

Description

Set or query the storage format.

Parameter

Name	Type	Range	Default
<format>	Discrete	{TRACe|WAVeform|SETup|PICTure|CSV}	PICTure

Return Format

The query returns TRAC, WAV, SET, PICT or CSV.

:SAVE:IMAGe[:STARt]

Syntax

:SAVE:IMAGe[:STARt] <file_spec>

Description

Store the content displayed on the screen into the external memory in picture form.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

<file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. The suffix of the filename can be .bmp, .png, .jpeg or .tiff. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:IMAGe D:\123.png /*Store the content displayed on the screen into the external memory with the filename 123.png*/

:SAVE:IMAGe:TYPE

Syntax

:SAVE:IMAGe:TYPE <type>

:SAVE:IMAGe:TYPE?

Description

Set or query the picture type of picture storage.

Parameter

Name	Type	Range	Default
<type>	Discrete	{BMP24bit|JPEG|PNG|TIFF}	PNG

Return Format

The query returns BMP24, JPEG, PNG or TIFF.

:SAVE:IMAGe:FACTors

Syntax

:SAVE:IMAGe:FACTors <bool>

:SAVE:IMAGe:FACTors?

Description

Enable or disable the parameter storage function of picture storage; or query whether the parameter storage function of picture storage is enabled.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

When this function is enabled, a TXT file with the same filename will also be stored when sending the :SAVE:IMAGe[:STARt] command to store the picture file. This file includes the model, serial number, hardware and software version numbers as well as the current parameter configurations of the oscilloscope.

Return Format

The query returns 1 or 0.

:SAVE:SETup[:STARt]

Syntax

:SAVE:SETup[:STARt] {<internal_loc>|<file_spec>}

Description

Store the current parameter settings of the oscilloscope into the internal or external memory in "*.stp" format.

Parameter

Name	Type	Range	Default
<internal_loc>	ASCII string	C:\LocalSetup0.stp to C:\LocalSetup9.stp	--
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- In internal storage, if the specified location already contains a file, the original file will be overwritten.
- In external storage, <file_spec> includes the external storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:SETup D:\123.stp /*Store the current oscilloscope setting parameters into the external memory with the filename 123.stp*/

:SAVE:TRACe[:STARt]

Syntax

:SAVE:TRACe[:STARt] {<file_spec>}

Description

Store the waveform trace into the external memory in "*.trc" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

<file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:TRACe D:\123.trc /*Store the waveform trace into the external memory with the filename 123.trc*/

:SAVE:WAVeform[:STARt]

Syntax

:SAVE:WAVeform[:STARt] {<file_spec>}

Description

Store the waveform data into the external memory in "*.wfm" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

<file_spec> includes the file storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:WAVeform D:\123.wfm /*Store the waveform file into the external memory*/

:SAVE:REFerence[:STARt]

Syntax

:SAVE:REFerence[:STARt] {<internal_loc>|<file_spec>}

Description

Store the reference waveform currently stored by the oscilloscope into the internal or external memory in "*.ref" format.

Parameter

Name	Type	Range	Default
<internal_loc>	ASCII string	C:\LocalREF0.ref to C:\LocalREF9.ref	--
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- Before using this command to store the reference waveform file, send the :REFerence:SAVe command to store the reference waveform of the current reference channel; otherwise, this command is invalid.
- In internal storage, if the specified location already contains a file, the original file will be overwritten.
- In external storage, <file_spec> includes the external storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:REFerence C:\LocalREF3.ref /*Store the reference waveform currently stored by the oscilloscope into the internal memory*/

:SAVE:MTESt[:STARt]

Syntax

:SAVE:MTESt[:STARt] {<internal_loc>|<file_spec>}

Description

Store the current pass/fail test mask into the internal or external memory in "*.pf" format.

Parameter

Name	Type	Range	Default
<internal_loc>	ASCII string	C:\LocalPF0.pf to C:\LocalPF9.pf	--
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- This command is only available when the pass/fail test function is enabled (refer to :MASK:ENABle).
- In internal storage, if the specified location already contains a file, the original file will be overwritten.
- In external storage, <file_ spec> includes the external storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:MTESt C:\LocalPF3.pf /*Store the current pass/fail test mask into the internal memory*/

:SAVE:ARB[:STARt]

Syntax

:SAVE:ARB[:STARt] {<internal_loc>|<file_spec>}

Description

Store the arbitrary waveform currently edited into the internal or external memory in “*.arb” format.

Parameter

Name	Type	Range	Default
<internal_loc>	ASCII string	C:\LocalArb0.arb to C:\LocalArb9.arb	--
<file_spec>	ASCII string	Refer to the **Explanation**	--

Explanation

- In internal storage, if the specified location already contains a file, the original file will be overwritten.
- In external storage, <file_spec> includes the external storage directory and the filename with suffix. Its length cannot exceeds 64 characters. Wherein, the storage directory can only be D:\. If the specified directory already contains a file with the same filename, the original file will be overwritten.

Example

:SAVE:ARB C:\LocalArb3.arb /*Store the arbitrary waveform currently edited into the internal memory*/

:SOURce<n> Commands (For MSO2000A-S/DS2000A-S)

The [:SOURce<n>] commands are used to set the output waveforms and their parameters of the built-in signal source of the oscilloscope. <n> is the number of the channel (1 or 2) and the operation will be executed on Source1 by default if [:SOURce<n>] is omitted.

- [:SOURce<n>]:FREQuency[:FIXed]
- [:SOURce<n>]:PHASe[:ADJust]
- [:SOURce<n>]:PHASe:INITiate
- [:SOURce<n>]:FUNCtion[:SHAPe]
- [:SOURce<n>]:FUNCtion:RAMP:SYMMetry
- [:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude]
- [:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet
- [:SOURce<n>]:PULSe:DCYCle
- [:SOURce<n>]:MOD[:STATe]
- [:SOURce<n>]:MOD:TYPe
- [:SOURce<n>]:MOD:AM[:DEPTh]
- [:SOURce<n>]:MOD:AM:INTernal:FREQuency
- [:SOURce<n>]:MOD:AM:INTernal:FUNCtion
- [:SOURce<n>]:MOD:FM[:DEVIation]
- [:SOURce<n>]:MOD:FM:INTernal:FREQuency
- [:SOURce<n>]:MOD:FM:INTernal:FUNCtion
- [:SOURce<n>]:APPLy:NOISe
- [:SOURce<n>]:APPLy:PULSe
- [:SOURce<n>]:APPLy:RAMP
- [:SOURce<n>]:APPLy:SINusoid
- [:SOURce<n>]:APPLy:SQUare
- [:SOURce<n>]:APPLy:USER
- [:SOURce<n>]:APPLy?

[:SOURce<n>]:FREQuency[:FIXed]

Syntax

[:SOURce<n>]:FREQuency[:FIXed] {<frequency>|MINimum|MAXimum}
[:SOURce<n>]:FREQuency[:FIXed]? [MINimum|MAXimum]

Description

Set or query the output frequency of the specified signal source channel when the modulation of the specified signal source is not enabled; set or query the carrier frequency of the specified signal source channel when the modulation of the specified signal source is enabled. The default unit is Hz.

Parameter

Name	Type	Range	Default
<frequency>	Real	Sine: 100mHz to 25MHz Square: 100mHz to 15MHz Pulse: 100mHz to 1MHz Ramp: 100mHz to 100kHz Built-in waveform: 100mHz to 1MHz Arbitrary waveform: 100mHz to 10MHz	1kHz
<n>	Discrete	{1|2}	1

Explanation

This command is not available when the waveform currently selected is DC or noise.

Return Format

The query returns the frequency in scientific notation.

[:SOURce<n>]:PHASe[:ADJust]

Syntax

[:SOURce<n>]:PHASe[:ADJust] {<phase>|MINimum|MAXimum}
[:SOURce<n>]:PHASe[:ADJust]? [MINimum|MAXimum]

Description

Set or query the start phase of the signal of the specified signal source channel. The default unit is °.

Parameter

Name	Type	Range	Default
<phase>	Real	0° to 360°	0°
<n>	Discrete	{1|2}	1

Return Format

The query returns the start phase in scientific notation.

[:SOURce<n>]:PHASe:INITiate

Syntax

[:SOURce<n>]:PHASe:INITiate

Description

Execute the align phase operation.

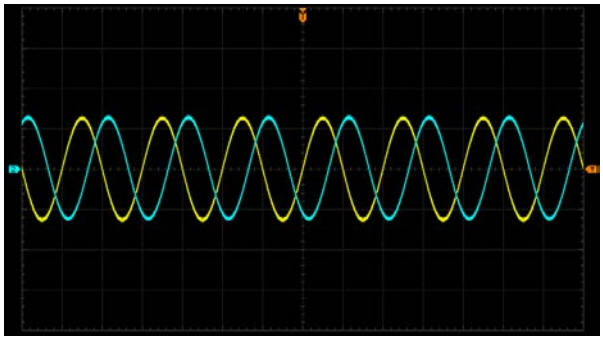
Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	1

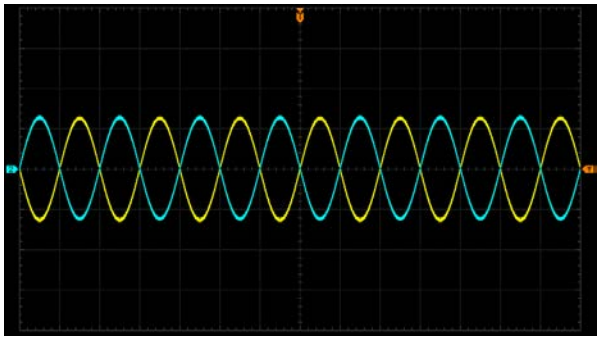
Explanation

When executing the align phase operation, the oscilloscope will re-configure the two channels to output according to the preset frequency and phase.

For two signals of which the frequencies are the same or are multiples, this operation can align their phases. Assume that Source1 outpts a 1kHz, 5Vpp and 0° sine and Source2 outputs a 1kHz, 5Vpp and 180° sine. Acquire the waveforms of the two channels using the oscilloscope and display the waveforms stably. The phase deviation of the two waveforms displayed on the oscilloscope is no longer 180°. At this point, execute the align phase operation; the phase deviation shown on the oscilloscope will restore to 180° without manual adjustment of the start phases of the signal source.



Before Align Phase



After Align Phase

[:SOURce<n>]:FUNCtion[:SHAPe]

Syntax

[:SOURce<n>]:FUNCtion[:SHAPe] <wave>

[:SOURce<n>]:FUNCtion[:SHAPe]?

Description

Set or query the output waveform when the modulation of the specified signal source channel is not enabled. Set or query the carrier waveform of modulation when the modulation of the specified signal source is channel enabled; at this point, if PULSe, NOISe or DC is selected, the modulation function will be disabled automatically.

Parameter

Name	Type	Range	Default
<wave>	Real	{SINusoid|SQUare|RAMP|PULSe|NOISe|DC|INTErnal|SINC|EXPRise|EXPFall|ECG|GAUSs|LORentz|HAVersine|EXTernal}	SINusoid
<n>	Discrete	{1|2}	1

Explanation

MSO2000A/DS2000A provides 7 kinds of built-in waveforms: SINC, EXPRise, EXPFall, ECG, GAUSs, LORentz and HAVersine. When INTErnal (built-in waveform) is sent, the signal source outputs the built-in waveform selected formerly. You can also directly send the specified built-in waveform parameter to output the desired built-in waveform.

Return Format

The query returns SIN, SQU, RAMP, PULS, NOIS, DC, SINC, EXPR, EXPF, ECG, GAUS, LOR, HAV or EXET.

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry

Syntax

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry {<val>|MINimum|MAXimum}

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry? [MINimum|MAXimum]

Description

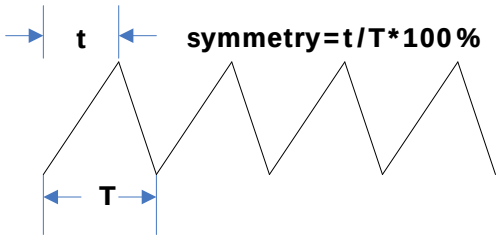
Set or query the symmetry of the ramp of the specified signal source channel.

Parameter

Name	Type	Range	Default
<val>	Real	0% to 100%	10%
<n>	Discrete	{1|2}	1

Explanation

Symmetry is defined as the percentage that the rising period takes up in the whole period.



Return Format

The query returns the current symmetry in scientific notation.

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

Syntax

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude] {<amplitude>|MINimum|MAXimum}

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude]? [MINimum|MAXimum]

Description

Set or query the amplitude of the signal of the specified signal source channel. The default unit is Vpp.

Parameter

Name	Type	Range	Default
<amplitude>	Real	HighZ: 20mVpp to 5Vpp 50Ω: 10mVpp to 2.5Vpp	5Vpp
<n>	Discrete	{1|2}	1

Explanation

You can use :OUTPut[<n>]:IMPedance command to set the output impedance of the signal source.

Return Format

The query returns the amplitude in scientific notation.

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet

Syntax

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet {<offset>|MINimum|MAXimum}

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet? [MINimum|MAXimum]

Description

Set or query the DC offset of the signal of the specified signal source channel. The default unit is V_{DC}.

Parameter

Name	Type	Range	Default
<offset>	Real	HighZ: -2.5+current amplitude/2 to 2.5- current amplitude /2 50Ω: -1.25+ current amplitude /2 to 1.25- current amplitude /2	$0V_{DC}$
<n>	Discrete	{1|2}	1

Explanation

- You can use the [:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude] command to set the amplitude of the waveform currently selected and use the :OUTPut[<n>]:IMPedance command to set the output impedance of the signal source.
- When the current waveform is DC, the offset range is from $-2.5V_{DC}$ to $2.5V_{DC}$.

Return Format

The query returns the DC offset in scientific notation.

[:SOURce<n>]:PULSe:DCYCle

Syntax

[:SOURce<n>]:PULSe:DCYCle {<percent>|MINimum|MAXimum}

[:SOURce<n>]:PULSe:DCYCle? [MINimum|MAXimum]

Description

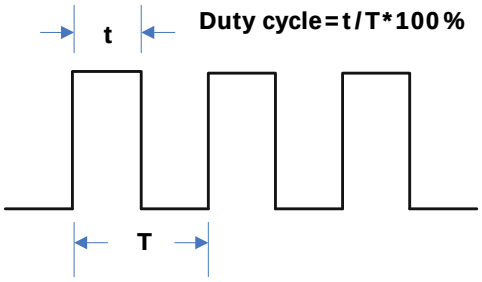
Set or query the duty cycle of the pulse of the specified signal source channel.

Parameter

Name	Type	Range	Default
<percent>	Real	10% to 90%	20%
<n>	Discrete	{1|2}	1

Explanation

Duty cycle is defined as the percent that the high level takes up in a whole period.



Return Format

The query returns the current duty cycle in scientific notation.

[:SOURce<n>]:MOD[:STATe]

Syntax

[:SOURce<n>]:MOD[:STATe] <bool>

[:SOURce<n>]:MOD[:STATe]?

Description

Enable or disable the modulation function of the specified signal source channel; or query the on/off status of the modulation function of the specified signal source channel.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF
<n>	Discrete	{1|2}	1

Explanation

- The signal source of MSO2000A/DS2000A supports AM (Amplitude Modulation) and FM (Frequency Modulation). You can send the [:SOURce<n>]:MOD:TYPe command to set the modulation type.
- Sine, square, ramp, built-in waveform and arbitrary waveform (except DC) can be used as carrier waveform.
- Sine, square, triangle waveform or noise can be used as modulating waveform. You can use the [:SOURce<n>]:MOD:AM:INTernal:FUNCtion or [:SOURce<n>]:MOD:FM:INTernal:FUNCtion command to select the modulating waveform.

Return Format

The query returns 1 or 0.

[:SOURce<n>]:MOD:TYPe

Syntax

[:SOURce<n>]:MOD:TYPe <type>

[:SOURce<n>]:MOD:TYPe?

Description

Set or query the modulation type of the specified signal source channel.

Parameter

Name	Type	Range	Default
<type>	Discrete	{AM|FM}	AM
<n>	Discrete	{1|2}	1

Explanation

- AM: amplitude modulation. The amplitude of the carrier varies with the amplitude of the modulating waveform.
  FM: frequency modulation . The frequency of the carrier varies with the amplitude of the modulating waveform.
- Sine, square, ramp, built-in waveform and arbitrary waveform (except DC) can be used as carrier waveform.
- Sine, square, triangle waveform or noise can be used as modulating waveform. You can use the [:SOURce<n>]:MOD:AM:INTernal:FUNCtion or [:SOURce<n>]:MOD:FM:INTernal:FUNCtion command to select the modulating waveform.

Return Format

The query returns AM or FM.

[:SOURce<n>]:MOD:AM[:DEPTh]

Syntax

[:SOURce<n>]:MOD:AM[:DEPTh] {<depth>|MINimum|MAXimum}

[:SOURce<n>]:MOD:AM[:DEPTh]? [MINimum|MAXimum]

Description

Set or query the modulation depth of AM of the specified signal source channel.

Parameter

Name	Type	Range	Default
<depth>	Integer	0% to 120%	100%
<n>	Discrete	{1|2}	1

Return Format

The query returns the current modulation depth in scientific notation.

[:SOURce<n>]:MOD:AM:INTernal:FREQuency

Syntax

[:SOURce<n>]:MOD:AM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}

[:SOURce<n>]:MOD:AM:INTernal:FREQuency? [MINimum|MAXimum]

Description

Set or query the modulating waveform frequency of AM of the specified signal source channel. The default unit is Hz.

Parameter

Name	Type	Range	Default
<frequency>	Real	1Hz to 50kHz	1kHz
<n>	Discrete	{1|2}	1

Return Format

The query returns the current modulating waveform frequency in scientific notation.

[:SOURce<n>]:MOD:AM:INTernal:FUNCtion

Syntax

[:SOURce<n>]:MOD:AM:INTernal:FUNCtion <wave>

[:SOURce<n>]:MOD:AM:INTernal:FUNCtion?

Description

Set or query the modulating waveform of AM of the specified signal source channel.

Parameter

Name	Type	Range	Default
<wave>	Discrete	{SINusoid|SQUare|TRIangle|NOISe}	SINusoid
<n>	Discrete	{1|2}	1

Return Format

The query returns SIN, SQU, TRI or NOIS.

[:SOURce<n>]:MOD:FM[:DEVIation]

Syntax

[:SOURce<n>]:MOD:FM[:DEVIation] {<dev>|MINimum|MAXimum}
[:SOURce<n>]:MOD:FM[:DEVIation]? [MINimum|MAXimum]

Description

Set or query the frequency deviation of FM of the specified signal source channel. The default unit is Hz.

Parameter

Name	Type	Range	Default
<dev>	Real	0Hz to the current frequency of the carrier waveform. The sum of the frequency deviation and carrier frequency cannot be greater than the sum of the upper limit of the carrier frequency and 1kHz.	1kHz
<n>	Discrete	{1|2}	1

Return Format

The query returns the current frequency deviation in scientific notation.

[:SOURce<n>]:MOD:FM:INTernal:FREQuency

Syntax

[:SOURce<n>]:MOD:FM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}
[:SOURce<n>]:MOD:FM:INTernal:FREQuency? [MINimum|MAXimum]

Description

Set or query the modulating waveform frequency of FM of the specified signal source channel. The default unit is Hz.

Parameter

Name	Type	Range	Default
<frequency>	Real	1Hz to 50kHz	1kHz
<n>	Discrete	{1|2}	1

Return Format

The query returns the current modulating waveform frequency in scientific notation.

[:SOURce<n>]:MOD:FM:INTernal:FUNCtion

Syntax

[:SOURce<n>]:MOD:FM:INTernal:FUNCtion <wave>

[:SOURce<n>]:MOD:FM:INTernal:FUNCtion?

Description

Set or query the modulating waveform of FM of the specified signal source channel.

Parameter

Name	Type	Range	Default
<wave>	Discrete	{SINusoid|SQUare|TRIangle|NOISe}	SINusoid
<n>	Discrete	{1|2}	1

Return Format

The query returns SIN, SQU, TRI or NOIS.

[:SOURce<n>]:APPLy:NOISe

[:SOURce<n>]:APPLy:PULSe

[:SOURce<n>]:APPLy:RAMP

[:SOURce<n>]:APPLy:SINusoid

[:SOURce<n>]:APPLy:SQUare

[:SOURce<n>]:APPLy:USER

Syntax

[:SOURce<n>]:APPLy:NOISe [<amp>[,<offset>]]
[:SOURce<n>]:APPLy:PULSe [<freq>[,<amp>[,<offset>[,<phase>]]]]
[:SOURce<n>]:APPLy:RAMP [<freq>[,<amp>[,<offset>[,<phase>]]]]
[:SOURce<n>]:APPLy:SINusoid [<freq>[,<amp>[,<offset>[,<phase>]]]]
[:SOURce<n>]:APPLy:SQUare [<freq>[,<amp>[,<offset>[,<phase>]]]]
[:SOURce<n>]:APPLy:USER [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description

Configure the specified signal source channel to output a signal with the specified waveform and parameters.

Parameter

Name	Type	Range	Default
<freq>	Real	Sine: 100mHz to 25MHz Square: 100mHz to 15MHz Ramp: 100mHz to 100kHz Pulse: 100mHz to 1MHz Arbitrary waveform: 100mHz to 10MHz	1kHz
<amp>	Real	HighZ: 20mVpp to 5Vpp 50Ω: 10mVpp to 2.5Vpp	5Vpp
<offset>	Real	HighZ: ±(2.5-current amplitude/2) 50Ω: ±(1.25-current amplitude /2)	$0V_{DC}$
<phase>	Real	0° to 360°	0°
<n>	Discrete	{1|2}	1

Explanation

- These commands are used to select the waveform shape.
  NOISe: noise
  PULSe: pulse
  RAMP: ramp

SINusoid: sine
SQUare: square
USER: arbitrary waveform

- <freq>: set the frequency of the specified waveform (noise does not have this parameter). The default unit is Hz.
  <amp>: set the amplitude of the specified waveform. The default unit is Vpp.
  <offset>: set the DC offset of the specified waveform. The default unit is V_{DC}.
  <phase>: set the start phase of the specified waveform (noise does not have this parameter). The default unit is degree (°).
- One or more parameters can be omitted for these commands. When all the parameters are omitted, these commands only configure the specified signal source channel to the specified waveform and do not modify the corresponding parameters.
- <freq>, <amp>, <offset> and <phase> are placed in order. You cannot omit the one parameter and directly set the parameters behind it. For example, you cannot omit <freq> and directly set <amp>.
- The ranges of <amp> and <offset> are related to the output impedance of the signal source channel. You can use the :OUTPut[<n>]:IMPedance command to set the output impedance of the signal source.

Example

:APPLy:NOISe	/*Set the waveform of Source1 to noise and do not modify the parameters*/
:APPLy:PULSe 100,1,0.5	/*Set Source1 to output a pulse with 100Hz frequency, 1Vpp amplitude and 500mV_{DC} offset*/
:SOURce2:APPLy:SINusoid 100,1,0.5,0	/*Set Source2 to output a sine with 100Hz frequency, 1Vpp amplitude, 500mV_{DC} offset and 0° start phase*/

[:SOURce<n>]:APPLy?

Syntax

[:SOURce<n>]:APPLy?

Description

Query the output configuration of the specified signal source channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	1

Return Format

The query returns the current output configuration in "<Waveform Name>,<Frequency>,<Amplitude>,<Offset>,<Start Phase>" format. When the corresponding parameter does not exist, the parameter will be replaced by DEF. For example, SIN,100000.000000,1.000000,0.000000,0.000000.

:SYSTem Commands

- :SYSTem:AOUTput
- :SYSTem:AUToscale
- :SYSTem:BEEPer
- :SYSTem:DATE
- :SYSTem:ERRor[:NEXT]?
- :SYSTem:EXPand
- :SYSTem:GAMount?
- :SYSTem:GPIB
- :SYSTem:KEY:PRESs
- :SYSTem:KEY:INCRease
- :SYSTem:KEY:DECRease
- :SYSTem:LANGuage
- :SYSTem:OPTion:INSTall
- :SYSTem:OPTion:UNINSTall
- :SYSTem:OPTion:VALid?
- :SYSTem:PON
- :SYSTem:PSTatus
- :SYSTem:RAMount?
- :SYSTem:RESet
- :SYSTem:SSAVer:TIME
- :SYSTem:SETup
- :SYSTem:TIME
- :SYSTem:UDEVice
- :SYSTem:VERSion?

:SYSTem:AOUTput

Syntax

:SYSTem:AOUTput <aux output>

:SYSTem:AOUTput?

Description

Set or query the type of the signal output from the **[Trigger Out]** connector at the rear panel.

Parameter

Name	Type	Range	Default
<aux output>	Discrete	{TOUT|PFAil}	TOUT

Explanation

- TOUT: output a signal that can reflect the current acquisition rate of the oscilloscope via the **[Trigger Out]** connector each time the oscilloscope triggers.
- PFAil: output a pulse via the **[Trigger Out]** connector when a failed waveform is detected. You can connect the signal to other control systems to view the test result.

Return Format

The query returns TOUT or PFA.

:SYSTem:AUToscale

Syntax

:SYSTem:AUToscale <opt>

:SYSTem:AUToscale?

Description

Disable or recover the AUTO function; or query the status of the AUTO function.

Parameter

Name	Type	Range	Default
<opt>	Bool	{{1|ON}|{0|OFF}}	1|ON

Explanation

By default, pressing **AUTO** or sending the :AUToscale command can execute a waveform auto setting operation. This command can be used to disable or recover this function.

- 0|OFF: disable the AUTO function
- 1|ON: recover the AUTO function

Return Format

The query returns 1 or 0.

:SYSTem:BEEPer

Syntax

:SYSTem:BEEPer <bool>

:SYSTem:BEEPer?

Description

Enable or disable the beeper; or query the status of the beeper.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:SYSTem:DATE

Syntax

:SYSTem:DATE <year>,<month>,<day>

:SYSTem:DATE?

Description

Set or query the system date.

Parameter

Name	Type	Range	Default
<year>	Integer	2011 to 2099	--
<month>	Integer	1 to 12	--
<day>	Integer	1 to 31 (28, 29 or 30)	--

Return Format

The query returns the current date in string. The year, month and date parameters are separated by commas.

:SYSTem:ERRor[:NEXT]?

Syntax

:SYSTem:ERRor[:NEXT]?

Description

Query and delete the last system error message.

Return Format

The query returns the error message in “<Message Number>,<Message Content>” format. Wherein, <Message Number> is an integer and <Message Content> is a double-quotated ASCII string. For example, -410,"Query INTERRUPTED".

:SYSTem:EXPand

Syntax

:SYSTem:EXPand <exp>

:SYSTem:EXPand?

Description

Set or query the reference around which the waveform is expanded or compressed.

Parameter

Name	Type	Range	Default
<exp>	Discrete	{CENTer|GROund}	GROund

Explanation

- CENTer: when changing the vertical scale, the oscilloscope expands or compresses the waveform vertically around the center of the screen.
- GROund: when changing the vertical scale, the oscilloscope expands and compresses the waveform vertically around the ground level.

Return Format

The query returns CENT or GRO.

:SYSTem:GAMount?

Syntax

:SYSTem:GAMount?

Description

Query the number of grids on the screen horizontally.

Return Format

The query returns the number of grids on the screen horizontally in integer. For this oscilloscope, the return value is always 14.

:SYSTem:GPIB

Syntax

:SYSTem:GPIB <adr>

:SYSTem:GPIB?

Description

Set or query the GPIB address.

Parameter

Name	Type	Range	Default
<adr>	Integer	1 to 30	--

Return Format

The query returns an integer between 1 and 30.

:SYSTem:KEY:PRESs

Syntax

:SYSTem:KEY:PRESs <key>

Description

Press the specified key at the front panel of the oscilloscope.

Parameter

Name	Type	Range	Default
<key>	Discrete	{CH1|CH2|MATH|REF|LA|DECode1|DECode2|AOFF|MOFF|F1|F2|F3|F4|F5|F6|F7|QPRevious|QNEXt|VPOSition|VPOSition1|VPOSition2|VSCale|VSCale1|VSCale2|HSCale|HPOSition|HMENu|KFUNction|TLEVel|TMENu|TFORce|TMODe|CLEar|AUTO|RSTop|SINGle|QPRInt|MEASure|ACQuire|STORage|CURSor|DISPlay|UTILity|HELP|SRECord|ERECord|PPAuse|FFP10|FFP20|FFP30|FFP40|FFP50|FFP60|FFP70|FFN10|FFN20|FFN30|FFN40|FFN50|FFN60|FFN70|SOURce}	--

Explanation

The ranges of <key> correspond to the keys at the front panel of the oscilloscope. The definitions are as follows.

- CH1|CH2|MATH|REF|LA|DECode1|DECode2|CLEar|AUTO|SINGle|MEASure|ACQuire|STORage|CURSor|DISPlay|UTILity|HELP|SOURce: press the corresponding key at the front panel.
- AOFF: turn off the analog channels and MATH channel.
- MOFF: hide or recover the display of the menu at the right of the screen.
- F1|F2|F3|F4|F5|F6|F7: press the 7 menu softkeys at the right of the screen.
- QPRevious|QNEXt: open the previous page or next page of the menu at the left of the screen.
- VPOSition|VPOSition1: press the CH1 vertical position knob; namely set the vertical position of CH1 to 0.
- VPOSition2: press the CH2 vertical position knob; namely set the vertical position of CH2 to 0.
- VSCale|VSCale1: press the CH1 vertical scale knob; namely switch between the coarse and fine adjustment of the CH1 vertical scale.
- VSCale2: press the CH2 vertical scale knob; namely switch between the coarse and fine adjustment of the CH2 vertical scale.
- HSCale: press the horizontal time base adjustment knob; namely turn on or off the sweep delay.
- HPOSition: press the horizontal position adjustment knob; namely set the horizontal position to 0.
- HMENu: press **MENU** in the horizontal control area.
- KFUNction: press the multifunction knob to set the waveform brightness to 50% (only valid when the menu at the right side of the screen is hidden or the **Display** menu is opened).
- TLEVel: press the trigger level adjustment knob; namely set the trigger level to 0.

- TMENu: press **MENU** in the trigger control area.
- TFORce: press **FORCE** in the trigger control area.
- TMODe: press **MODE** in the trigger control area.
- RSTop: press **RUN/STOP**.
- QPRInt: press the print key.
- SRECord|ERECord: start or stop recording waveforms.
- PPAuse: start, pause or resume the playback of the recorded waveform (only valid when waveforms are recorded).
- FFP10|FFP20|FFP30|FFP40|FFP50|FFP60|FFP70: rotate the outer layer of the navigation knob clockwise. The number in the paramerter denotes the rotation step. Larger number corresponds to faster rotating speed.
- FFN10|FFN20|FFN30|FFN40|FFN50|FFN60|FFN70: rotate the outer layer of the navigation knob counterclockwise. The number in the paramerter denotes the rotation step. Larger number corresponds to faster rotating speed.

:SYSTem:KEY:INCRease

:SYSTem:KEY:DECRease

Syntax

:SYSTem:KEY:INCRease <key>[,<val>]

:SYSTem:KEY:DECRease <key>[,<val>]

Description

Rotate the specified knob clockwise or counterclockwise.

Parameter

Name	Type	Range	Default
<key>	Discrete	{VPOSition|VPOSition1|VPOSition2| VSCale|VSCale1|VSCale2|HSCale|HPOSition| KFUNction|TLEVel|SFINd}	--
<val>	Integer	Determined by the range of the parameter corresponding to <key> and the current setting of the parameter	1

Explanation

- The values of <key> correspond to the knob at the front panel of the oscilloscope. The definitions are as follows.
  VPOSition|VPOSition1: CH1 vertical position adjustment knob.
  VPOSition2: CH2 vertical scale adjustment knob.
  VSCaLe| VSCaLe1: CH1 vertical scale adjustment knob.
  VSCaLe2: CH2 vertical scale adjustment knob.
  HSCale: horizontal time base adjustment knob.
  HPOSition: horizontal position adjustment knob.
  KFUNction: multifunction knob. It can be used to adjust the waveform brightness (only valid when the menu at the right side of the screen is hidden or the **Display** menu is opened).
  TLEVel: trigger level adjustment knob.
  SFINd: inner knob of the navigation knob.
- <val> defines the number of rotations of the specified knob. When the parameter is omitted, rotate the specified knob once.

:SYSTem:LANGuage

Syntax

:SYSTem:LANGuage <lang>

:SYSTem:LANGuage?

Description

Set or query the system language.

Parameter

Name	Type	Range	Default
<lang>	Discrete	{SCHinese|TCHinese|KORean|JAPanese|ENGLish|GERMan|PORTuguese|POLish}	--

Return Format

The query returns SCH, TCH, KOR, JAP, ENGL, GERM, PORT or POL.

:SYSTem:OPTion:INSTall

Syntax

:SYSTem:OPTion:INSTall <license>

Description

Install the option.

Explanation

<license> represents the serial number of the option (do not add space between characters).

Example

:SYSTem:OPTion:INSTall PDUY9N9QTS9PQSWPLAETRD3UJHYA

:SYSTem:OPTion:UNINSTall

Syntax

:SYSTem:OPTion:UNINSTall

Description

Unload all the options installed.

:SYSTem:OPTion:VALid?

Syntax

:SYSTem:OPTion:VALid? <module>

Description

Query the status of the options of the oscilloscope.

Parameter

Name	Type	Range	Default
<module>	Discrete	{TRIGger|DECode|CAN|MEMDepth}	--

Explanation

- TRIGger: advanced trigger option
- DECode: decoding option
- CAN: CAN protocol analysis option (include CAN trigger and CAN decoding)
- MEMDepth: deep memory depth option

Return Format

The query returns 0, 1, 2 or 3.

0: the option is not installed

1: the trial period of the option expires

2: original option is installed

3: valid trial option is installed

:SYSTem:PON

Syntax

:SYSTem:PON <power_on>

:SYSTem:PON?

Description

Set or query the configuration to be recalled when the oscilloscope is powered on after power-off.

Parameter

Name	Type	Range	Default
<power_on>	Discrete	{LATest|DEFault}	--

Explanation

- LATest: restore the oscilloscope to the setting at the last power-off.
- DEFault: restore the oscilloscope to the factory setting.

Return Format

The query returns LAT or DEF.

:SYSTem:PSTatus

Syntax

:SYSTem:PSTatus <sat>

:SYSTem:PSTatus?

Description

Set or query the power status of the oscilloscope.

Parameter

Name	Type	Range	Default
<sat>	Discrete	{DEFault|OPEN}	--

Explanation

- DEFault: you need to press the power key at the front panel to start the oscilloscope after the instrument is energized.
- OPEN: the oscilloscope starts directly after it is energized.

Return Format

The query returns DEF or OPEN.

:SYSTem:RAMount?

Syntax

:SYSTem:RAMount?

Description

Query the number of analog channels of the instrument.

Return Format

The query returns the number of analog channels of the instrument in integer. For this oscilloscope, the query always returns 2.

:SYSTem:RESet

Syntax

:SYSTem:RESet

Description

Power on the system again.

Explanation

This command is applicable to instrument with 1.0 version hardware or higher.

:SYSTem:SSAVer:TIME

Syntax

:SYSTem:SSAVer:TIME <time>
:SYSTem:SSAVer:TIME?

Description

Set or query the screen saver time.

Parameter

Name	Type	Range	Default
<time>	Discrete	{1MIN|2MIN|5MIN|15MIN|30MIN|45MIN|60MIN|2HOur|5HOur|OFF}	OFF

Explanation

After the oscilloscope enters idle state for the specified period of time, the screen saver program will be enabled. OFF denotes do not use the screen saver program.

Return Format

The query returns the screen saver time currently set or OFF.

:SYSTem:SETup

Syntax

:SYSTem:SETup <setup_data>
:SYSTem:SETup?

Description

Send or read the data of the system setup file.

Parameter

Name	Type	Range	Default
<setup_data>	Refer to the **Explanation**		

Explanation

When sending the command, <setup_data> is a binary data block. The data stream is added directly behind the command string to send the data in one operation.
When reading the data, make sure that the buffer is large enough to receive the data stream; otherwise, the program might be abnormal during the reading.

The data stream format: Stream Block Header ::= #NX...X is used to describe the length of the data stream. Wherein, # is the start denoter of the data stream. N is less than or equal to 9 and the N figures following it denotes the length (number of bytes) of the data stream. For example, #9000002493; wherein, N is 9 and 000002493 denotes that the length of the data stream is 2493byte.

:SYSTem:TIME

Syntax

:SYSTem:TIME <hours>,<minutes>,<seconds>

:SYSTem:TIME?

Description

Set or query the system time.

Parameter

Name	Type	Range	Default
<hours>	Integer	0 to 23	--
<minutes>	Integer	0 to 59	--
<seconds>	Integer	0 to 59	--

Return Format

The query returns the current time in string.

Note: There is a certain delay between the return time and the set time because of the command response time and other consideration.

:SYSTem:UDEVice

Syntax

:SYSTem:UDEVice <udv>

:SYSTem:UDEVice?

Description

Set or query the type of the device connected to the USB Device interface.

Parameter

Name	Type	Range	Default
<udv>	Discrete	{COMPuter|PICTbridge}	COMPuter

Explanation

The oscilloscope can communicate with a PC or PictBridge printer via the USB Device interface at the rear panel.

Return Format

The query returns COMP.

When PICTbridge is selected, the PC cannot communicate with the instrument; therefore, the query command cannot be used.

:SYSTem:VERSion?

Syntax

:SYSTem:VERSion?

Description

Query the SCPI version number of the oscilloscope.

Return Format

The query always returns 1999.0.

:TIMebase Commands

- :TIMebase:DELay:ENABle
- :TIMebase:DELay:OFFSet
- :TIMebase:DELay:SCALe
- :TIMebase[:MAIN]:OFFSet
- :TIMebase[:MAIN]:SCALe
- :TIMebase:HREF:MODE
- :TIMebase:HREF:POSition
- :TIMebase:MODE
- :TIMebase:VERNier

:TIMebase:DELay:ENABle

Syntax

:TIMebase:DELay:ENABle <bool>

:TIMebase:DELay:ENABle?

Description

Enable or disable the delayed sweep mode; or query the current status of the delayed sweep mode.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:TIMebase:DELay:OFFSet

Syntax

:TIMebase:DELay:OFFSet <offset>

:TIMebase:DELay:OFFSet?

Description

Set or query the horizontal offset of the delayed sweep and the unit is s.

Parameter

Name	Type	Range	Default
<offset>	Real	-(LeftTime-DelayRange/2) to (RightTime-DelayRange/2)	0

Note:

LeftTime=7×MainScale-MainOffset. For the MainScale, refer to the :TIMebase[:MAIN]:SCALe command.

RightTime=7×MainScale+MainOffset. For the MainOffset, refer to the :TIMebase[:MAIN]:OFFSet command.

DelayRange=14×DelayScale. For the DelayScale, refer to the :TIMebase:DELay:SCALe command.

Return Format

The query returns the horizontal offset of the delayed sweep in scientific notation.

:TIMebase:DELay:SCALe

Syntax

:TIMebase:DELay:SCALe <scale_value>

:TIMebase:DELay:SCALe?

Description

Set or query the delayed sweep time base and the unit is s/div.

Parameter

Name	Type	Range	Default
<scale_value>	Real	(1×50/real-time sample rate)×1/40 to the current main time base	500ns/div

Note: For the main time base, refer to the :TIMebase[:MAIN]:SCALe command.

Return Format

The query returns the delayed sweep time base in scientific notation.

:TIMebase[:MAIN]:OFFSet

Syntax

:TIMebase[:MAIN]:OFFSet <offset>

:TIMebase[:MAIN]:OFFSet?

Description

Set or query the horizontal offset of the main time base and the unit is s.

Parameter

Name	Type	Range	Default
<offset>	Real	RUN: When TimeScale is lower than 10ms: -MemDepth/SamplingRate to 1s TimeScale is greater than or equal to 10ms: -MemDepth/SamplingRate to 100×TimeScale STOP: -7000s to 7000s ROLL RUN: not available ROLL STOP: -7000s to 0	0

Note:

For the MemDepth, refer to the :ACQuire:MDEPth command.

For the SamplingRate, refer to the :ACQuire:SRATe? command.

For the TimeScale, refer to the :TIMebase[:MAIN]:SCALe command.

Return Format

The query returns the horizontal offset of the main time base in the scientific notation.

:TIMebase[:MAIN]:SCALe

Syntax

:TIMebase[:MAIN]:SCALe <scale_value>

:TIMebase[:MAIN]:SCALe?

Description

Set or query the main time base and the unit is s/div.

Parameter

Name	Type	Range	Default
<scale_value>	Real	The range differs for different mode[1]: Normal: 1ns[2] to 1ks ROLL: 200ms to 1ks	1us/div

Note[1]: Refer to the :TIMebase:MODE command.

Note[2]: This value is different for different model. For MSO2202A/DS2202A/MSO2202A-S/DS2202A-S, it is 2ns. For MSO2102A/DS2102A/MSO2102A-S/DS2102A-S and MSO2072A/DS2072A/MSO2072A-S/DS2072A-S, it is 5ns.

Return Format

The query returns the main time base in scientific notation.

:TIMebase:HREF:MODE

Syntax

:TIMebase:HREF:MODE <href>

:TIMebase:HREF:MODE?

Description

Set or query the horizontal reference mode; namely the refrence position of the horizontal expansion and compression of the screen waveform.

Parameter

Name	Type	Range	Default
<href>	Discrete	{CENTer|TPOSition|USER}	CENTer

Explanation

- CENTer: when changing the horizontal time base, the oscilloscope expands or compresses the waveform horizontally around the center of the screen.
- TPOSition: when changing the horizontal time base, the oscilloscope expands or compresses the waveform horizontally around the trigger position.
- USER: when changing the horizontal time base, the oscilloscope expands or compresses the waveform horizontally around the user-defined reference position. Refer to the :TIMebase:HREF:POSition command.

Return Format

The query returns CENT, TPOS or USER.

:TIMebase:HREF:POSition

Syntax

:TIMebase:HREF:POSition <pos>

:TIMebase:HREF:POSition?

Description

Set or query the user-defined reference position around which the waveform is expanded or compressed horizontally.

Parameter

Name	Type	Range	Default
<pos>	Integer	-350 to 350	0

Return Format

The query returns the user-defined reference position in integer.

:TIMebase:MODE

Syntax

:TIMebase:MODE <mode>

:TIMebase:MODE?

Description

Set or query the horizontal time base mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{MAIN|XY|ROLL}	MAIN

Return Format

The query returns MAIN, XY or ROLL.

:TIMebase:VERNier

Syntax

:TIMebase:VERNier <bool>

:TIMebase:VERNier?

Description

Enable or disable the fine adjustment of the horizontal scale; or query the current status of the fine adjustment of the horizontal scale.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Return Format

The query returns 1 or 0.

:TRACe<n> Commands (For MSO2000A-S/DS2000A-S)

The [:TRACe<n>] commands are used to set the arbitrary waveform related parameters of the built-in signal source. <n> denotes the corresponding built-in signal source channels and can be 1 or 2. When [:TRACe<n>] is omitted, the operation is applied to Source1 by default.

- [:TRACe<n>]:DATA
- [:TRACe<n>]:DATA:DAC16
- [:TRACe<n>]:DATA:DAC
- [:TRACe<n>]:DATA:LOAD?
- [:TRACe<n>]:DATA:POINts
- [:TRACe<n>]:DATA:POINts:INTerpolate
- [:TRACe<n>]:DATA:VALue

[:TRACe<n>]:DATA

Syntax

[:TRACe<n>]:DATA VOLATILE,<value>,<value> [,<value>[,<value>...]]

Description

Download the floating point voltage values to the volatile memory of the specified signal source.

Parameter

Name	Type	Range	Default
<value>	Real	-1 to 1	--
<n>	Discrete	{1|2}	1

Explanation

- <value> denotes the floating point voltage values. -1 and 1 correspond to the minimum and maximum values of the waveform amplitude respectively. For example, when the amplitude is 5Vpp and the offset is $0V_{DC}$, -1 corresponds to -2.5V and 1 corresponds to 2.5V. This command will overwrite the previous waveform in the volatile memory (no error will be generated).
- 2 to 16384 points can be downloaded each time.
- After sending this command, the specified signal source channel switches to volatile waveform output automatically. While at the same time, the number of initial points is modified. Users can edit the data downloaded using this command on the instrument.

Example

:DATA VOLATILE,0.25,-0.5 /*Download two floating point voltage values into the volatile memory of the source 1*/

[:TRACe<n>]:DATA:DAC16

Syntax

[:TRACe<n>]:DATA:DAC16 VOLATILE,<flag>,<binary_block_data>

Description

Download binary data block into the volatile memory of the specified signal source.

Parameter

Name	Type	Range	Default
<flag>	Discrete	{END}	--
<binary_block_data>	ASCII string	Refer to the **Explanation**	--
<n>	Discrete	{1|2}	1

Explanation

- This command consists of two parts: the command string ([:TRACe<n>]:DATA:DAC16 VOLATILE,<flag>) and the bianry data (<binary_block_data>).
- <flag> denotes the data transmission status and can only be set to END which denotes the data transmission finishes.
- <binary_block_data> denotes the binary data to be downloaded. The data length ranges from 4Bytes (2pts) to 32kBytes (16kpts). <binary_block_data> is a binary data block starts with #. For example, **#516384 binary data**; the number **5** behind **#** denotes that the data length information (**16384**) occupies 5 characters. **16384** denotes the number of bytes of the **binary data**. As each waveform point corresponds to two bytes of binary number (the range is from 0000 to 3FFF; 0000 and 3FFF correspond to the minimum and maximum values of the waveform amplitude respectively), the number of bytes must be an even number.
- When the data transmission completion denoter END is recieved, the instrument switches to arbitrary waveform output automatically.

[:TRACe<n>]:DATA:DAC

Syntax

[:TRACe<n>]:DATA:DAC VOLATILE, {<binary_block_data>|<value>,<value>[,<value>[,<value>...]]}

Description

Download binary data block or decimal DAC values to the volatile memory of the specified signal source.

Parameter

Name	Type	Range	Default
<binary_block_data>	ASCII string	Refer to the **Explanation**	--
<value>	Integer	0 to 16383	--
<n>	Discrete	{1|2}	1

Explanation

- <binary_block_data> denotes the binary data to be downloaded. The data length is from 4Bytes (2pts) to 32768Bytes (16kpts). <binary_block_data> is a binary data block starts with #. For example, **#516384 binary data**; the number **5** behind **#** denotes that the data length information (**16384**) occupies 5 characters. **16384** denotes the number of bytes of the **binary data**. As each waveform point corresponds to two bytes of binary number (the range is from 0000 to 3FFF; 0000 and 3FFF correspond to the minimum and maximum values of the waveform amplitude respectively), the number of bytes must be an even number.
- <value> denotes the decimal DAC values. 0 and 16383 correspond to the minimum and maximum values of the waveform amplitude respectively. For example, when the amplitude is 5Vpp and the offset is $0V_{DC}$, 0 corresponds to -2.5V and 16383 corresponds to 2.5V. The range of the number of waveform points is from 2pts to 16384pts. For example, 5 waveform point data are sent by the **:DATA:DAC VOLATILE,0,16383,8192,0,16383** command.
- After sending this command, the specified signal source channel switches to volatile waveform output automatically. While at the same time, the number of initial points is modified. Users can edit the data downloaded using this command on the instrument.

Example

:DATA:DAC VOLATILE,0,16383,8192,0,16383

[:TRACe<n>]:DATA:LOAD?

Syntax

[:TRACe<n>]:DATA:LOAD? 1

Description

Read the specified data packet in the volatile memory of the specified signal source.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2}	1

Return Format

The query returns a binary data block. The data block header is #9000032768 followed by 32768 bytes binary data.

[:TRACe<n>]:DATA:POINts

Syntax

[:TRACe<n>]:DATA:POINts VOLATILE, {<point>|MINimum|MAXimum}
[:TRACe<n>]:DATA:POINts? VOLATILE[,MINimum|MAXimum]

Description

Set or query the number of initial points of the arbitrary waveform of the specified signal source channel.

Parameter

Name	Type	Range	Default
<point>	Integer	1 to 16384	2
<n>	Discrete	{1|2}	1

Explanation

- This command sets the amplitudes of the initial points of the volatile waveform to 0μV automatically.
- After sending this command, you can use the [:TRACe<n>]:DATA:VALue command to modify the voltage of the specified point.

Return Format

The query returns an integer between 1 and 16384.

Example

:DATA:POINts VOLATILE,200

[:TRACe<n>]:DATA:POINts:INTerpolate

Syntax

[:TRACe<n>]:DATA:POINts:INTerpolate <mode>

[:TRACe<n>]:DATA:POINts:INTerpolate?

Description

Set or query the interpolation mode of the editable points of the arbitrary waveform of the specified signal source channel.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{LINear|OFF}	OFF
<n>	Discrete	{1|2}	1

Explanation

- LINear: linear interpolation. The waveform editor connects two adjacent editable points using a straight line.
- OFF: turn off linear interpolation. The waveform editor will keep a constant voltage level between two adjacent editable points and create a ladder-like waveform.

Return Format

The query returns LIN or OFF.

[:TRACe<n>]:DATA:VALue

Syntax

[:TRACe<n>]:DATA:VALue VOLATILE,<point>,<data>

[:TRACe<n>]:DATA:VALue? VOLATILE,<point>

Description

Modify or query the decimal value of the specified point in the volatile memory of the specified signal source.

Parameter

Name	Type	Range	Default
<point>	Integer	1 to the number of initial points	--
<data>	Integer	0 to 16383	--
<n>	Integer	{1|2}	1

Explanation

- This command is only valid when the current output is volatile waveform.
- The number of initial points can be set by the [:TRACe<n>]:DATA:POINts command.
- <data> denotes the decimal value. 0 and 16383 correspond to the minimum and maximum values of the waveform amplitude respectively. For example, when the amplitude is 5Vpp and the offset is $0V_{DC}$, 0 corresponds to -2.5V and 16383 corresponds to 2.5V.

Return Format

The query returns the decimal value of the specified point in the volatile memory of the specified signal source in integer.

Example

:DATA:VALue VOLATILE,200,500

:DATA:VALue? VOLATILE,200

:TRIGger Commands

- :TRIGger:COUPling
- :TRIGger:HOLDoff
- :TRIGger:MODE
- :TRIGger:NREJect
- :TRIGger:STATus?
- :TRIGger:SWEep
- :TRIGger:CAN (Option)
- :TRIGger:DELay (Option)
- :TRIGger:DURATion (Option)
- :TRIGger:EDGe
- :TRIGger:IIC
- :TRIGger:NEDGe (Option)
- :TRIGger:PATTern
- :TRIGger:PULSe
- :TRIGger:RS232
- :TRIGger:RUNT
- :TRIGger:SHOLd
- :TRIGger:SLOPe
- :TRIGger:SPI
- :TRIGger:TIMeout (Option)
- :TRIGger:USB (Option)
- :TRIGger:VIDeo (HDTV Option)
- :TRIGger:WINDows (Option)

:TRIGger:COUPling

Syntax

:TRIGger:COUPling <couple>

:TRIGger:COUPling?

Description

Set or query the trigger coupling mode.

Parameter

Name	Type	Range	Default
<couple>	Discrete	{DC|AC|LFReject|HFReject}	DC

Explanation

- DC: allow DC and AC components to pass through the trigger path.
  AC: block the DC components and attanuate signals lower than 75Hz.
  LFReject: block the DC components and reject the low frequency components (lower than 75kHz).
  HFReject: reject the high frequency components (higher than 75kHz).
- Trigger coupling is only valid in edge trigger.
- The trigger coupling setting is invalid when the trigger source is a digital channel.

Return Format

The query returns AC, DC, LFR or HFR.

:TRIGger:HOLDoff

Syntax

:TRIGger:HOLDoff <value>

:TRIGger:HOLDoff?

Description

Set or query the trigger holdoff time. The unit is s.

Parameter

Name	Type	Range	Default
<value>	Real	100ns to 10s	100ns

Explanation

This setting is not available for the Nth edge trigger, video trigger, timeout trigger, setup/hold trigger, RS232 trigger, I2C trigger, SPI trigger, USB trigger and CAN trigger.

Return Format

The query returns the trigger holdoff time in scientific notation.

:TRIGger:MODE

Syntax

:TRIGger:MODE <mode>

:TRIGger:MODE?

Description

Set or query the trigger type.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{EDGE|PULSe|RUNT|WIND|NEDG|SLOPe|VIDeo|PATTern|DELay|TIMeout|DURATion|SHOLd|RS232|IIC|SPI|USB|CAN }	EDGE

Return Format

The query returns EDGE, PULS, RUNT, WIND, NEDG, SLOP, VID, PATT, DEL, TIM, DURAT, SHOL, RS232, IIC, SPI, USB or CAN.

:TRIGger:NREJect

Syntax

:TRIGger:NREJect <bool>

:TRIGger:NREJect?

Description

Enable or disable noise rejection; or query the current status of noise rejection.

Parameter

Name	Type	Range	Default
<bool>	Bool	{{1|ON}|{0|OFF}}	0|OFF

Explanation

The noise rejection function is invalid when the trigger source is a digital channel.

Return Format

The query returns 1 or 0.

:TRIGger:STATus?

Syntax

:TRIGger:STATus?

Description

Query the current trigger status.

Return Format

The query returns TD, WAIT, RUN, AUTO or STOP.

:TRIGger:SWEep

Syntax

:TRIGger:SWEep <sweep>

:TRIGger:SWEep?

Description

Set or query the trigger mode.

Parameter

Name	Type	Range	Default
<sweep>	Discrete	{AUTO|NORMal|SINGle}	AUTO

Explanation

- **AUTO:**
  After this mode is selected, the oscilloscope starts searching for trigger signals that meet the specified condition. If trigger signals that meet the specified condition are found, “T’D” is displayed at the upper-left corner of the user interface and stable waveform is displayed. Otherwise, “AUTO” is displayed and unstable waveform is displayed.
- **NORMal:**
  After this mode is selected, the oscilloscope enters the wait-for-trigger state and starts searching for trigger signals that meet the specified condition. If trigger signals that meet the specified condition are found, “T’D” is displayed in the running status bar and stable waveform is displayed. Otherwise, “WAIT” is displayed and the waveform of the last trigger (there is a last trigger) or no waveform (there is not a last trigger) is displayed.
- **SINGle:**
  When this mode is selected, the backlight of **SINGLE** turns on. The oscilloscope enters the wait-for-trigger state and starts searching for trigger signals that meet the specified condition. If trigger signals that meet the specified condition are found, “T’D” is displayed in the running status bar and stable waveform is displayed. Then, the oscilloscope stops sweeping, the backlight of **RUN/STOP** turns on and “STOP” is displayed in the running status bar. Otherwise, “WAIT” is displayed in the running status bar and no waveform is displayed.

Return Format

The query returns AUTO, NORM or SING.

:TRIGger:CAN (Option)

- :TRIGger:CAN:BAUD
- :TRIGger:CAN:BUSer
- :TRIGger:CAN:SOURce
- :TRIGger:CAN:STYPe
- :TRIGger:CAN:WHEN
- :TRIGger:CAN:SPOint
- :TRIGger:CAN:FTYPe
- :TRIGger:CAN:LEVel

:TRIGger:CAN:BAUD

Syntax

:TRIGger:CAN:BAUD <baud_rate>

:TRIGger:CAN:BAUD?

Description

Set or query the signal rate of CAN trigger. The unit is b/s.

Parameter

Name	Type	Range	Default
<baud_rate>	Discrete	{10000|20000|33300|50000|62500|83300|100000|125000|250000|500000|800000|1000000|USER}	10000

Explanation

When USER is selected, you can use the :TRIGger:CAN:BUSer command to set the signal rate.

Return Format

The query returns the signal rate of CAN trigger in integer or returns USER.

:TRIGger:CAN:BUSer

Syntax

:TRIGger:CAN:BUSer <user baud>

:TRIGger:CAN:BUSer?

Description

Set or query the user-defined signal rate of CAN trigger. The unit is b/s.

Parameter

Name	Type	Range	Default
<user baud>	Integer	10000 to 1000000	50000

Return Format

The query returns the user-defined signal rate of CAN trigger in integer.

:TRIGger:CAN:SOURce

Syntax

:TRIGger:CAN:SOURce <source>

:TRIGger:CAN:SOURce?

Description

Set or query the trigger source of CAN trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:CAN:STYPe

Syntax

:TRIGger:CAN:STYPe <stype>

:TRIGger:CAN:STYPe?

Description

Set or query the signal type of CAN trigger.

Parameter

Name	Type	Range	Default
<stype>	Discrete	{RX|TX|H|L|DIFFerential}	RX

Return Format

The query returns RX, TX, H, L or DIFF.

:TRIGger:CAN:WHEN

Syntax

:TRIGger:CAN:WHEN <when>

:TRIGger:CAN:WHEN?

Description

Set or query the trigger condition of CAN trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{SOF|EOF|FTYPe|FERRor}	SOF

Note: When the trigger condition is set to FTYPe (frame type), you can use the :TRIGger:CAN:FTYPe command to specify the frame type.

Explanation

- SOF (start frame): trigger on the start frame of the data frame.
- EOF (end frame): trigger on the end frame of the data frame.
- FTYPe (frame type): trigger when the specified type of frame is detected.
- FERRor (error frame): trigger when the frame with the specified type of error is detected.

Return Format

The query returns SOF, EOF, FTYP or FERR.

:TRIGger:CAN:SPOint

Syntax

:TRIGger:CAN:SPOint <spo>

:TRIGger:CAN:SPOint?

Description

Set or query the sample point (expressed in percentage) of CAN trigger.

Parameter

Name	Type	Range	Default
<spo>	Integer	5 to 95	50

Return Format

The query returns the sample point of CAN trigger in integer.

:TRIGger:CAN:FTYPe

Syntax

:TRIGger:CAN:FTYPe <ftype>

:TRIGger:CAN:FTYPe?

Description

Set ro query the frame type of CAN trigger (when the trigger condition is FTYPe).

Parameter

Name	Type	Range	Default
<ftype>	Discrete	{DATA|REMote|ERRor|OVERload}	DATA

Explanation

When the CAN trigger condition is set to FTYPe (frame type) (:TRIGger:CAN:WHEN), you can use this command to set the oscilloscope to trigger when the specified type of frame is detected.

Return Format

The query returns DATA, REM, ERR or OVER.

:TRIGger:CAN:LEVel

Syntax

:TRIGger:CAN:LEVel <level>

:TRIGger:CAN:LEVel?

Description

Set or query the trigger level of CAN trigger when the trigger source is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the CAN trigger source, please refer to the :TRIGger:CAN:SOURce command.
- When the trigger source of CAN trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of CAN trigger.

Return Format

The query returns the trigger level of CAN trigger when the trigger source is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:DELay (Option)

- :TRIGger:DELay:SA
- :TRIGger:DELay:SB
- :TRIGger:DELay:SLOPA
- :TRIGger:DELay:SLOPB
- :TRIGger:DELay:TLOWer
- :TRIGger:DELay:TUPPer
- :TRIGger:DELay:TYPe

:TRIGger:DELay:SA
:TRIGger:DELay:SB

Syntax

:TRIGger:DELay:SA <SourceA>

:TRIGger:DELay:SA?

:TRIGger:DELay:SB <SourceB>

:TRIGger:DELay:SB?

Description

Set or query the trigger source of signal source A or B in delay trigger.

Parameter

Name	Type	Range	Default
<sourceA>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<sourceB>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:DELay:SLOPA
:TRIGger:DELay:SLOPB

Syntax

:TRIGger:DELay:SLOPA <slope>
:TRIGger:DELay:SLOPA?
:TRIGger:DELay:SLOPB <slope>
:TRIGger:DELay:SLOPB?

Description

Set or query the edge type of signal source A or B of delay trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative}	POSitive

Return Format

The query returns POS or NEG.

:TRIGger:DELay:TLOWer

Syntax

:TRIGger:DELay:TLOWer <tlower>
:TRIGger:DELay:TLOWer?

Description

Set or query the lower limit of the delay time in delay trigger.

Parameter

Name	Type	Range	Default
<tlower>	Real	When the delay type is GREater: 2ns to 4s When the delay type is GLESs or GOUT: 2ns to 3.99s	1us

Note: For the delay type of delay trigger, please refer to the :TRIGger:DELay:TYPe command.

Return Format

The query returns the lower limit of the delay time in delay trigger in scientific notation.

:TRIGger:DELay:TUPPer

Syntax

:TRIGger:DELay:TUPPer <tupper>

:TRIGger:DELay:TUPPer?

Description

Set or query the upper limit of the delay time in delay trigger.

Parameter

Name	Type	Range	Default
<tupper>	Real	When the delay type is LESS: 2ns to 4 s When the delay type is GLESs or GOUT: 12ns to 4s	2us

Note: For the delay type of delay trigger, please refer to the :TRIGger:DELay:TYPe command.

Return Format

The query returns the upper limit of the delay time in delay trigger in scientific notation.

:TRIGger:DELay:TYPe

Syntax

:TRIGger:DELay:TYPe <type>

:TRIGger:DELay:TYPe?

Description

Set or query the delay type of delay trigger.

Parameter

Name	Type	Range	Default
<type>	Discrete	{GREater|LESS|GLESs|GOUT}	GREater

Explanation

- GREater: trigger when the time difference (△T) between the specified edges of source A and source B is greater than the preset time limit.
- LESS: trigger when the time difference (△T) between the specified edges of source A and source B is lower than the preset time limit.
- GLESs: trigger when the time difference (△T) between the specified edges of source A and source B is greater than the preset time lower limit and lower than the preset time upper limit.
  Note: The time lower limit must be lower than the time upper limit.
- GOUT: trigger when the time difference (△T) between the specified edges of source A and source B is lower than the preset time lower limit or greater than the preset time upper limit.
  Note: The time lower limit must be lower than the time upper limit.

Return Format

The query returns GRE, LESS, GLES or GOUT.

:TRIGger:DURATion (Option)

- :TRIGger:DURATion:SOURce
- :TRIGger:DURATion:TLOWer
- :TRIGger:DURATion:TUPPer
- :TRIGger:DURATion:TYPe
- :TRIGger:DURAtion:WHEN

:TRIGger:DURATion:SOURce

Syntax

:TRIGger:DURATion:SOURce <source>
:TRIGger:DURATion:SOURce?

Description

Set or query the trigger source of duration trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:DURATion:TLOWer

Syntax

:TRIGger:DURATion:TLOWer <tlower>
:TRIGger:DURATion:TLOWer?

Description

Set or query the lower limit of the duration time in duration trigger. The unit is s.

Parameter

Name	Type	Range	Default
<tlower>	Real	When the trigger condition is GREater: 2ns to 4s When the trigger condition is GLESs: 2ns to 3.99s	1us

Note: For the trigger condition of duration trigger, please refer to the :TRIGger:DURAtion:WHEN command.

Return Format

The query returns the lower limit of the duration time in duration trigger in scientific notation.

:TRIGger:DURATion:TUPPer

Syntax

:TRIGger:DURATion:TUPPer <tupper>

:TRIGger:DURATion:TUPPer?

Description

Set or query the upper limit of the duration time in duration trigger. The unit is s.

Parameter

Name	Type	Range	Default
<tupper>	Real	When the trigger condition is LESS: 2ns to 4s When the trigger condition is GLESs: 12ns to 4s	2us

Note: For the trigger condition of duration trigger, please refer to the :TRIGger:DURATion:WHEN command.

Return Format

The query returns the upper limit of the duration time in duration trigger in scientific notation.

:TRIGger:DURATion:TYPe

Syntax

:TRIGger:DURATion:TYPe <pa_ch1>[,<pa_ch2>[,<pa_d0>...[,<pa_d15>]]]

:TRIGger:DURATion:TYPe?

Description

Set or query the pattern of each channel in duration trigger.

Parameter

Name	Type	Range	Default
<pa_ch1>	Discrete	{H,L,X}	X
<pa_ch2>	Discrete	{H,L,X}	X
<pa_d0>	Discrete	{H,L,X}	X
……	……	……	……
<pa_d15>	Discrete	{H,L,X}	X

Explanation

- The patterns consist of 2 analog channels and 16 digital channels.
- <pa_ch1> and <pa_ch2> set the patterns of analog channels CH1 and CH2. <pa_d0> to <pa_d15> set the patterns of digital channels D0 to D15. Users can send 18 parameters to set the patataerns of all the channels. Users can also omit some parameters to set the patterns of some of the channels (the pattern states of the channels of which the parameters are omitted remains unchanged), but at least one parameter (this parameter sets the pattern of CH1) should be sent. When the number of parameters sent is less than 18, the instrument sets the channels in CH1, CH2 and D0 to D15 order. No matter whether parameters are omitted, the query command returns the patterns currently set for all the channels (18).
- In the range of the parameter, H represents high level (higher than the threshold level of the channel). L represents low level (lower than the threshold level of the channel). X denotes that this channel is ignored (this channel is not used as a part of the pattern. When all the channels in the pattern are set to X, the oscilloscope will not trigger).
- Please distinguish “omit parameter” from “ignore channel”. The former means that the parameters corresponding to some channels are not sent when sending the command and the pattern states of these channels remain unchanged. The latter means that the channel is set to X when sending the command and the state of this channel is ignored when the instrument judges the patterns.

Return Format

The query returns the patterns of all the channels (18) in duration trigger.

Example

:TRIGger:DURATion:TYPe L,H /*Set the patterns of CH1 and CH2 to L and H respectively. The pattern states of D0 to D15 remain unchanged*/

:TRIGger:DURATion:TYPe? /*The query returns L,H,X,X,X,X,X,X,X,X,X,X,X,X,X,X,X,X*/

:TRIGger:DURATion:WHEN

Syntax

:TRIGger:DURATion:WHEN <when>

:TRIGger:DURATion:WHEN?

Description

Set or query the trigger condition in duration trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{GREater|LESS|GLESs}	GREater

Explanation

- GREater: you need to specify a time. The oscilloscope triggers when the duration of the pattern is greater than the preset time.
- LESS: you need to specify a time. The oscilloscope triggers when the duration of the pattern is lower than the preset time.
- GLESs: you need to specify an upper limit of the time and lower limit of the time. The oscilloscope triggers when the duration of the pattern is lower than the preset upper limit of the time and greater than the preset lower limit of the time.

Return Format

The query returns GRE, LESS or GLES.

:TRIGger:EDGe

- :TRIGger:EDGe:LEVel
- :TRIGger:EDGe:SLOPe
- :TRIGger:EDGe:SOURce

:TRIGger:EDGe:LEVel

Syntax

:TRIGger:EDGe:LEVel <level>
:TRIGger:EDGe:LEVel?

Description

Set or query the trigger level in edge trigger when the trigger source is CHANnel1, CHANnel2 or EXT. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	When the trigger source is CHANnel1 or CHANnel2: -5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet When the trigger source is EXT: -4V to 4V	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the trigger source of edge trigger, please refer to the :TRIGger:EDGe:SOURce command.
- When the trigger source of edge trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of edge trigger.
- When the trigger source of edge trigger is ACLine, you do not need to set this parameter.

Return Format

The query returns the trigger level in edge trigger when the trigger source is CHANnel1, CHANnel2 or EXT in scientific notation.

:TRIGger:EDGe:SLOPe

Syntax

:TRIGger:EDGe:SLOPe <slope>

:TRIGger:EDGe:SLOPe?

Description

Set or query the edge type in edge trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative|RFALI}	POSitive

Explanation

- POSitive: trigger on the rising edge of the input signal when the voltage level meets the preset trigger level.
- NEGative: trigger on the falling edge of the input signal when the voltage level meets the preset trigger level.
- RFALI: trigger on the rising or falling edge of the input signal when the voltage level meets the preset trigger level.

Return Format

The query returns POS, NEG or RFAL.

:TRIGger:EDGe:SOURce

Syntax

:TRIGger:EDGe:SOURce <src>

:TRIGger:EDGe:SOURce?

Description

Set or query the trigger source of edge trigger.

Parameter

Name	Type	Range	Default
<src>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2|EXT|ACLine}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2, EXT or ACL.

:TRIGger:IIC

- :TRIGger:IIC:ADDRess
- :TRIGger:IIC:AWIDth
- :TRIGger:IIC:CLEVel
- :TRIGger:IIC:DLEVel
- :TRIGger:IIC:DATA
- :TRIGger:IIC:DIRection
- :TRIGger:IIC:SCL
- :TRIGger:IIC:SDA
- :TRIGger:IIC:WHEN

:TRIGger:IIC:ADDRess

Syntax

:TRIGger:IIC:ADDRess <adr>

:TRIGger:IIC:ADDRess?

Description

Set or query the address value in I2C trigger when the trigger condition is Address or A&D.

Parameter

Name	Type	Range	Default
<adr>	Integer	0 to 2^n–1	1

Note: In the expression 2^n-1, n is the current address bits (refer to the :TRIGger:IIC:AWIDth command) and can be 7, 8 or 10. Therefore, the range of <adr> can be 0 to 127, 0 to 255 or 0 to 1023.

Explanation

To set the trigger condition of I2C trigger, refer to the :TRIGger:IIC:WHEN command.

Return Format

The query returns the address value in I2C trigger when the trigger condition is Address or A&D in integer.

:TRIGger:IIC:AWIDth

Syntax

:TRIGger:IIC:AWIDth <bits>

:TRIGger:IIC:AWIDth?

Description

Set or query the number of bits of the address in I2C trigger when the trigger condition is Address or A&D.

Parameter

Name	Type	Range	Default
<bits>	Discrete	{7|8|10}	7

Explanation

To set the trigger condition of I2C trigger, refer to the :TRIGger:IIC:WHEN command.

Return Format

The query returns 7, 8 or 10.

:TRIGger:IIC:CLEVel
:TRIGger:IIC:DLEVel

Syntax

:TRIGger:IIC:CLEVel <level>

:TRIGger:IIC:CLEVel?

:TRIGger:IIC:DLEVel <level>

:TRIGger:IIC:DLEVel?

Description

Set or query the trigger level in I2C trigger when the channel source of SCL or SDA is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the channel sources of SCL and SDA, please refer to the :TRIGger:IIC:SCL and :TRIGger:IIC:SDA commands respectively.
- When the channel source of SCL or SDA in I2C trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of the SCL or SDA channel source in I2C trigger.

Return Format

The query returns the trigger level in I2C trigger when the channel source of SCL or SDA is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:IIC:DATA

Syntax

:TRIGger:IIC:DATA <dat>

:TRIGger:IIC:DATA?

Description

Set or query the data value in I2C trigger when the trigger condition is Data or A&D.

Parameter

Name	Type	Range	Default
<dat>	Integer	Refer to **Explanation**	0

Explanation

- To set the trigger condition of I2C trigger, refer to the :TRIGger:IIC:WHEN command.
- The maximum range available for <dat> is from 0 to 2^{40}-1. The actual range available is related to the length of the data byte currently set (ByteLength; an integer from 1 to 5) and is from 0 to $2^{8*ByteLength}$-1.

Return Format

The query returns the data value in I2C trigger when the trigger condition is Data or A&D in integer.

:TRIGger:IIC:DIRection

Syntax

:TRIGger:IIC:DIRection <dir>

:TRIGger:IIC:DIRection?

Description

Set or query the data direction in I2C trigger when the trigger condition is Address or A&D.

Parameter

Name	Type	Range	Default
<dir>	Discrete	{READ|WRITe|RWRite}	READ

Explanation

To set trigger condition of I2C trigger, refer to the :TRIGger:IIC:WHEN command.

Return Format

The query returns READ, WRIT or RWR.

:TRIGger:IIC:SCL
:TRIGger:IIC:SDA

Syntax

:TRIGger:IIC:SCL <scl>

:TRIGger:IIC:SCL?

:TRIGger:IIC:SDA <sda>

:TRIGger:IIC:SDA?

Description

Set or query the SCL or SDA channel source in IIC trigger.

Parameter

Name	Type	Range	Default
<scl>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<sda>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:IIC:WHEN

Syntax

:TRIGger:IIC:WHEN <trig_type>

:TRIGger:IIC:WHEN?

Description

Set or query the trigger condition of I2C trigger.

Parameter

Name	Type	Range	Default
<trig_type>	Discrete	{STARt|RESTart|STOP|NACKnowledge|ADDRess|DATA|ADATa}	STARt

Explanation

- STARt: trigger when SDA data transitions from high level to low level while SCL is high level.
- RESTart: trigger when another start condition occurs before a stop condition.
- STOP: trigger when SDA data transitions from low level to high level while SCL is high level.
- NACKnowledge: trigger when the SDA data is high level during any acknowledgement of SCL clock position.
- ADDRess: the trigger searches for the specified address value and trigger on the read/write bit.
- DATA: the trigger searches for the specified data value on the SDA and trigger on th SCL jumping edge of the last bit of the data.
- ADATa: search for the specified address and data values at the same time and trigger when the “Address” and “Data” conditions are met at the same time.

Return Format

The query returns STAR, REST, STOP, NACK, ADDR, DATA or ADAT.

:TRIGger:NEDGe (Option)

- :TRIGger:NEDGe:EDGE
- :TRIGger:NEDGe:IDLE
- :TRIGger:NEDGe:LEVel
- :TRIGger:NEDGe:SLOPe
- :TRIGger:NEDGe:SOURce

:TRIGger:NEDGe:EDGE

Syntax

:TRIGger:NEDGe:EDGE <NR1>

:TRIGger:NEDGe:EDGE?

Description

Set or query the edge number of Nth edge trigger.

Parameter

Name	Type	Range	Default
<NR1>	Integer	1 to 65535	2

Return Format

The query returns an integer between 1 and 65535.

:TRIGger:NEDGe:IDLE

Syntax

:TRIGger:NEDGe:IDLE <NR3>

:TRIGger:NEDGe:IDLE?

Description

Set or query the idle time of Nth edge trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	16ns to 4s	100ns

Return Format

The query returns the idle time value in scientific notation.

:TRIGger:NEDGe:LEVel

Syntax

:TRIGger:NEDGe:LEVel <level>

:TRIGger:NEDGe:LEVel?

Description

Set or query the trigger level in Nth edge trigger when the trigger source is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the trigger source of Nth edge trigger, please refer to the :TRIGger:NEDGe:SOURce command.
- When the trigger source of Nth edge trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of Nth edge trigger.

Return Format

The query returns the trigger level in Nth edge trigger when the trigger source is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:NEDGe:SLOPe

Syntax

:TRIGger:NEDGe:SLOPe <slope>

:TRIGger:NEDGe:SLOPe?

Description

Set or query the edge type of Nth edge trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative}	POSitive

Return Format

The query returns POSitive or NEGative.

:TRIGger:NEDGe:SOURce

Syntax

:TRIGger:NEDGe:SOURce <source>

:TRIGger:NEDGe:SOURce?

Description

Set or query the trigger source of Nth egde trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:PATTern

- :TRIGger:PATTern:LEVel
- :TRIGger:PATTern:PATTern
- :TRIGger:PATTern:SOURce

:TRIGger:PATTern:LEVel

Syntax

:TRIGger:PATTern:LEVel <chan>,<level>

:TRIGger:PATTern:LEVel? <chan>

Description

Set or query the trigger level of CHANnel1 or CHANnel2 in pattern trigger. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1|CHANnel2}	CHANnel1
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

If needed, please use the :LA:POD<n>:THReshold command to set or query the threshold levels of the digital channels in pattern trigger.

Return Format

The query returns the trigger level of CHANnel1 or CHANnel2 in pattern trigger in scientific notation.

:TRIGger:PATTern:PATTern

Syntax

:TRIGger:PATTern:PATTern <pa_ch1>[,<pa_ch2>[,<pa_d0>...[,<pa_d15>]]]
:TRIGger:PATTern:PATTern?

Description

Set or query the pattern of each channel in pattern trigger.

Parameter

Name	Type	Range	Default
<pa_ch1>	Discrete	{H,L,X,R,F}	X
<pa_ch2>	Discrete	{H,L,X,R,F}	X
<pa_la0>	Discrete	{H,L,X,R,F}	X
……	……	……	……
<pa_la15>	Discrete	{H,L,X,R,F}	X

Explanation

- The patterns consist of 2 analog channels and 16 digital channels.
- <pa_ch1> and <pa_ch2> set the patterns of analog channels CH1 and CH2. <pa_d0> to <pa_d15> set the patterns of digital channels D0 to D15. Users can send 18 parameters to set the patataerns of all the channels. Users can also omit some parameters to set the patterns of some of the channels (the pattern states of the channels of which the parameters are omitted remains unchanged), but at least one parameter (this parameter sets the pattern of CH1) should be sent. When the number of parameters sent is less than 18, the instrument sets the channels in CH1, CH2 and D0 to D15 order. No matter whether parameters are omitted, the query command returns the patterns currently set for all the channels (18).
- H: high level (higher than the threshold level of the channel).
  L: low level (lower than the threshold level of the channel).
  X: ignore this channel (this channel is not used as a part of the pattern). When all the channels in the pattern are set to X, the oscilloscope will not trigger.
  R, F: rising edge, falling edge. In the pattern, you cannot specify multiple channels as rising edge or falling edge at the same time. If an edge item is already defined and then another edge item is defined in another channel in the pattern, the edge item defined formerly will be replaced by X).
- Please distinguish “omit parameter” from “ignore channel”. The former means that the parameters corresponding to some channels are not sent when sending the command and the pattern states of these channels remain unchanged. The latter means that the channel is set to X when sending the command and the state of this channel is ignored when the instrument judges the patterns.

Return Format

The query returns the patterns of all the channels (18).

Example

```
:TRIGger:PATTern:PATTern H,R    /*Set the patterns of CH1 and CH2 to H and R respectively. The
                                  pattern states of D0 to D15 remain unchanged*/
:TRIGger:PATTern:PATTern?       /*The query returns H,R,X,X,X,X,X,X,X,X,X,X,X,X,X,X,X,X*/
```

:TRIGger:PATTern:SOURce

Syntax

:TRIGger:PATTern:SOURce <source>

:TRIGger:PATTern:SOURce?

Description

Set or query the trigger source of pattern trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:PULSe

- :TRIGger:PULSe:LEVel
- :TRIGger:PULSe:LWIDth
- :TRIGger:PULSe:SOURce
- :TRIGger:PULSe:UWIDth
- :TRIGger:PULSe:WHEN

:TRIGger:PULSe:LEVel

Syntax

:TRIGger:PULSe:LEVel <level>

:TRIGger:PULSe:LEVel?

Description

Set or query the trigger level in pulse trigger when the trigger source is CHANnel1, CHANnel2 or EXT. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	When the trigger source is CHANnel1 or CHANnel2: -5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet When the trigger source is EXT: -4V to 4V	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the trigger source of pulse trigger, please refer to the :TRIGger:PULSe:SOURce command.
- When the trigger source of pulse trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of pulse trigger.

Return Format

The query returns the trigger level in pulse trigger when the trigger source is CHANnel1, CHANnel2 or EXT in scientific notation.

:TRIGger:PULSe:LWIDth

Syntax

:TRIGger:PULSe:LWIDth <width>

:TRIGger:PULSe:LWIDth?

Description

Set or query the lower limit of the pulse width in pulse trigger. The unit is s.

Parameter

Name	Type	Range	Default
<width>	Real	When the trigger condition is PGReater or NGReater: 2ns to 4s When the trigger condition is PGLess or NGLess: 2ns to 3.99s	1us

Note: For the trigger condition of pulse trigger, please refer to the :TRIGger:PULSe:WHEN command.

Return Format

The query returns the lower limit of the pulse width in pulse trigger in scientific notation.

:TRIGger:PULSe:SOURce

Syntax

:TRIGger:PULSe:SOURce <source>

:TRIGger:PULSe:SOURce?

Description

Set or query the trigger source in pulse trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11 |D12|D13|D14|D15|CHANnel1|CHANnel2|EXT}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1, CHAN2 or EXT.

:TRIGger:PULSe:UWIDth

Syntax

:TRIGger:PULSe:UWIDth <width>

:TRIGger:PULSe:UWIDth?

Description

Set or query the upper limit of the pulse width in pulse trigger. The unit is s.

Parameter

Name	Type	Range	Default
<width>	Real	When the trigger condition is PLESs or NLESs: 2ns to 4s When the trigger condition is PGLess or NGLess: 10ns to 4s	2us

Note: For the trigger condition of pulse trigger, please refer to the :TRIGger:PULSe:WHEN command.

Return Format

The query returns the upper limit of the pulse width in pulse trigger in scientific notation.

:TRIGger:PULSe:WHEN

Syntax

:TRIGger:PULSe:WHEN <when>

:TRIGger:PULSe:WHEN?

Description

Set or query the trigger condition of pulse trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{PGReater|PLESs|NGReater|NLESs|PGLess|NGLess}	PGReater

Explanation

- PGReater: you need to specify a pulse width (refer to the :TRIGger:PULSe:LWIDth command). The oscilloscope triggers when the positive pulse width of the input signal is greater than the specified pulse width.
- PLESs: you need to specify a pulse width (refer to the :TRIGger:PULSe:UWIDth command). The oscilloscope triggers when the positive pulse width of the input signal is lower than the specified pulse width.
- NGReater: you need to specify a pulse width (refer to the :TRIGger:PULSe:LWIDth command). The oscilloscope triggers when the negative pulse width of the input signal is greater than the specified pulse width.
- NLESs: you need to specify a pulse width (refer to the :TRIGger:PULSe:UWIDth command). The oscilloscope triggers when the negative pulse width of the input signal is lower than the specified pulse width.
- PGLess: you need to specify an upper (refer to the :TRIGger:PULSe:UWIDth command) and a lower (refer to the :TRIGger:PULSe:LWIDth command) pulse width. The oscilloscope triggers when the positive pulse width of the input signal is greater than the specified lower pulse width and lower than the upper pulse width.
- NGLess: you need to specify an upper (refer to the :TRIGger:PULSe:UWIDth command) and a lower (refer to the :TRIGger:PULSe:LWIDth command) pulse width. The oscilloscope triggers when the negative pulse width of the input signal is greater than the specified lower pulse width and lower than the upper pulse width.

Return Format

The query returns PGR, PLES, NGR, NLES, PGL or NGL.

:TRIGger:RS232

- :TRIGger:RS232:BAUD
- :TRIGger:RS232:BUSer
- :TRIGger:RS232:DATA
- :TRIGger:RS232:LEVel
- :TRIGger:RS232:PARity
- :TRIGger:RS232:SOURce
- :TRIGger:RS232:STOP
- :TRIGger:RS232:WHEN
- :TRIGger:RS232:WIDTh

:TRIGger:RS232:BAUD

Syntax

:TRIGger:RS232:BAUD <baud_rate>

:TRIGger:RS232:BAUD?

Description

Set or query the baud rate in RS232 trigger. The unit is bps.

Parameter

Name	Type	Range	Default
<baud_rate>	Discrete	{2400|4800|9600|19200|38400|57600|115200|USER}	9600

Explanation

When USER is selected, use the :TRIGger:RS232:BUSer comamnd to set the baud rate.

Return Format

The query returns the baud rate currently set.

:TRIGger:RS232:BUSer

Syntax

:TRIGger:RS232:BUSer <user baud>

:TRIGger:RS232:BUSer?

Description

Set or query the user-defined baud rate in RS232 trigger. The unit is bps.

Parameter

Name	Type	Range	Default
<user baud>	Integer	110 to 20000000	9600

Return Format

The query returns the user-defined baud rate.

:TRIGger:RS232:DATA

Syntax

:TRIGger:RS232:DATA <data>

:TRIGger:RS232:DATA?

Description

Set or query the data value in RS232 trigger when the trigger condition is Data.

Parameter

Name	Type	Range	Default
<data>	Integer	0 to 2^n-1	70

Note: In the expression 2^n-1, n is the current data bits (refer to the :TRIGger:RS232:WIDTh command).

Explanation

To set the trigger condition of RS232 trigger, refer to the :TRIGger:RS232:WHEN command.

Return Format

The query returns the data value in RS232 trigger when the trigger condition is Data in integer.

:TRIGger:RS232:LEVel

Syntax

:TRIGger:RS232:LEVel <level>
:TRIGger:RS232:LEVel?

Description

Set or query the trigger level in RS232 trigger when the trigger source is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the trigger source of RS232 trigger, please refer to the :TRIGger:RS232:SOURce command.
- When the trigger source of RS232 trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of RS232 trigger.

Return Format

The query returns the trigger level in RS232 trigger when the trigger source is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:RS232:PARity

Syntax

:TRIGger:RS232:PARity <parity>
:TRIGger:RS232:PARity?

Description

Set or query the even-odd check mode in RS232 trigger when the trigger condition is Error or Check Error.

Parameter

Name	Type	Range	Default
<parity>	Discrete	{EVEN|ODD|NONE}	NONE

Note: The even-odd check mode can not be set to NONE when the trigger condition is Check Error.

Explanation

To set the trigger condition of RS232 trigger, refer to the :TRIGger:RS232:WHEN command.

Return Format

The query returns EVEN, ODD or NONE.

:TRIGger:RS232:SOURce

Syntax

:TRIGger:RS232:SOURce <source>

:TRIGger:RS232:SOURce?

Description

Set or query the trigger source of RS232 trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:RS232:STOP

Syntax

:TRIGger:RS232:STOP <bit>

:TRIGger:RS232:STOP?

Description

Set or query the stop bit in RS232 trigger when the trigger condition is Error.

Parameter

Name	Type	Range	Default
<bit>	Discrete	{1|2}	1

Explanation

To set the trigger condition of RS232 trigger, refer to the :TRIGger:RS232:WHEN command.

Return Format

The query returns 1 or 2.

:TRIGger:RS232:WHEN

Syntax

:TRIGger:RS232:WHEN <when>

:TRIGger:RS232:WHEN?

Description

Set or query the trigger condition of RS232 trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{STARt|ERRor|PARity|DATA}	STARt

Explanation

- STARt: trigger on the start frame position.
- ERRor: trigger when error frame is detected.
- PARity: trigger when check error is detected.
- DATA: trigger on the last bit of the preset data bits and even-odd check bits.

Return Format

The query returns STAR, ERR, PAR or DATA.

:TRIGger:RS232:WIDTh

Syntax

:TRIGger:RS232:WIDTh <width>

:TRIGger:RS232:WIDTh?

Description

Set or query the data bits in RS232 trigger when the trigger condition is Data.

Parameter

Name	Type	Range	Default
<width>	Discrete	{5|6|7|8}	8

Explanation

To set the trigger condition of RS232 trigger, refer to the :TRIGger:RS232:WHEN command.

Return Format

The query returns 5, 6, 7 or 8.

:TRIGger:RUNT

- :TRIGger:RUNT:ALEVel
- :TRIGger:RUNT:BLEVel
- :TRIGger:RUNT:SOURce
- :TRIGger:RUNT:POLarity
- :TRIGger:RUNT:WHEN
- :TRIGger:RUNT:WLOWer
- :TRIGger:RUNT:WUPPer

:TRIGger:RUNT:ALEVel
:TRIGger:RUNT:BLEVel

Syntax

:TRIGger:RUNT:ALEVel <alevel>

:TRIGger:RUNT:ALEVel?

:TRIGger:RUNT:BLEVel <blevel>

:TRIGger:RUNT:BLEVel?

Description

Set or query the upper limit or lower limit of the trigger level in runt trigger. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<alevel>	Real	-4.98×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	1
<blevel>	Real	-5×VerticalScale–OFFSet to +4.98×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Return Format

The query returns the upper limit or lower limit of the trigger level in runt trigger in scientific notation.

:TRIGger:RUNT:SOURce

Syntax

:TRIGger:RUNT:SOURce <source>

:TRIGger:RUNT:SOURce?

Description

Set or query the trigger source of runt trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:TRIGger:RUNT:POLarity

Syntax

:TRIGger:RUNT:POLarity <polarity>

:TRIGger:RUNT:POLarity?

Description

Set or query the pulse polarity of runt trigger.

Parameter

Name	Type	Range	Default
<polarity>	Discrete	{POSitive|NEGative}	POSitive

Explanation

- POSitive: trigger on the positive runt pulse.
- NEGative: trigger on the negative runt pulse.

Return Format

The query returns POS or NEG.

:TRIGger:RUNT:WHEN

Syntax

:TRIGger:RUNT:WHEN <when>

:TRIGger:RUNT:WHEN?

Description

Set or query the qualifier of runt trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{NONE|GREater|LESS|GLESs}	NONE

Explanation

- NONE: do not set the trigger condition of runt trigger.
- GREater: trigger when the runt pulse width is greater than the lower limit of pulse width (refer to the :TRIGger:RUNT:WLOWer command).
- LESS: trigger when the runt pulse width is lower than the upper limit of pulse width (refer to the :TRIGger:RUNT:WUPPer command).
- GLESs: trigger when the runt pulse width is greater than the lower limit (refer to the :TRIGger:RUNT:WLOWer command) and lower than the upper limit (refer to the :TRIGger:RUNT:WUPPer command) of pulse width.

  Note: The lower limit of the pulse width must be lower than the upper limit.

Return Format

The query returns NONE, GRE, LESS or GLES.

:TRIGger:RUNT:WLOWer

Syntax

:TRIGger:RUNT:WLOWer <NR3>

:TRIGger:RUNT:WLOWer?

Description

Set or query the lower limit of the pulse width in runt trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	When the qualifier is GREater: 2ns to 4s When the qualifier is GLESs: 2ns to 3.99s	1us

Note: For the qualifier of runt trigger, please refer to the :TRIGger:RUNT:WHEN command.

Return Format

The query returns the lower limit of the pulse width in scientific notation.

:TRIGger:RUNT:WUPPer

Syntax

:TRIGger:RUNT:WUPPer <NR3>

:TRIGger:RUNT:WUPPer?

Description

Set or query the upper limit of the pulse width in runt trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	When the qualifier is LESS: 2ns to 4s When the qualifier is GLESs: 10ns to 4s	2us

Note: For the qualifier of runt trigger, please refer to the :TRIGger:RUNT:WHEN command.

Return Format

The query returns the upper limit of the pulse width in scientific notation.

:TRIGger:SHOLd

- :TRIGger:SHOLd:CSrc
- :TRIGger:SHOLd:DSrc
- :TRIGger:SHOLd:HTIMe
- :TRIGger:SHOLd:PATTern
- :TRIGger:SHOLd:SLOPe
- :TRIGger:SHOLd:STIMe
- :TRIGger:SHOLd:TYPe

:TRIGger:SHOLd:CSrc
:TRIGger:SHOLd:DSrc

Syntax

:TRIGger:SHOLd:CSrc <csrc>

:TRIGger:SHOLd:CSrc?

:TRIGger:SHOLd:DSrc <dsrc>

:TRIGger:SHOLd:DSrc?

Description

Set or query the channel source of SCL or SDA of setup/hold trigger.

Parameter

Name	Type	Range	Default
<csrc>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<dsrc>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:SHOLd:HTIMe

Syntax

:TRIGger:SHOLd:HTIMe <NR3>

:TRIGger:SHOLd:HTIMe?

Description

Set or query the hold time of setup/hold trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	2ns to 1s	50ns

Explanation

- Hold time refers to the period of time that the data stays stable and constant after the clock signal of the trigger appears.
- This command is available when the hold type (refer to the :TRIGger:SHOLd:TYPe command) is set to HOLd or SETHOLd.

Return Format

The query returns the hold time of setup/hold trigger in scientific notation.

:TRIGger:SHOLd:PATTern

Syntax

:TRIGger:SHOLd:PATTern <pattern>

:TRIGger:SHOLd:PATTern?

Description

Set or query the data type of setup/hold trigger.

Parameter

Name	Type	Range	Default
<pattern>	Discrete	{H|L}	H

Return Format

The query returns H or L.

:TRIGger:SHOLd:SLOPe

Syntax

:TRIGger:SHOLd:SLOPe <slope>

:TRIGger:SHOLd:SLOPe?

Description

Set or query the edge type of setup/hold trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative}	POSitive

Return Format

The query returns POS or NEG.

:TRIGger:SHOLd:STIMe

Syntax

:TRIGger:SHOLd:STIMe <NR3>

:TRIGger:SHOLd:STIMe?

Description

Set or query the setup time of setup/hold trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	2ns to 1s	50ns

Explanation

- Setup time refers to the period of time that the data stays stable and constant before the clock signal of the trigger appears.
- This command is available when the hold type (refer to the :TRIGger:SHOLd:TYPe command) is set to SETup or SETHOLd.

Return Format

The query returns the setup time of setup/hold trigger in scientific notation.

:TRIGger:SHOLd:TYPe

Syntax

:TRIGger:SHOLd:TYPe <type>

:TRIGger:SHOLd:TYPe?

Description

Set or query the hold type of setup/hold trigger.

Parameter

Name	Type	Range	Default
<type>	Discrete	{SETup|HOLd|SETHOLd}	SETup

Explanation

- SETup: the oscilloscope triggers when the setup time is less than the setting value (refer to the :TRIGger:SHOLd:STIMe command).
- HOLd: the oscilloscope triggers when the hold time is less than the setting value (refer to the :TRIGger:SHOLd:HTIMe command).
- SETHOLd: the oscilloscope triggers when the setup time or hold time is less than the corresponding setting value (refer to the :TRIGger:SHOLd:STIMe and :TRIGger:SHOLd:HTIMe commands).

Return Format

The query returns SET, HOL or SETHOL.

:TRIGger:SLOPe

- :TRIGger:SLOPe:ALEVel
- :TRIGger:SLOPe:BLEVel
- :TRIGger:SLOPe:TLOWer
- :TRIGger:SLOPe:TUPPer
- :TRIGger:SLOPe:SOURce
- :TRIGger:SLOPe:WHEN
- :TRIGger:SLOPe:WINDow

:TRIGger:SLOPe:ALEVel
:TRIGger:SLOPe:BLEVel

Syntax

:TRIGger:SLOPe:ALEVel <alevel>

:TRIGger:SLOPe:ALEVel?

:TRIGger:SLOPe:BLEVel <blevel>

:TRIGger:SLOPe:BLEVel?

Description

Set or query the upper limit or lower limit of the trigger level in slope trigger. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<alevel>	Real	-4.98×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	1
<blevel>	Real	-5×VerticalScale–OFFSet to +4.98×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Return Format

The query returns the upper limit or lower limit of the trigger level in slope trigger in scientific notation.

:TRIGger:SLOPe:TLOWer

Syntax

:TRIGger:SLOPe:TLOWer <time>

:TRIGger:SLOPe:TLOWer?

Description

Set or query the lower limit of time in slope trigger. The unit is s.

Parameter

Name	Type	Range	Default
<time>	Real	When the trigger condition is PGReater or NGReater: 10ns to 1s When the trigger condition is PGLess or NGLess: 10ns to 999ms	1us

Note: For the trigger condition of slope trigger, please refer to the :TRIGger:SLOPe:WHEN command.

Return Format

The query returns the lower limit of time in slope trigger in scientific notation.

:TRIGger:SLOPe:TUPPer

Syntax

:TRIGger:SLOPe:TUPPer <time>

:TRIGger:SLOPe:TUPPer?

Description

Set or query the upper limit of time in slope trigger. The unit is s.

Parameter

Name	Type	Range	Default
<time>	Real	When the trigger condition is PLESs or NLESs: 10ns to 1s When the trigger condition is PGLess or NGLess: 20ns to 1s	2us

Note: For the trigger condition of slope trigger, please refer to the :TRIGger:SLOPe:WHEN command.

Return Format

The query returns the upper limit of time in slope trigger in scientific notation.

:TRIGger:SLOPe:SOURce

Syntax

:TRIGger:SLOPe:SOURce <source>

:TRIGger:SLOPe:SOURce?

Description

Set or query the trigger source of slope trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:TRIGger:SLOPe:WHEN

Syntax

:TRIGger:SLOPe:WHEN <when>

:TRIGger:SLOPe:WHEN?

Description

Set or query the trigger condition of slope trigger.

Parameter

Name	Type	Range	Default
<when>	Discrete	{PGReater|PLESs|NGReater|NLESs|PGLess|NGLess}	PGReater

Explanation

- PGReater: you need to specify a time value (refer to the :TRIGger:SLOPe:TLOWer command). The oscilloscope triggers when the positive slope time of the input signal is greater than the specified time.
- PLESs: you need to specify a time value (refer to the :TRIGger:SLOPe:TUPPer command). The oscilloscope triggers when the positive slope time of the input signal is lower than the specified time.
- NGReater: you need to specify a time value (refer to the :TRIGger:SLOPe:TLOWer command). The oscilloscope triggers when the negative slope time of the input signal is greater than the specified time.
- NLESs: you need to specify a time value (refer to the :TRIGger:SLOPe:TUPPer command). The oscilloscope triggers when the negative slope time of the input signal is lower than the specified time.
- PGLess: you need to specify an upper limit (refer to the :TRIGger:SLOPe:TUPPer command) and a lower limit (refer to the :TRIGger:SLOPe:TLOWer command) of time. The oscilloscope triggers when the positive slope time of the input signal is greater than the specified lower limit and lower than the specified upper limit.
- NGLess: you need to specify an upper limit (refer to the :TRIGger:SLOPe:TUPPer command) and a lower limit (refer to the :TRIGger:SLOPe:TLOWer command) of time. The oscilloscope triggers when the negative slope time of the input signal is greater than the specified lower limit and lower than the specified upper limit.

Return Format

The query returns PGR, PLES, NGR, NLES, PGL or NGL.

:TRIGger:SLOPe:WINDow

Syntax

:TRIGger:SLOPe:WINDow <window>

:TRIGger:SLOPe:WINDow?

Description

Set or query the vertical window type in slope trigger.

Parameter

Name	Type	Range	Default
<window>	Discrete	{TA|TB|TAB}	TA

Explanation

Different vertical windows correspond to different trigger level adjustment modes.

- TA: only adjust the upper limit of the trigger level.
- TB: only adjust the lower limit of the trigger level.
- TAB: adjust the upper and lower limits of the trigger level at the same time.

Return Format

The query returns TA, TB or TAB.

:TRIGger:SPI

- :TRIGger:SPI:CLEVel
- :TRIGger:SPI:DLEVel
- :TRIGger:SPI:DATA
- :TRIGger:SPI:SCL
- :TRIGger:SPI:SDA
- :TRIGger:SPI:SLOPe
- :TRIGger:SPI:TIMeout
- :TRIGger:SPI:WIDTh

:TRIGger:SPI:CLEVel
:TRIGger:SPI:DLEVel

Syntax

:TRIGger:SPI:CLEVel <level>

:TRIGger:SPI:CLEVel?

:TRIGger:SPI:DLEVel <level>

:TRIGger:SPI:DLEVel?

Description

Set or query the trigger level in SPI trigger when the channel source of SCL or SDA is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the channel sources of SCL and SDA in SPI trigger, please refer to the :TRIGger:SPI:SCL and :TRIGger:SPI:SDA commands respectively.
- When the channel source of SCL or SDA in SPI trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of the channel source of SCL or SDA in SPI trigger.

Return Format

The query returns the trigger level in SPI trigger when the channel source of SCL or SDA is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:SPI:DATA

Syntax

:TRIGger:SPI:DATA <data>

:TRIGger:SPI:DATA?

Description

Set or query the data value in SPI trigger.

Parameter

Name	Type	Range	Default
<data>	Integer	0 to 2^n-1	0

Note: In the expression 2^n-1, n is the current data bits (refer to the :TRIGger:SPI:WIDTh command).

Return Format

The query returns the data value in SPI trigger in integer.

:TRIGger:SPI:SCL
:TRIGger:SPI:SDA

Syntax

:TRIGger:SPI:SCL <scl>

:TRIGger:SPI:SCL?

:TRIGger:SPI:SDA <sda>

:TRIGger:SPI:SDA?

Description

Set or query the SCL or SDA channel source in SPI trigger.

Parameter

Name	Type	Range	Default
<scl>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1
<sda>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10| D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:SPI:SLOPe

Syntax

:TRIGger:SPI:SLOPe <slope>
:TRIGger:SPI:SLOPe?

Description

Set or query the edge type of the clock signal in SPI trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative}	POSitive

Return Format

The query returns POS or NEG.

:TRIGger:SPI:TIMeout

Syntax

:TRIGger:SPI:TIMeout <time_value>
:TRIGger:SPI:TIMeout?

Description

Set or query the timeout time in SPI trigger when the trigger condition is Timeout. The unit is s.

Parameter

Name	Type	Range	Default
<time_value>	Real	100ns to 1s	1us

Return Format

The query returns the timeout time in SPI trigger when the trigger condition is Timeout in scientific notation.

:TRIGger:SPI:WIDTh

Syntax

:TRIGger:SPI:WIDTh <width>

:TRIGger:SPI:WIDTh?

Description

Set or query the number of bits of data in SPI trigger.

Parameter

Name	Type	Range	Default
<width>	Integer	4 to 32	8

Return Format

The query returns the number of bits of data in SPI trigger in integer.

:TRIGger:TIMeout (Option)

- :TRIGger:TIMeout:SOURce
- :TRIGger:TIMeout:SLOPe
- :TRIGger:TIMeout:TIMe

:TRIGger:TIMeout:SOURce

Syntax

:TRIGger:TIMeout:SOURce <source>

:TRIGger:TIMeout:SOURce?

Description

Set or query the trigger source of timeout trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:TIMeout:SLOPe

Syntax

:TRIGger:TIMeout:SLOPe <slope>

:TRIGger:TIMeout:SLOPe?

Description

Set or query the edge type of timeout trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive|NEGative|ALTernate}	POSitive

Explanation

- POSitive: start timing when the rising edge of the input signal passes through the trigger level.
- NEGative: start timing when the falling edge of the input signal passes through the trigger level.
- ALTernate: start timing when any edge of the input signal passes through the trigger level.

Return Format

The query returns POS, NEG or ALT.

:TRIGger:TIMeout:TIMe

Syntax

:TRIGger:TIMeout:TIMe <NR3>

:TRIGger:TIMeout:TIMe?

Description

Set or query the timeout time of timeout trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	16ns to 4s	1us

Return Format

The query returns the timeout time of timeout trigger in scientific notation.

:TRIGger:USB (Option)

- :TRIGger:USB:DMINus
- :TRIGger:USB:DPLus
- :TRIGger:USB:MLEVel
- :TRIGger:USB:PLEVel
- :TRIGger:USB:SPEed
- :TRIGger:USB:WHEN

:TRIGger:USB:DMINus
:TRIGger:USB:DPLus

Syntax

:TRIGger:USB:DMINus <dm>
:TRIGger:USB:DMINus?
:TRIGger:USB:DPLus <dp>
:TRIGger:USB:DPLus?

Description

Set or query the channel source of the D- or D+ data line in USB trigger.

Parameter

Name	Type	Range	Default
<dm>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel2
<dp>	Discrete	{D0|D1|D2|D3|D4|D5|D6|D7|D8|D9|D10|D11|D12|D13|D14|D15|CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, CHAN1 or CHAN2.

:TRIGger:USB:MLEVel
:TRIGger:USB:PLEVel

Syntax

:TRIGger:USB:MLEVel <level>

:TRIGger:USB:MLEVel?

:TRIGger:USB:PLEVel <level>

:TRIGger:USB:PLEVel?

Description

Set or query the trigger level in USB trigger when the channel source of the D- or D+ data line is CHANnel1 or CHANnel2. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Explanation

- To set the channel sources of the D- and D+ data line in USB trigger, please refer to the :TRIGger:USB:DMINus and :TRIGger:USB:DPLus commands respectively.
- When the channel source of the D- or D+ data line in USB trigger is a digital channel, please use the :LA:POD<n>:THReshold command to set or query the threshold level of the channel source of the D- or D+ data line in USB trigger.

Return Format

The query returns the trigger level in USB trigger when the channel source of the D- or D+ data line is CHANnel1 or CHANnel2 in scientific notation.

:TRIGger:USB:SPEed

Syntax

:TRIGger:USB:SPEed <value>

:TRIGger:USB:SPEed?

Description

Set or query the signal speed in USB trigger

Parameter

Name	Type	Range	Default
<value>	Discrete	{LOW|FULL}	LOW

Return Format

The query returns LOW or FULL.

:TRIGger:USB:WHEN

Syntax

:TRIGger:USB:WHEN <condition>

:TRIGger:USB:WHEN?

Description

Set or query the trigger condition of USB trigger.

Parameter

Name	Type	Range	Default
<condition>	Discrete	{SOP|EOP|RC|SUSPend|EXITsuspend}	SOP

Explanation

- SOP: trigger at the sync bit at the start of the data packet (SOP).
- EOP: trigger at the end of the SEO portion of the EOP of the data packet.
- RC: trigger when SEO is greater than 10ms.
- SUSPend: trigger when the idle time of the bus is greater than 3ms.
- EXITsuspend: trigger when the bus exits from idle state for more than 10ms.

Return Format

The query returns SOP, EOP, RC, SUSP or EXIT.

:TRIGger:VIDeo (HDTV Option)

- :TRIGger:VIDeo:MODE
- :TRIGger:VIDeo:LEVel
- :TRIGger:VIDeo:LINE
- :TRIGger:VIDeo:POLarity
- :TRIGger:VIDeo:SOURce
- :TRIGger:VIDeo:STANdard

:TRIGger:VIDeo:MODE

Syntax

:TRIGger:VIDeo:MODE <mode>

:TRIGger:VIDeo:MODE?

Description

Set or query the sync type in video trigger

Parameter

Name	Type	Range	Default
<mode>	Discrete	{ODDField|EVENfield|LINE|ALINes}	ALINes

Note: When the video standard is HDTV, the sync type could only be set to AllLine or Line Number. For the video standard, refer to the :TRIGger:VIDeo:STANdard command.

Explanation

- ODDField: trigger on the rising edge of the first ramp waveform pulse in the odd field.
- EVENfield: trigger on the rising edge of the first ramp waveform pulse in the even field.
- LINE: for NTSC and PAL/SECAM video standards, trigger on the specified line in the odd or even field; for HDTV video standard, trigger on the specified line. Note that when this sync trigger mode is selected, you can modify the line number using in the “Line Num” menu with a step of 1. The range of the line number is from 1 to 525 (NTSC), 1 to 625 (PAL/SECAM), 1 to 525 (480P), 1 to 625 (576P), 1 to 750 (720P), 1 to 1125 (1080P) or 1 to 1125 (1080I).
- ALINes: trigger on all the horizontal sync pulses.

Return Format

The query returns ODDF, EVEN, LINE or ALIN.

:TRIGger:VIDeo:LEVel

Syntax

:TRIGger:VIDeo:LEVel <level>

:TRIGger:VIDeo:LEVel?

Description

Set or query the trigger level in video trigger. The unit is the same with the current amplitude unit.

Parameter

Name	Type	Range	Default
<level>	Real	-5×VerticalScale–OFFSet to +5×VerticalScale–OFFSet	0

Note: For the VerticalScale, refer to the :CHANnel<n>:SCALe command. For the OFFSet, refer to the :CHANnel<n>:OFFSet command.

Return Format

The query returns the trigger level in video trigger in scientific notation.

:TRIGger:VIDeo:LINE

Syntax

:TRIGger:VIDeo:LINE <line>

:TRIGger:VIDeo:LINE?

Description

Set or query the line number in video trigger when the sync type is Line (refer to :TRIGger:VIDeo:MODE command).

Parameter

Name	Type	Range	Default
<line>	Integer	NTSC: 1 to 525 PAL: 1 to 625 480P: 1 to 525 576P: 1 to 625 720P60HZ: 1 to 750 720P50HZ: 1 to 750 720P30HZ: 1 to 750 720P25HZ: 1 to 750 720P24HZ: 1 to 750 1080P60HZ: 1 to 1125 1080P50HZ: 1 to 1125 1080P30HZ: 1 to 1125 1080P25HZ: 1 to 1125 1080P24HZ: 1 to 1125 1080I30HZ: 1 to 1125 1080I25HZ: 1 to 1125 1080I24HZ: 1 to 1125	1

Return Format

The query returns the line number in video trigger when the sync type is Line in integer.

:TRIGger:VIDeo:POLarity

Syntax

:TRIGger:VIDeo:POLarity <polarity>

:TRIGger:VIDeo:POLarity?

Description

Set or query the video polarity in video trigger.

Parameter

Name	Type	Range	Default
<polarity>	Discrete	{POSitive|NEGative}	NEGative

Return Format

The query returns POS or NEG.

:TRIGger:VIDeo:SOURce

Syntax

:TRIGger:VIDeo:SOURce <source>

:TRIGger:VIDeo:SOURce?

Description

Set or query the trigger source of video trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:TRIGger:VIDeo:STANdard

Syntax

:TRIGger:VIDeo:STANdard <standard>

:TRIGger:VIDeo:STANdard?

Description

Set or query the video standard in video trigger.

Parameter

Name	Type	Range	Default
<standard>	Discrete	{PALSecam|NTSC|480P|576P|720P60HZ|720P50HZ|720P30HZ|720P25HZ|720P24HZ|1080P60HZ|1080P50HZ|1080P30HZ|1080P25HZ|1080P24HZ|1080I30HZ|1080I25HZ|1080I24HZ}	NTSC

Return Format

The query returns the video standard selected.

:TRIGger:WINDows (Option)

- :TRIGger:WINDows:POSition
- :TRIGger:WINDows:TIMe
- :TRIGger:WINDows:SOURce
- :TRIGger:WINDows:SLOPe

:TRIGger:WINDows:POSition

Syntax

:TRIGger:WINDows:POSition <pos>

:TRIGger: WINDows:POSition?

Description

Set or query the trigger position of windows trigger.

Parameter

Name	Type	Range	Default
<type>	Discrete	{EXIT|ENTER|TIMe}	ENTER

Explanation

- EXIT: trigger when the input signal exits the specified trigger level range.
- ENTER: trigger when the trigger signal enters the specified trigger level range.
- TIMe: trigger when the accumulated hold time after entering the specified trigger level range is greater than the windows time. The range is from 16ns to 4s and the default is 1.00us.

Return Format

The query returns EXIT, ENTER or TIM.

:TRIGger:WINDows:TIMe

Syntax

:TRIGger:WINDows:TIMe <NR3>

:TRIGger: WINDows:TIMe?

Description

Set or query the windows time of windows trigger.

Parameter

Name	Type	Range	Default
<NR3>	Real	16ns to 4s	1us

Explanation

This command is only available when the trigger position of windows trigger (refer to the :TRIGger:WINDows:POSition command) is set to TIMe.

Return Format

The query returns the windows time in scientific notation.

:TRIGger:WINDows:SOURce

Syntax

:TRIGger:WINDows:SOURce <source>

:TRIGger:WINDows:SOURce?

Description

Set or query the trigger source of windows trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2}	CHANnel1

Return Format

The query returns CHAN1 or CHAN2.

:TRIGger:WINDows:SLOPe

Syntax

:TRIGger:WINDows:SLOPe <type>

:TRIGger: WINDows:SLOPe?

Description

Set or query the windows type of windows trigger.

Parameter

Name	Type	Range	Default
<type>	Discrete	{POSitive|NEGative|RFALl}	POSitive

Explanation

- POSitive: trigger on the rising edge of the input signal when the voltage level is greater than the preset high trigger level.
- NEGative: trigger on the falling edge of the input signal when the voltage level is lower than the preset low trigger level.
- RFALl: trigger on any edge of the input signal when the voltage level meets the preset trigger level.

Return Format

The query returns POS, NEG or RFAL.

:WAVeform Commands

The :WAVeform commands are used to read the waveform data and its related settings.

The :WAVeform:MODE command is used to set the reading mode of the waveform data. In different mode, the definition of each parameter is different, as shown in Figure 2-1 and Figure 2-2.

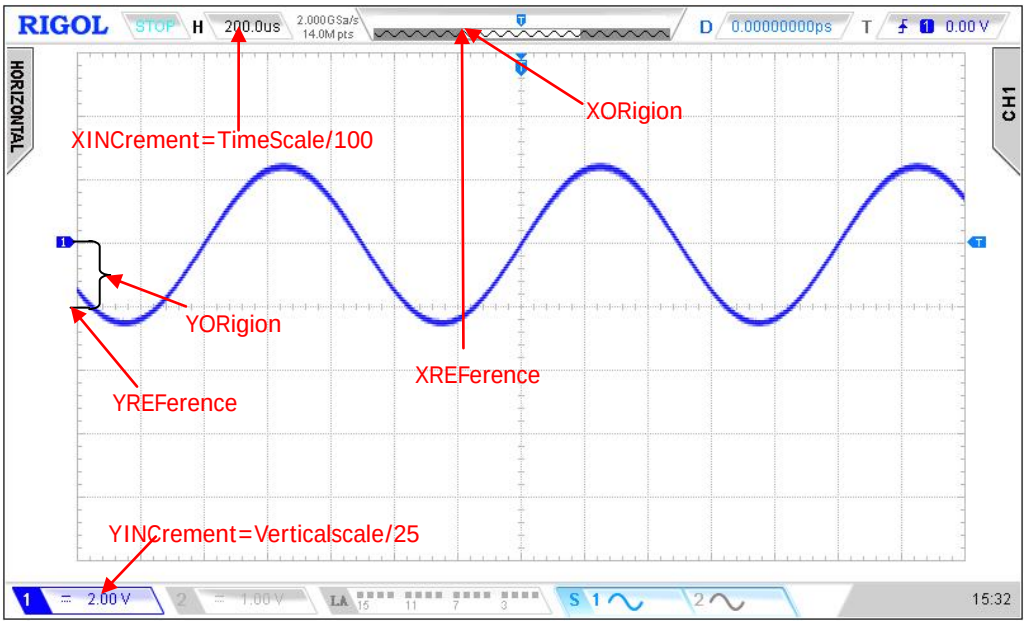


Figure 2-1 Parameter Definitions in NORMAL Mode

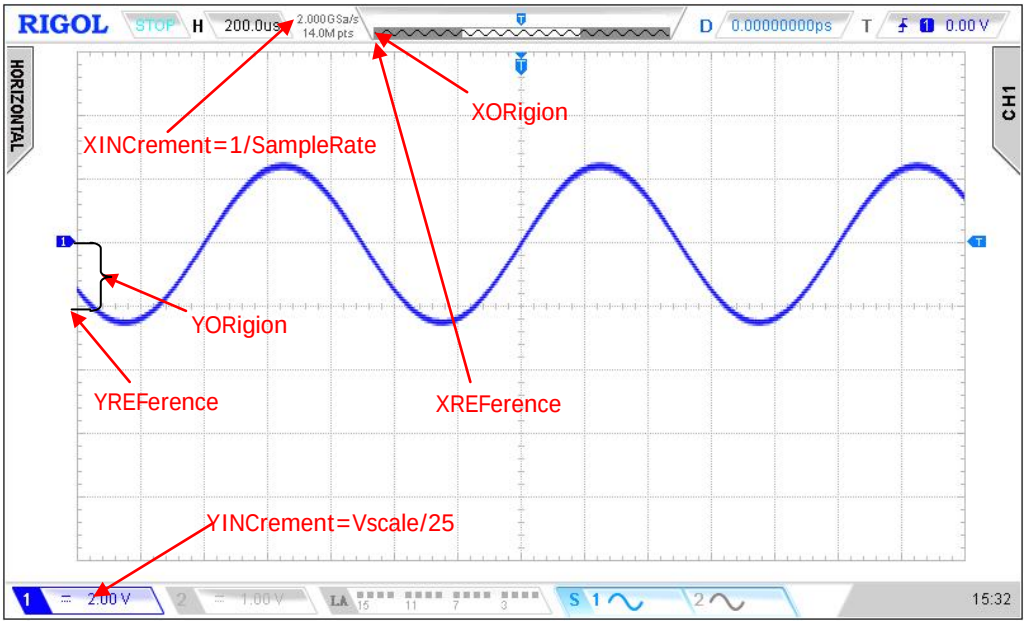


Figure 2-2 Paramter Definitions in RAW Mode

- :WAVeform:SOURce
- :WAVeform:MODE
- :WAVeform:FORMat
- :WAVeform:POINts
- :WAVeform:DATA?
- :WAVeform:XINCrement?
- :WAVeform:XORigin?
- :WAVeform:XREFerence?
- :WAVeform:YINCrement?
- :WAVeform:YORigin?
- :WAVeform:YREFerence?
- :WAVeform:STARt
- :WAVeform:STOP
- :WAVeform:BEGin
- :WAVeform:END
- :WAVeform:RESet
- :WAVeform:PREamble?
- :WAVeform:STATus?

:WAVeform:SOURce

Syntax

:WAVeform:SOURce <source>

:WAVeform:SOURce?

Description

Set or query the channel source of waveform data reading.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1|CHANnel2|MATH|FFT|LA}	CHANnel1

Explanation

- The following two methods can be used to set FFT as the channel source for waveform data reading.
  - Set <source> to FFT.
  - Set the operation source of MATH to FFT and then set <source> to MATH.
- When LA is set as the channel source of waveform data reading, the return format is WORD; namely, each 2 bytes represent a group of digital signal states and each bit represents a single digital signal channel. The highest bit represents D0 and the lowest bits represents D15.

Return Format

The query returns CHAN1, CHAN2, MATH, FFT or LA.

:WAVeform:MODE

Syntax

:WAVeform:MODE <mode>

:WAVeform:MODE?

Description

Set or query the data reading mode of the :WAVeform:DATA? Command.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{NORMal|RAW|MAXimum}	NORMal

Explanation

- NORMal: read the waveform data currently displayed on the screen.
- RAW: read the waveform data in the internal memory.

  Note: The waveform data in the internal memory can only be read when the oscilloscope is in the stop state and please do not operate the oscilloscope during the reading process.
- MAXimum: in the run state, read the waveform data displayed on the screen; in the stop state, read the waveform data in the internal memory.

Return Format

The query returns NORM, MAX or RAW.

:WAVeform:FORMat

Syntax

:WAVeform:FORMat <format>
:WAVeform:FORMat?

Description

Set or query the return format of the waveform data.

Parameter

Name	Type	Range	Default
<format>	Discrete	{WORD|BYTE|ASCii}	BYTE

Explanation

- WORD: each waveform point occupies two bytes (namely 16 bits). The lower 8 bits are valid and the higher 8 bits are 0.
- BYTE: each waveform point occupies one byte (namely 8 bits).
- ASCii: return the waveform point in character value format. Each waveform point is returned in scientific notation and multiple points are separated by commas.

Return Format

The query returns WORD, BYTE or ASC.

:WAVeform:POINts

Syntax

:WAVeform:POINts <point>
:WAVeform:POINts?

Description

Set or query the number of waveform points to be read.

Parameter

Name	Type	Range	Default
<point>	Integer	NORMal: 1 to 1400 MAX: 1 to the number of effective points currently on the screen RAW: 1 to the current maximum memory depth	1400

Explanation

The number of waveform points is limited by the current reading mode of waveform (refer to the :WAVeform:MODE command).

Return Format

The query returns the number of waveform points to be read in integer.

:WAVeform:DATA?

Syntax

:WAVeform:DATA?

Description

Read the waveform data.

Explanation

This command is affected by
the :WAVeform:FORMat, :WAVeform:MODE, :WAVeform:POINts, :WAVeform:SOURce and related commands.

Procedures of the screen waveform data reading:

S1. :WAV:SOUR CHAN1	Set the channel source to be read
S2. :WAV:MODE NORM	Set the waveform mode to NORM
S3. :WAV:DATA?	Obtain data from the buffer

Procedures of the internal memory waveform data reading:

S1. :STOP	The internal memory waveform data can only be read in the stop state
S2. :WAV:SOUR CHAN1	Set the channel source to be read
S3. :WAV:MODE RAW	Set the waveform mode to RAW. **Note:** When the channel source of waveform reading is MATH, the query can only return the screen data and this mode is not available.
S4. :WAV:RES	Reset the waveform reading
S5. :WAV:BEG	Start the waveform reading
S6. :WAV:STAT?	Get the state
1) IDLE	Waveform reading thread finishes
:WAV:DATA?	Get the data in the buffer
:WAV: END	Waveform reading finishes
2) READ	Waveform reading thread is running
:WAV:DATA?	Get the data in the buffer
Repeat S6	Continue to read waveform data

See the example below.

```
visa32.viPrintf(viSession, ":STOP\n");
visa32.viPrintf(viSession, ":WAV:MODE RAW\n");
visa32.viPrintf(viSession, ":WAV:SOURce %s\n", strChan );
visa32.viPrintf(viSession, ":WAV:RESet\n");
visa32.viPrintf(viSession, ":WAV:BEGin\n");
```

```
while (true)
        {
            Thread.Sleep( 100 );
            visa32.viPrintf(viSession, ":WAV:STATus?\n");
            visa32.viScanf(viSession, "%s", strBuild);
            if (strBuild[0] == 'I')        //IDLE
            {
                visa32.viPrintf(viSession, ":WAV:DATA?\n");
                visa32.viRead(viSession, wfmBuf, wfmBuf.Length, out readCnt);
                readSum += ( readCnt -12);
                readTim++;
                Console.WriteLine("{0}: Read {1} Sum {2}" , readTim, readCnt, readSum);
                return readSum;
            }
            else
            {
                visa32.viPrintf(viSession, ":WAV:DATA?\n");
                visa32.viRead(viSession, wfmBuf, wfmBuf.Length, out readCnt);
                readSum += (readCnt -12);
                readTim++;
                Console.WriteLine("{0}: Read {1} Sum {2}" , readTim, readCnt, readSum);
                Console.WriteLine("Press any key to read next data." );
                //Console.ReadKey();
                Console.WriteLine("Reading..." );
                }
        }
```

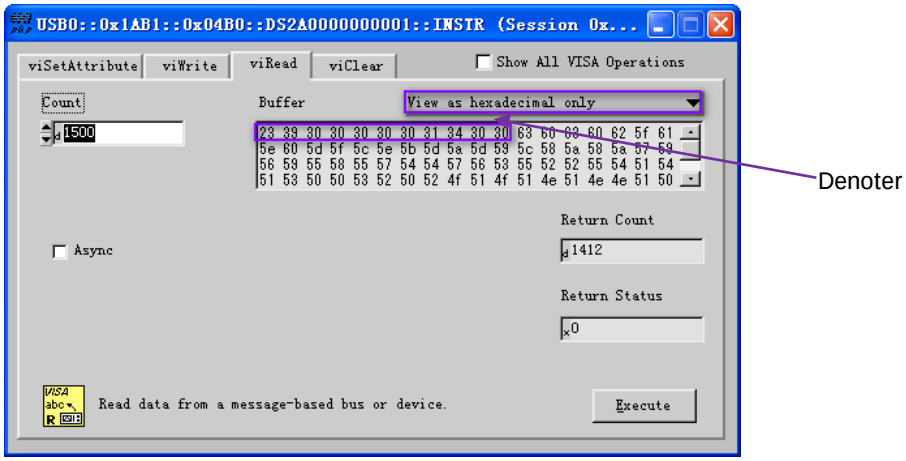
Return Format

The data returned contains 2 parts: the TMC data description header and the waveform data.
#900000ddddXXXX...
Wherein, dddd denotes the number of the effective waveform points in the data stream.
When reading the internal memory data, the waveform data returned each time might be the data block in one area of the buffer. Each data block has a TMC description header similar to #9XXXXXXXXX; wherein XXXXXXXXX denotes the number of the waveform points in this data block. Waveform data in two adjacent data blocks are consecutive.

The waveform data read can be converted to the voltage of each point of the waveform on the screen according to the method below.

The figure below shows the waveform data read. First, select "View as hexadecimal only" from the dropdown list at the right of Buffer; at this point, the waveform data read is displayed in hexadecimal format; the first 11 figures denote the number of bytes that the "Denoter" holds in the internal memory; the figures following are the waveform data on the screen and users can convert the waveform data read to the voltage of each point of the waveform on the screen using the formula (ox63-vertical reference

position in Y direction)×VerticalScale-OFFSet. For the vertical reference position in Y direction, refer to the:WAVeform:YREFerence? Command; for the VerticalScale, refer to the :CHANnel<n>:SCALe command and for the OFFSet, refer to the :CHANnel<n>:OFFSet command.



Note: When the return format of the waveform data is set to ASCii (refer to the :WAVeform:FORMat command), the query returns the actual voltage of each point of the waveform on the screen in scientific notation.

:WAVeform:XINCrement?

Syntax

:WAVeform:XINCrement?

Description

Query the time difference between two neighboring points of the channel source currently selected (refer to the :WAVeform:SOURce command) in the X direction. The unit is s.

Explanation

- The return value is related to the current data reading mode:
  In NORMal mode, XINCrement=TimeScale/100.
  In RAW mode, XINCrement=1/SampleRate.
  In MAX mode, XINCrement = TimeScale/100 when the instrument is in running status; XINCrement = 1/SampleRate when the instrument is in stop status.
- The unit is related to the current channel source:
  When the channel source is CHANnel1, CHANnel2 or any of D0 to D15, the unit is s.
  When the channel source is MATH with FFT operation or the channel source is FFT, the unit is Hz.

Return Format

The query returns the time difference between two neighboring points of the channel source currently selected in the X direction in scientific notation.

:WAVeform:XORigin?

Syntax

:WAVeform:XORigin?

Description

Query the start time of the waveform data of the channel source currently selected (refer to the :WAVeform:SOURce command) in the X direction. The unit is s.

Explanation

- The return value is related to the current data reading mode:
  In NORMal mode, the query returns the start time of the waveform data displayed on the screen.
  In RAW mode, the query returns the start time of the waveform data in the internal memory.
  In MAX mode, the query returns the start time of the waveform data displayed on the screen when the instrument is in running status; the query returns the start time of the waveform data in the internal memory when the instrument is in stop status.
- The unit is related to the current channel source:
  When the channel source is CHANnel1, CHANnel2 or any of D0 to D15, the unit is s.
  When the channel source is MATH with FFT operation or the channel source is FFT, the unit is Hz.

Return Format

The query returns the start time of the waveform data of the channel source currently selected in the X direction in scientific notation.

:WAVeform:XREFerence?

Syntax

:WAVeform:XREFerence?

Description

Query the reference time base of the channel source currently selected (refer to the :WAVeform:SOURce command) in the X direction. The unit is s.

Return Format

The query returns 0 (namely the first waveform point on the screen or in the internal memory).

:WAVeform:YINCrement?

Syntax

:WAVeform:YINCrement?

Description

Query the voltage value per unit of the channel source currently selected (refer to the :WAVeform:SOURce command) in the Y direction. The unit is the same with the unit of the signal source.

Explanation

YINCrement=VerticalScale/25

Return Format

The query returns the voltage value per unit of the channel source currently selected in the Y direction in scientific notation.

:WAVeform:YORigin?

Syntax

:WAVeform:YORigin?

Description

Query the vertical offset relative to the vertical reference position (refer to the :WAVeform:YREFerence? command) of the channel source currently selected (refer to the :WAVeform:SOURce command) in the Y direction. The unit is the same with the unit of the signal source.

Return Format

The query returns the vertical offset relative to the vertical reference position of the channel source currently selected in the Y direction in integer.

:WAVeform:YREFerence?

Syntax

:WAVeform:YREFerence?

Description

Query the vertical reference position of the channel source currently selected (refer to the :WAVeform:SOURce command) in the Y direction.

Explanation

YREFerence is always 127 (the screen bottom is 0 and the screen top is 255).

Return Format

The query returns 127.

:WAVeform:STARt

Syntax

:WAVeform:STARt <sta>

:WAVeform:STARt?

Description

Set or query the start position of internal memory waveform reading.

Parameter

Name	Type	Range	Default
<sta>	Integer	NORMal: 1 to 1400 MAX: 1 to the number of effective point currently on the screen RAW: 11 to the current maximum memory depth	1

Explanation

- For the memory depth, refer to the :ACQuire:MDEPth command.
- The range of the start position is limited by the current waveform reading mode (refer to the :WAVeform:MODE command).

Return Format

The query returns the start position of internal memory waveform reading in integer.

:WAVeform:STOP

Syntax

:WAVeform:STOP <sta>

:WAVeform:STOP?

Description

Set or query the stop position of internal memory waveform reading.

Parameter

Name	Type	Range	Default
<sta>	Integer	NORMal: 1 to 1400 MAX: 1 to the number of effective point currently on the screen RAW: 1 to the current maximum memory depth	1400

Explanation

- For the memory depth, refer to the :ACQuire:MDEPth command.
- The range of the start position is limited by the current waveform reading mode (refer to the :WAVeform:MODE command).

Return Format

The query returns the stop position of internal memory waveform reading in integer.

:WAVeform:BEGin

Syntax

:WAVeform:BEGin

Description

Enable the waveform reading.

:WAVeform:END

Syntax

:WAVeform:END

Description

Stop the waveform reading.

:WAVeform:RESet

Syntax

:WAVeform:RESet

Description

Reset the waveform reading.

:WAVeform:PREamble?

Syntax

:WAVeform:PREamble?

Description

Query and return all the waveform parameters.

Return Format

The query returns 10 waveform parameters separated by ",":

<format>,<type>,<points>,<count>,<xincrement>,<xorigin>,<xreference>,<yincrement>,<yorigin>,<yreference>

Wherein,

<format>: 0 (BYTE), 1 (WORD) or 2 (ASC). Refer to the :WAVeform:FORMat command.

<type>: 0 (NORMal), 1 (MAXimum) or 2 (RAW). Refer to the :WAVeform:MODE command.

<points>: an integer between 1 and 56000000. Refer to the :WAVeform:POINts command.

<count>: the number of averages in average sample mode (refer to the :ACQuire:AVERages command) and 1 in other modes.

<xincrement>: the time difference (scientific notation) between two neighboringpoints in the X direction. Refer to the :WAVeform:XINCrement? command.

<xorigin>: the start time (scientific notation) of the waveform data in the X direction. Refer to the :WAVeform:XORigin? command.

<xreference>: the reference time (integer) of the data point in the X direction. Refer to the :WAVeform:XREFerence? command.

<yincrement>: the voltage value (scientific notation) per unit in the Y direction. Refer to the :WAVeform:YINCrement? command.

<yorigin>: the vertical offset (integer) relative to the "Vertical Reference Position" in the Y direction. Refer to the :WAVeform:YORigin? command.

<yreference>: the vertical reference position (integer) in the Y direction. Refer to the :WAVeform:YREFerence? command.

Example

:WAVeform:PREamble?

/*The query returns 0,0,1400,1,1.000000e-08,-7.000000e-06,0,4.000000e-02,2.000000e+00,127*/

:WAVeform:STATus?

Syntax

:WAVeform:STATus?

Description

Query and return the current waveform reading state.

Return Format

The quey returns IDLE,n or READ,n.

Wherein;

IDLE: the waveform reading thread finishes.

READ: the waveform reading thread is running.

n: the current number of waveform points to be read.

3 Programming Demos

This chapter lists the programming demos to illustrate how to program and control the oscilloscope in the development environments of Excel, LabVIEW, Matlab, Visual Basic 6.0 and Visual C++ 6.0 using SCPI commands on the basis of NI-VISA.

NI-VISA (National Instrument-Virtual Instrument Software Architecture) is an advanced application programming interface developed by NI (National Instrument) and is used for communication with various instrument buses. It communicates with instruments in the same method regardless of the type of the instrument interface (GPIB, USB, LAN/Ethernet or RS232).

NI-VISA calls the instruments that communicate with it via various interfaces as “resources”. The VISA descriptor (namely the resource name) is used to describe the accurate name and location of the VISA resource. For example, when the LAN interface is used to communicate with the instrument, the VISA descriptor is TCPIP::172.16.3.4::INSTR.

Before programming, acquire the correct VISA descriptor.

The topics of this chapter:

- Programming Preparations
- Excel Programming Demo
- LabVIEW Programming Demo
- Matlab Programming Demo
- Visual Basic 6.0 Programming Demo
- Visual C++ 6.0 Programming Demo

Programming Preparations

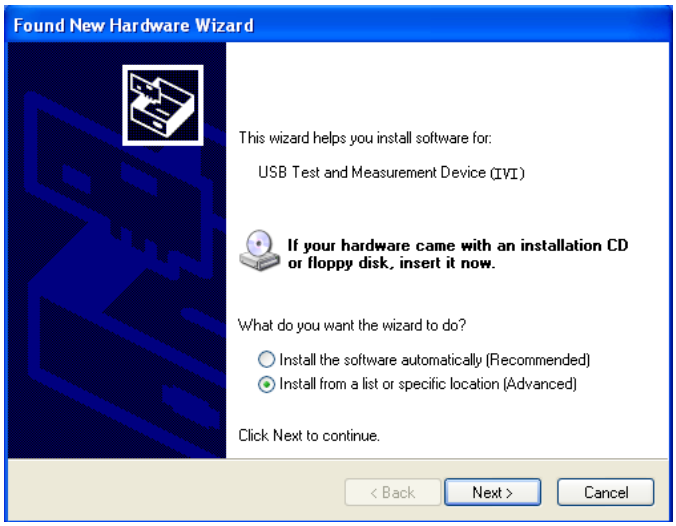
Before programming, make the following preparations.

1. Install the Ultra Sigma common PC software. You can acquire the software from the resource CD in the standard accessories or download it from **RIGOL** official website (www.rigol.com). Then, follow the instructions to install the software. When Ultra Sigma is installed, NI-VISA library is installed automatically. In this manual, the default installation directory is C:\Program Files\IVI Foundation\VISA.

2. In this manual, the USB Device interface of the oscilloscope is used to communicate with the PC. Please connect the USB Device interface at the rear panel of the oscilloscope with the PC using a USB cable. You can also use the LAN or GPIB (with the USB-GPIB interface converter provided by **RIGOL**) interface to communicate with the PC.

3. After the oscilloscope is correctly connected to the PC, power on and start the oscilloscope.

4. At this point, the "Found New Hardware Wizard" dialog box appears on the PC. Please install “USB Test and Measurement Device (IVI)” according to the instructions (for the installation method, refer to *MSO2000A/DS2000A User’s Guide*).



5. Acquire the USB VISA descriptor of the oscilloscope. Start Ultra Sigma and the instrument resource found is displayed under the “RIGOL Online Resource” directory in the Ultra Sigma interface together with the instrument model and USB information. In this demo, the USB VISA descriptor of the oscilloscope used is USB0::0x1AB1::0x04B0::DS2A0000000000::INSTR.

By now, the programming preparations are finished. In the following part, detailed introductions are given about the programming demos in the Excel, Labview, Matlab, Visual Basic 6.0 and Visual C++ 6.0 development environments.

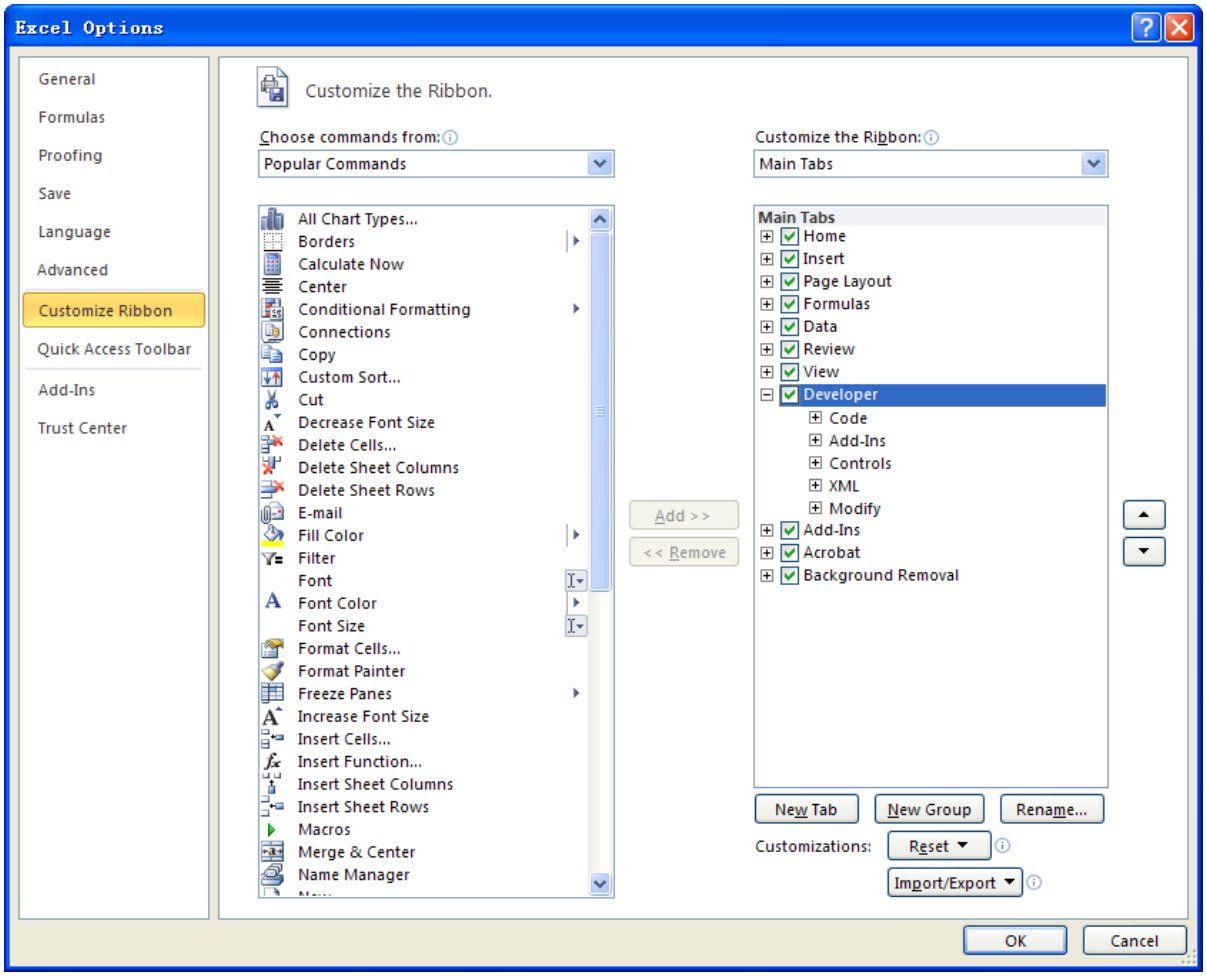
Excel Programming Demo

The program used in this demo: Microsoft Excel 2010

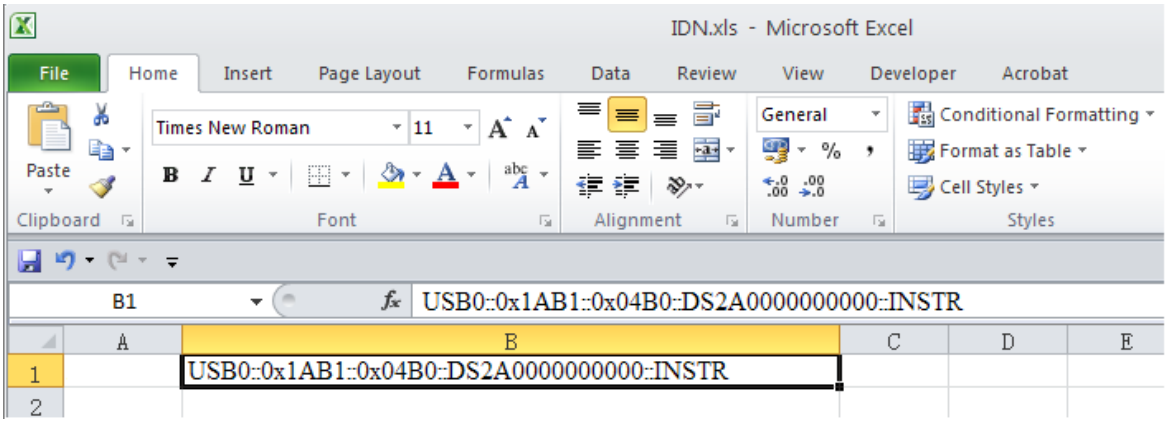
The function realized in this demo: send the *IDN? Command to read the device information.

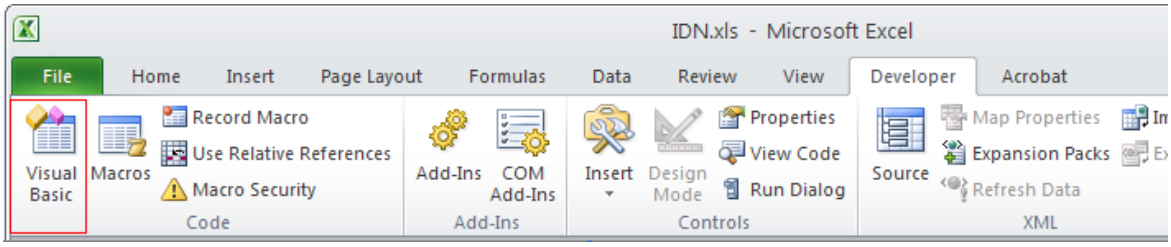
1. Create a new Excel file. In this demo, the file is named as IDN.xls.

2. Run the IDN.xls file. Click **File→Options** at the upper-left corner of the Excel file to open the interface as shown in the figure below. Click **Customize Ribbon** at the right, check **Developer** and click **OK**. At this point, the Excel menu bar displays the **Developer** menu.

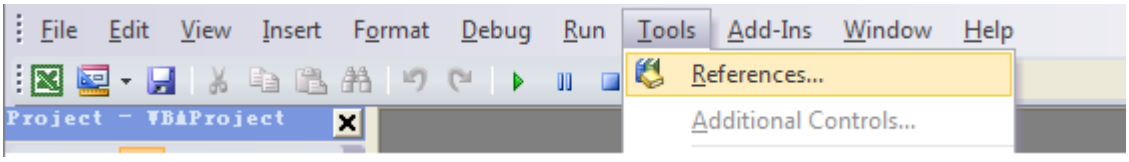


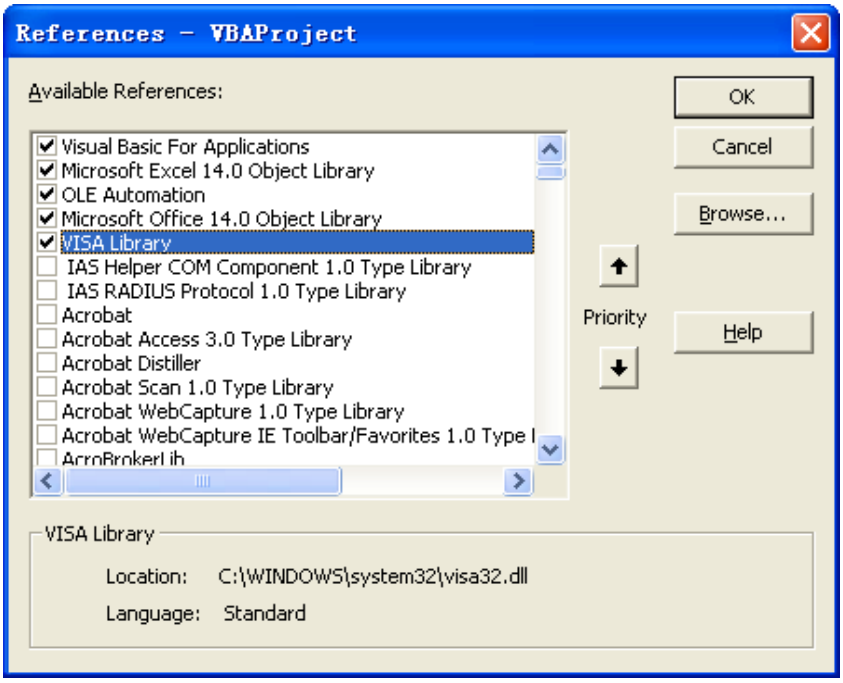
3. Enter the VISA descriptor into a cell of the file as shown in the figure below. Click the **Developer** menu and select the **Visual Basic** option to open the Microsoft Visual Basic.





4. Click **Tools(T)** in the Microsoft Visual Basic menu bar and select **References**. Select **VISA Library** in the pop-up dialog box and click **OK** to refer to the VISA Library.



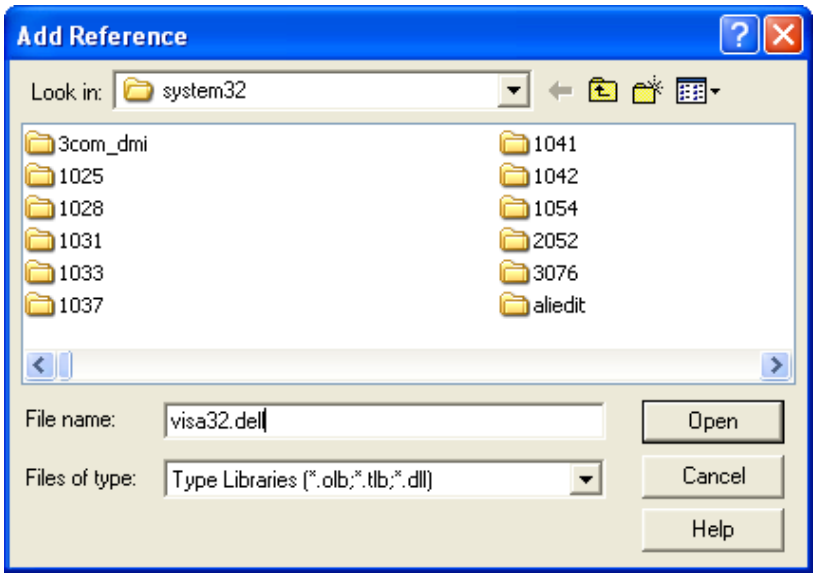


Explanation:

If you cannot find the VISA Library in the list at the left of the figure above, please follow the method below to find it.

(1) Make sure that your PC has installed the NI-VISA library.

(2) Click **Browse...** at the right and set the search range to **C:\WINDOWS\system32** and the filename to **visa32.dll**, as shown in the figure below.



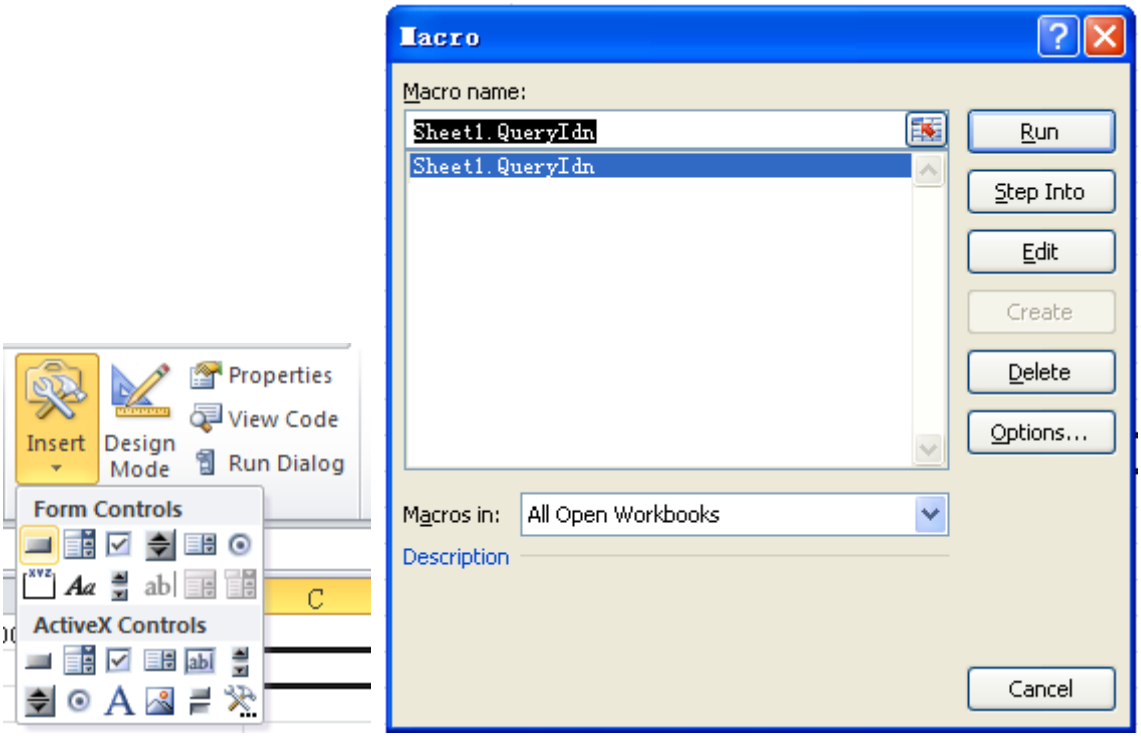
5. Click **View Code** in the **Developer** menu to enter the Microsoft Visual Basic interface. Add the following codes and save the file.

Note: At this point, the prompt message "The following features cannot be saved in macro-free workbooks" will be displayed. In this situation, please save the Excel file as a file using the Macros (the filename suffix changes to .xlsm).

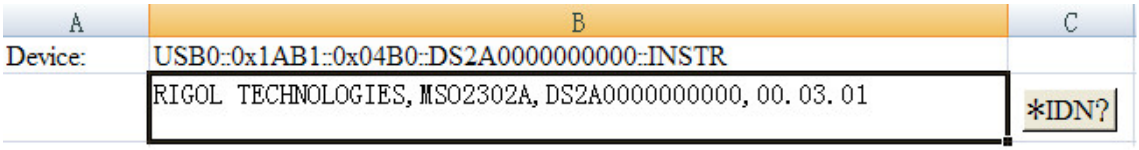
```
Sub QueryIdn()

    Dim viDefRm As Long
    Dim viDevice As Long
    Dim viErr As Long
        Dim cmdStr As String
    Dim idnStr As String * 128
    Dim ret As Long

    'Turn on the device, the device resource descriptor is in CELLS(1,2) of SHEET1'
    viErr = visa.viOpenDefaultRM(viDefRm)
    viErr = visa.viOpen(viDefRm, Sheet1.Cells(1, 2), 0, 5000, viDevice)

    'Send request, read the data, the return value is in CELLS(2,2) of SHEET1'
    cmdStr = "*IDN?"
```

```
    viErr = visa.viWrite(viDevice, cmdStr, Len(cmdStr), ret)
    viErr = visa.viRead(viDevice, idnStr, 128, ret)
    Sheet1.Cells(2, 2) = idnStr

    'Turn off the device'
  visa.viClose (viDevice)
    visa.viClose (viDefRm)

End Sub
```

6. Add button control: click **Insert** in the **Developer** menu, select the desired button in **Form Controls** and put it into the cell of the Excel. At this point, the **Assign Macro** interface is displayed, select "Sheet1.QueryIdn" and click "OK".



7. By default, the button mane is "Button 1". Right-click the button and select **Edit Text** in the pop-up menu to change the button name to "*IDN?". Click the "*IDN?" button to send request and read data.



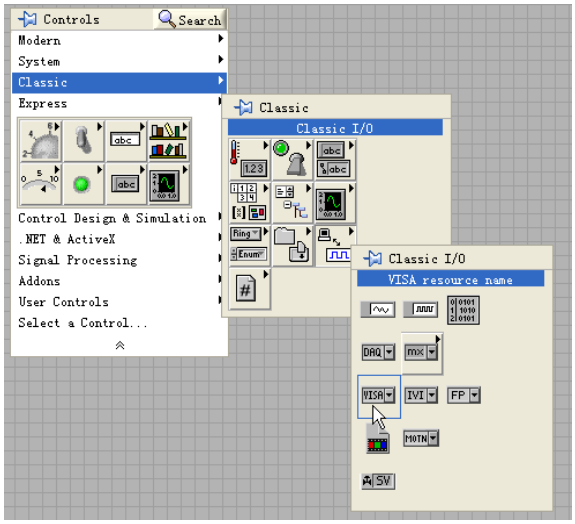
LabVIEW Programming Demo

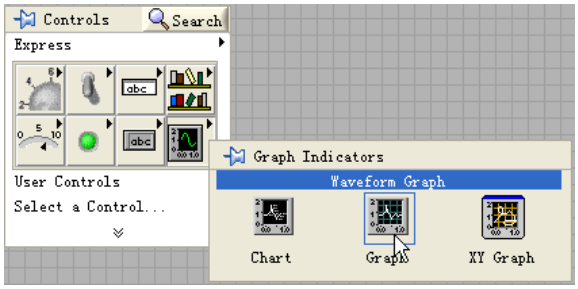
The program used in this demo: LabVIEW 2009

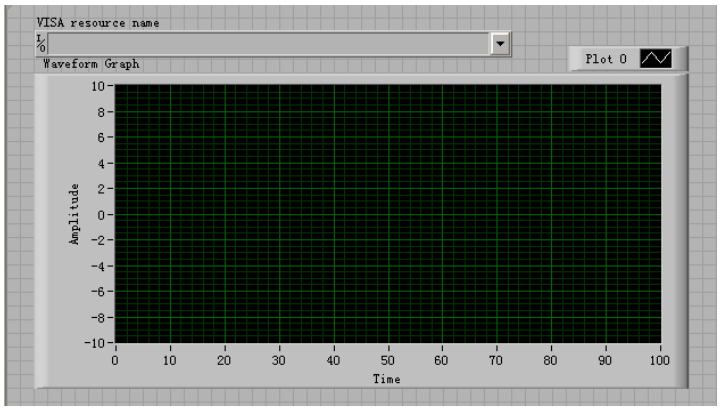
The functions realized in this demo: read the waveform data of CH1 on the screen.

1. Run LabVIEW 2009, create a VI file and name it as MSO2000A_Demo_LABVIEW.

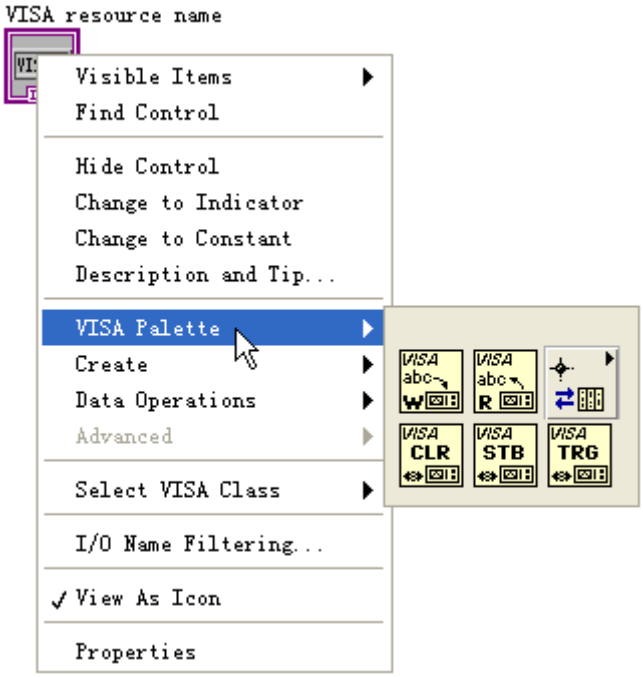
2. Add the **VISA resource name** and **Waveform Graph** controls, as shown in the figures below.





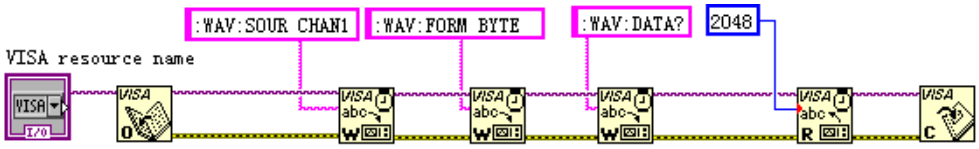


3. Open the **Block Diagram** interface. Right-click on the **VISA resource name** and you can select and add the following functions from **VISA Palette** from the pop-up menu: **VISA Write**, **VISA Read**, **VISA Open** and **VISA Close**.

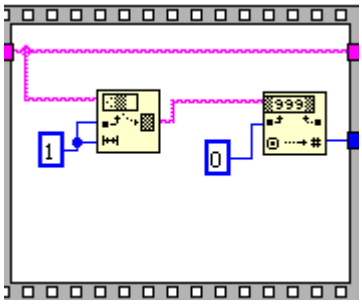


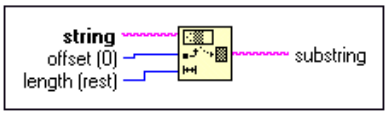
4. Connect the **VISA resource name** with the **VISA Open**. Then, connect the VISA resource name outputs of all the functions with the **VISA resource name** and connect the error output with the error input as shown in the figure below.

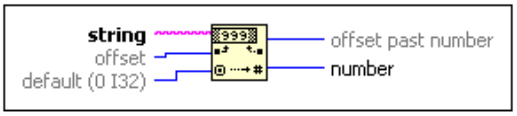
5. Add text boxes in the write buffer areas of the **VISA Write** control and input ":WAV:SOUR CHAN1", ":WAV:FORM BYTE" and ":WAV:DATA?" respectively. The first sets the channel source of waveform data reading to CH1, the second sets the waveform reading format to BYTE and the last reads the screen waveform data. Waveform data is read through the **VISA Read** function which requires users to input the total number of bytes to be read. In this example, the total number of bytes of waveform data to be read is less than 2048. Close the VISA resource after the VISA operation is finished.



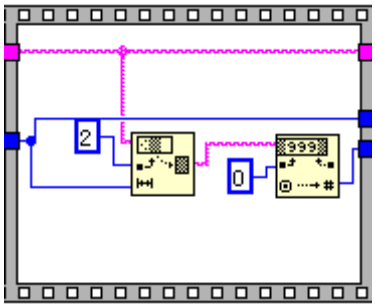
6. The data format is TMC header + waveform data points + terminator. The TMC header is in **#NX...X** format; wherein, **#** is the TMC header denoter, **N** represents that the N bytes following **(X...X)** are used to describe the length of the waveform data and the terminator represents the ending of the communication. For example, for : #9000001400XXXX, 9 bytes are used to describe the length of the data, 000001400 represents the length of the waveform data (namely 1400 bytes). Use the **String Subset** and **Decimal String To Number** functions to get the value of N.



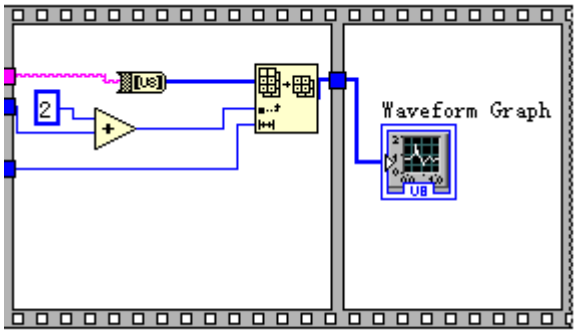


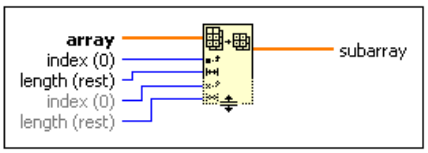


Get the length of the effective waveform data.

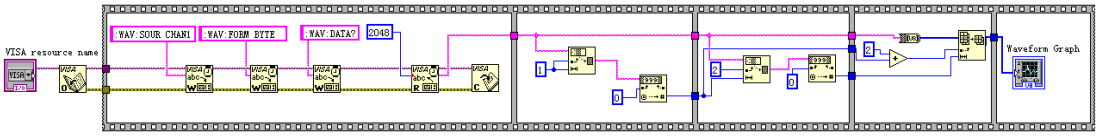


7. Convert the character data into array format using the **String To Byte Array**, namely display the waveform data on the **Waveform Graph** control and then remove the TMC data header using the **Array Subset** function.

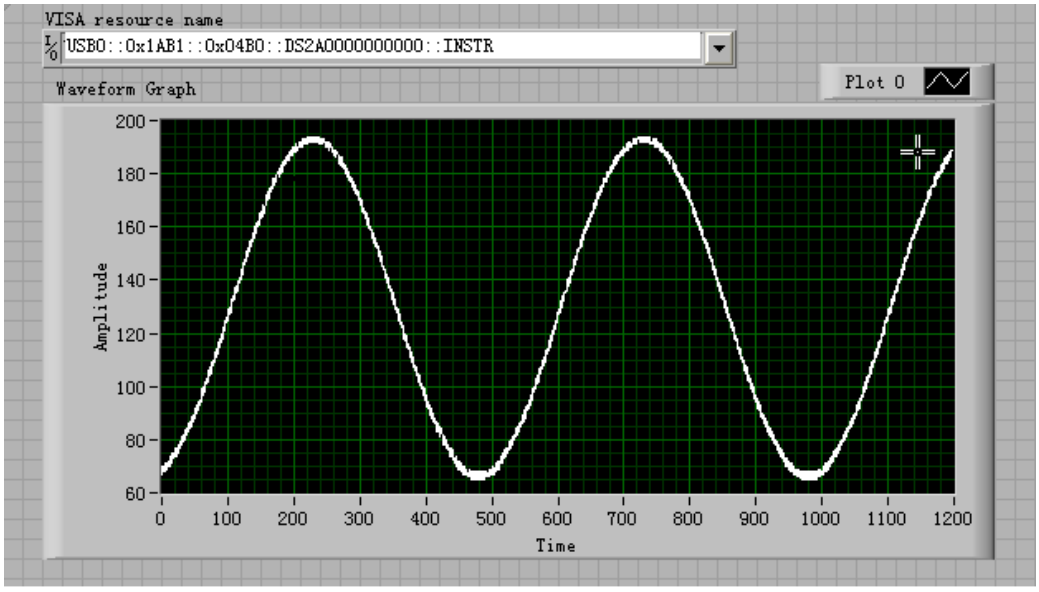




8. The complete program block diagram is as shown in the figure below.



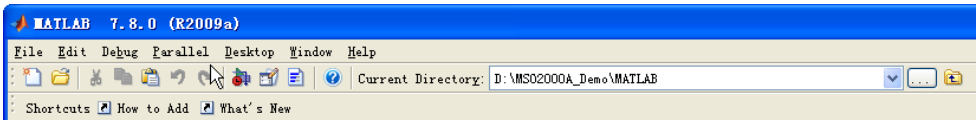
9. Select the device resource from the **VISA Resource Name** list box and run the program.



Matlab Programming Demo

The program used in this demo: MATLAB R2009a
The function realized in this demo: make FFT operation on the waveform data and draw the waveform.

1. Run the Matlab software and modify the current directory (namely modify the **Current Directory** at the top of the software). In this demo, the current directory is modified to D:\MSO2000A_Demo\MATLAB.

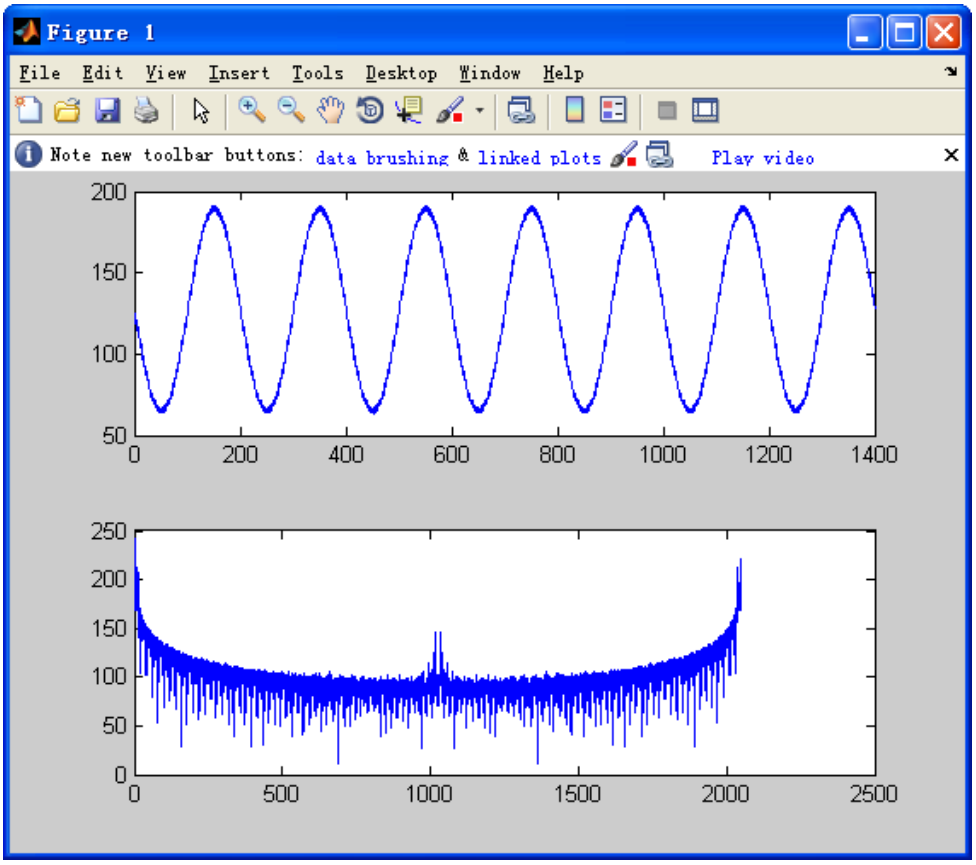


2. Click **File → New → Blank M-File** in the Matlab interface to create an empty M file. Add the following codes in the M file:

```
% Create VISA object . 'ni' is the saler Parameter and can be agilent, NI or tek.
'USB0::0x1AB1::0x04B0::DS2A0000000000::INSTR' is the device resource descriptor. You need to
set the device property. In this demo, set the length of the input buffer to 2048
MSO2000A = visa( 'ni','USB0::0x1AB1::0x04B0::DS2A0000000000::INSTR' );
MSO2000A.InputBufferSize = 2048;

% Open the VISA object created
fopen(MSO2000A);

% Request data
[data,len]= fread(MSO2000A,2048);

% Turn off the device
fclose(MSO2000A);
delete(MSO2000A);
clear MSO2000A;

% Data processing. The waveform data read contains the TMC header. The length of the header is 11
bytes; wherein, the first 2 bytes are the TMC header denoter (#) and the width descriptor (9)
respectively, the 9 bytes following are the length of the data which is followed by the waveform data
and the last byte is the terminator (0x0A). Therefore, the effective waveform points read is from the
12nd to the next to last.
wave = data(12:len-1);
wave = wave';
subplot(211);
plot(wave);
fftSpec = fft(wave',2048);
```

```
fftRms = abs( fftSpec');
fftLg = 20*log(fftRms);
subplot(212);
plot(fftLg);
```

3. Save the M file under the current directory. In this demo, the M file is named as MSO2000A_Demo_MATLAB.m. Run the M file and the running result is as follows.

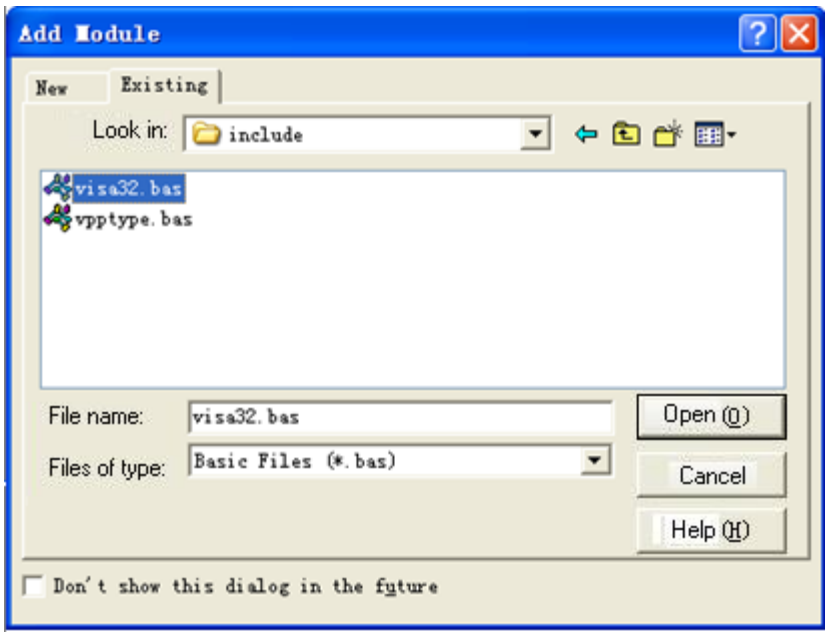


Visual Basic 6.0 Programming Demo

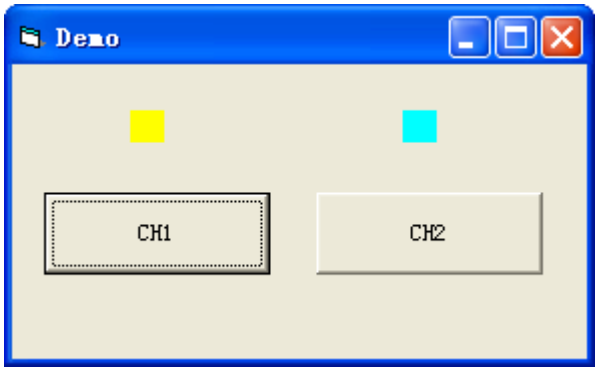
The program used in this demo: Visual Basic 6.0
The function realized in this demo: control the on/off state of any channel.

1. Build a standard application program project (Standard EXE) and name it as MSO2000A_Demo_VB.

2. Click the **Existing** tab of **Project→Add Module**. Search for the **visa32.bas** file in the **include** folder under the **NI-VISA** installation path and add the file.



3. Add two buttons to represent CH1 and CH2 respectively. Add two Labels (Label1(0) and Label1(1)) to represent the status of CH1 and CH2 respectively (when the channel is enabled, it dispays the color of the channel; when the channel is disabled, it displays gray), as shown in the figure below.



4. Open the **General** tab in **Project→Project1 Properties** and select **Form1** in the **Startup Object** dropdown box.

5. Double-click **CH1** to enter the programming environment. Add the following codes to control CH1 and CH2. The codes of CH1 are as shown below; the codes of CH2 are similar.

```
Dim defrm As Long
Dim vi As Long
Dim strRes As String * 200
Dim list As Long
Dim nmatches As Long
Dim matches As String * 200
Dim s32Disp As Integer

' acquire the usb source of visa
Call viOpenDefaultRM(defrm)
Call viFindRsrc(defrm, "USB?*", list, nmatches, matches)

' Open the device
Call viOpen(defrm, matches, 0, 0, vi)

' Send the command to query the status of CH1
Call viVPrintf(vi, ":CHAN1:DISP?" + Chr$(10), 0)

' Acquire the status of CH1
Call viVScanf(vi, "%t", strRes)
s32Disp = CInt(strRes)
If (s32Disp = 1) Then

' Send the setting command
Call viVPrintf(vi, ":CHAN1:DISP 0" + Chr$(10), 0)
Label1(0).ForeColor = &H808080 'Gray
Else
Call viVPrintf(vi, ":CHAN1:DISP 1" + Chr$(10), 0)
Label1(0).ForeColor = &HFFFF& 'Yellow
End If

' Close the device
Call viClose(vi)
Call viClose(defrm)
```

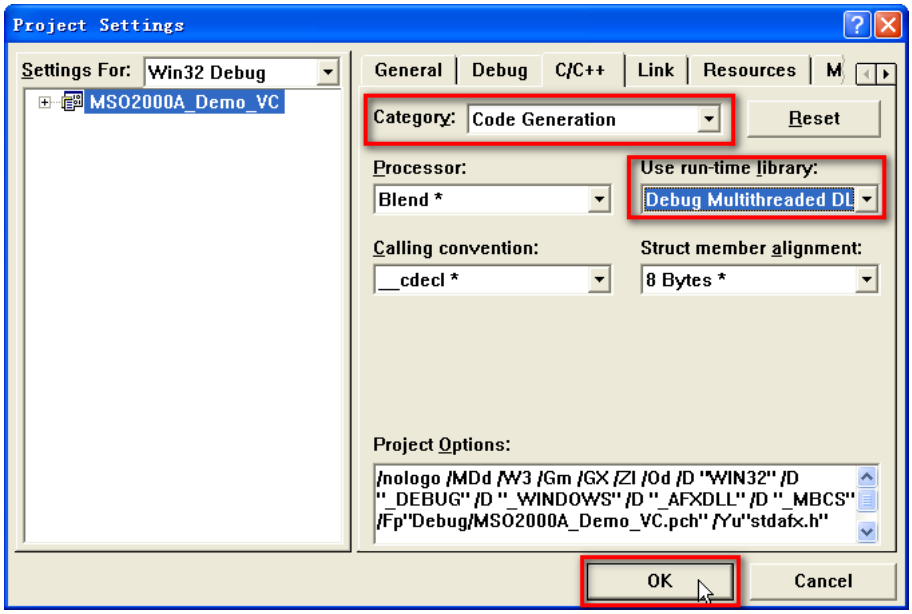
6. Save and run the project and a single exe program will be obtained. When the oscilloscope is correctly connected to the PC, the ON/OFF control of any channel can be realized.

Visual C++ 6.0 Programming Demo

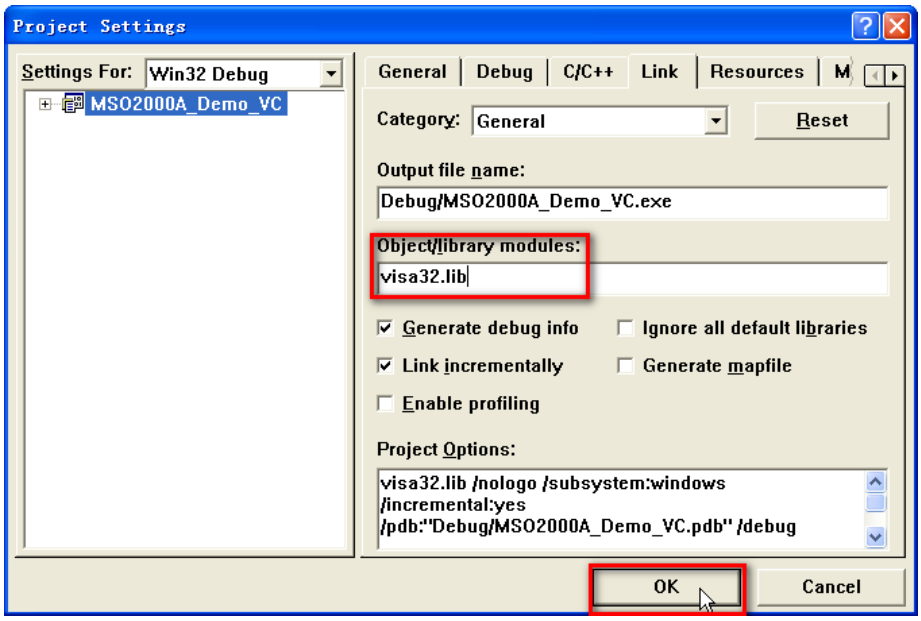
The program used in this demo: Microsoft Visual C++ 6.0
The functions realized in this demo: search for the instrument address, connect the instrument, send command and read the return value.

1. Run Microsoft Visual C++ 6.0 and create a MFC project based on dialog box. In this demo, the project is named as MSO2000A_Demo_VC.

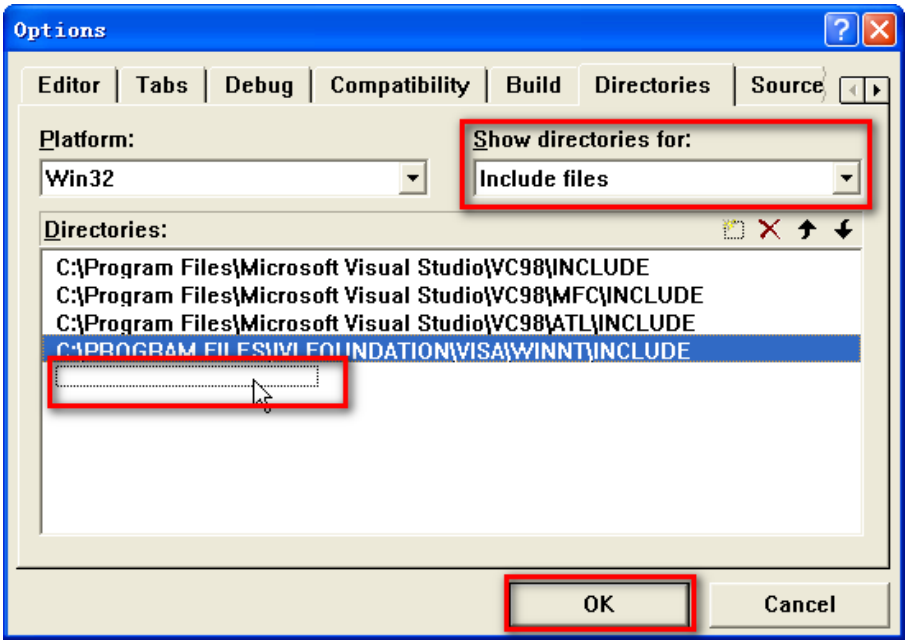
2. Open the **C/C++** tab in **Project→Settings**, select **Code Generation** in **Category** and **Debug Multithreaded DLL** in **Use run-time library**. Then, click **OK** to close the dialog box.



3. Open the **Link** tab in **Project→Settings** and add **visa32.lib** to the **Object/library modules** manually.

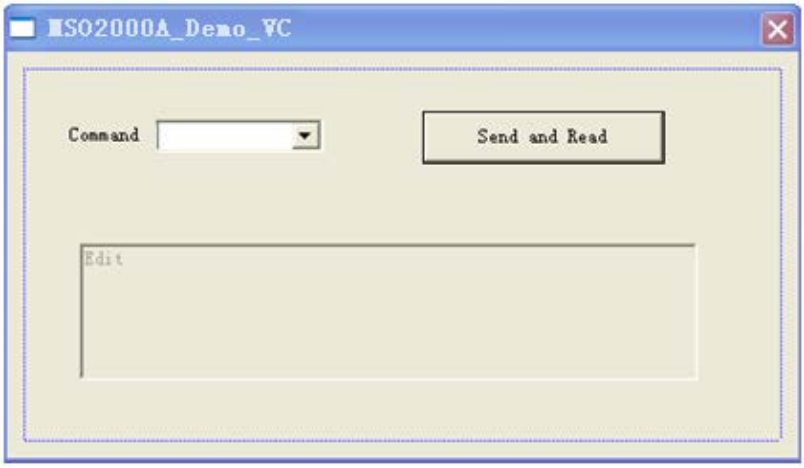


4. Open the **Directories** tab in **Tools→Options**.
   Select **Include files** in **Show directories for** and double-click the blank in **Directories** to add the path of **Include**: C:\Program Files\IVI Foundation\VISA\WinNT\include.
   Select **Library files** in **Show directories for** and double-click the blank in **Directories** to add the path of **Lib**: C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc.



   At present, VISA library has been added.

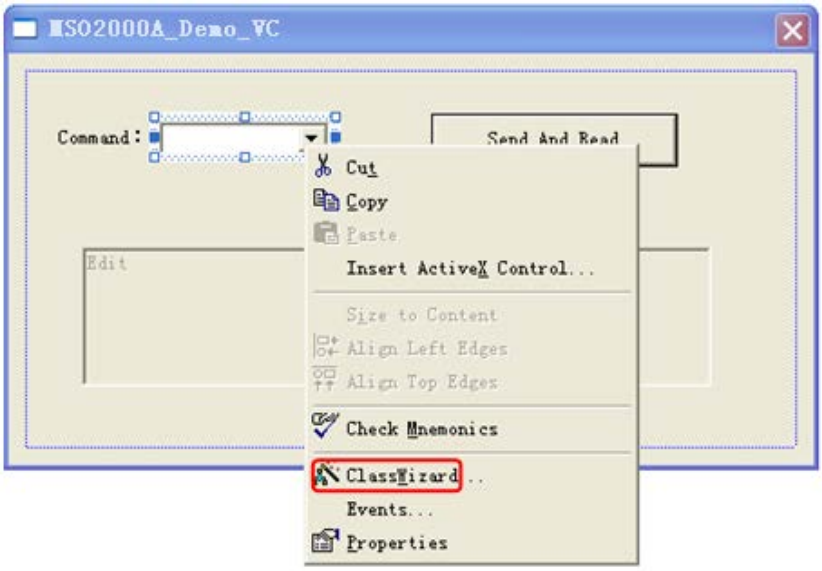
5. Add the **Text**, **Combo Box**, **Button** and **Edit Box** controls as shown in the figure below.

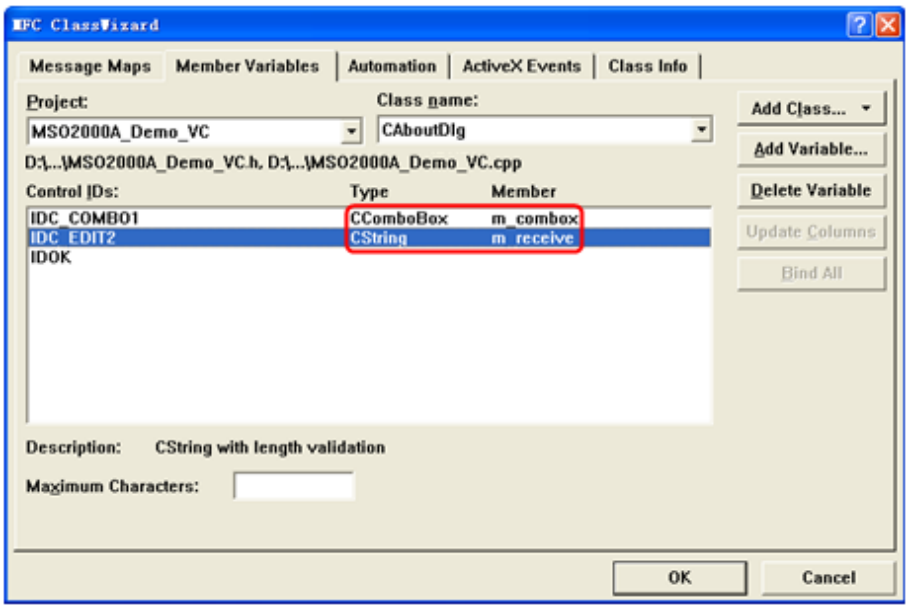


6. Modify the control attribute.
   1) Name **Text** as "Command".
   2) Open the **Data** item in **Combo Box** attribute and input the following three commands manually.
      *IDN?
      :CHAN1:DISP 1
      :CHAN1:DISP 0

3) Open the **General** item in **Edit Box** attribute and select **Disabled**.
4) Name **Button** as **Send and Read**.

7. Add the variables **m_combox** and **m_receive** for the **Combo Box** and **Edit** controls respectively.

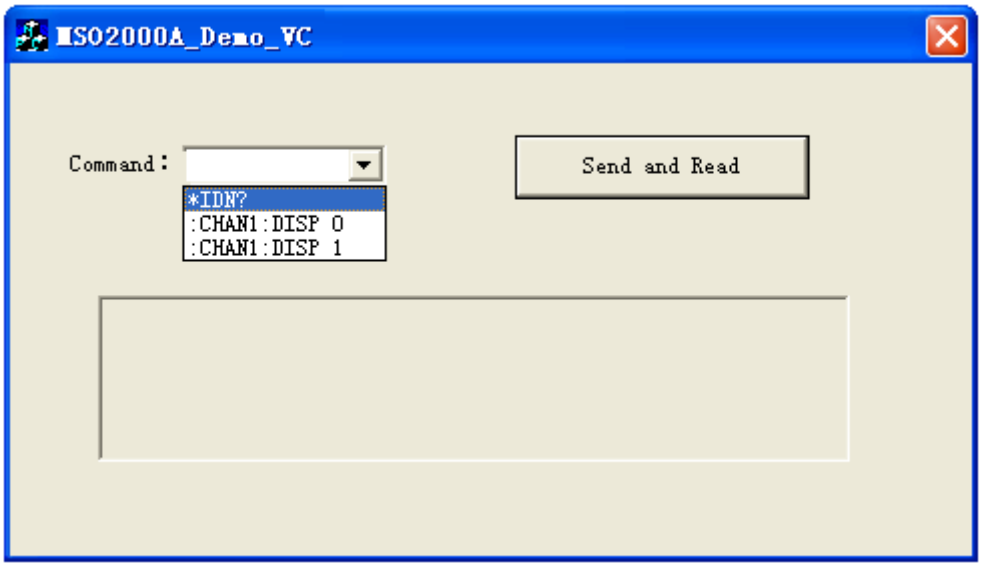




8. Add codes.

Double-click **Send and Read** to enter the programming environment. Declare the **#include <visa.h>** of the visa library in the header file and then add the following codes.

```
ViSession defaultRM, vi;
char buf [256] = {0};
CString s,strTemp;
char* stringTemp;
ViChar buffer [VI_FIND_BUFLEN];
ViRsrc matches=buffer;
ViUInt32 nmatches;
```

```
ViFindList list;
viOpenDefaultRM (&defaultRM);
// Acquire the USB resource of visa
viFindRsrc(defaultRM, "USB?*", &list,&nmatches, matches);
viOpen (defaultRM,matches,VI_NULL,VI_NULL,&vi);
viPrintf (vi, "*RST\n");
// Send the command received
m_combox.GetLBText(m_combox.GetCurSel(),strTemp);
strTemp = strTemp + "\n";
stringTemp = (char *)(LPCTSTR)strTemp;
viPrintf (vi,stringTemp);
// Read the result
viScanf (vi, "%t\n", &buf);
// Display the result
UpdateData (TRUE);
m_receive = buf;
UpdateData (FALSE);
viClose (vi);
viClose (defaultRM);
```

9. Save, compile and run the project and a single exe file can be obtained. When the oscilloscope is correctly connected to the PC, you can select the command *IDN? and click **Send and Read** to display the return result of the oscilloscope.