

RIGOL

Programming Guide

DS4000E Series Digital Oscilloscope

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RIGOL TECHNOLOGIES, INC.

Guaranty and Declaration

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Document Overview

This manual is your guide to programming **RIGOL** DS4000E series digital oscilloscope.

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For the newest version of this manual, please download it from **RIGOL** official website (www.rigol.com).

Main Topics in this Manual:

Chapter 1 SCPI Command Overview

This chapter introduces the syntax, symbols, parameters, and abbreviation rules of the SCPI commands.

Chapter 2 Command System

This chapter introduces the syntax, function, parameters, and usage of each command.

Chapter 3 Programming Examples

This chapter illustrates how to control the DS4000E series digital oscilloscope by programming in Excel, LabVIEW, MATLAB, Visual Basic 6.0, and Visual C++ 6.0.

Format Conventions in this Manual:

1. Function Key

The key on the front panel is denoted by the format of "Key Name (Bold) + Text Box" in the manual. For example, **Utility** denotes the "Utility" key.

2. Menu Softkey

The menu softkey is denoted by the format of "Menu Name (Bold) + Character Shading" in the manual. For example, **System** denotes the "System" softkey under **Utility**.

3. Operation Procedures

The next step is denoted by the arrow key ("→"). For example, **Utility** → **System** denotes that first press **Utility**, and then press the **System** softkey.

Content Conventions in this Manual:

DS4000E series includes the following models. Unless otherwise specified, this manual takes DS4024E as an example to make a detailed introduction about the commands of DS4000E series.

Model	Bandwidth	No. of Channels
DS4024E	200 MHz	4
DS4014E	100 MHz	4

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Chapter 1 SCPI Command Overview

This chapter introduces the syntax, symbols, parameters, and abbreviation rules of the SCPI commands.

Contents in this chapter:

- Syntax
- Symbol Description
- Parameter Type
- Command Abbreviation

Syntax

The SCPI commands provide a hierarchical tree structure, and consist of multiple subsystems. Each command subsystem consists of one root keyword and one or more sub-keywords. The command line usually starts with a colon; the keywords are separated by colons, and following the keywords are the parameter settings available. The command ending with a question mark indicates querying a certain function. The keywords of the command and the first parameter is separated by a space.

For example,

```
:CALCulate:ADVanced:EXPRession <str>
```

```
:CALCulate:ADVanced:EXPRession?
```

CALCulate is the root keyword of the command. ADVanced is the second-level keyword, and EXPRession is the third-level keyword. The command line starts with a colon, and a colon is also used to separate the multiple-level keywords. <str> represents the parameters available for setting. The command line ending with a question mark indicates that it is a query command.

The command :CALCulate:ADVanced:EXPRession and the parameter <str> are separated by a space.

In some commands with multiple parameters, commas are often used to separate these parameters. For example,

```
:SYSTem:DATE <year>,<month>,<day>.
```

Symbol Description

1. Braces { }

The contents enclosed in the braces are parameter options, which are usually separated by the vertical bar "|". When using the command, you must select one of the parameter options.

2. Vertical Bar |

The vertical bar is used to separate multiple parameter options. When using the command, you must select one of the parameter options.

3. Square Brackets []

The contents in the square brackets can be omitted.

4. Angle Brackets < >

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

Parameter Type

1. Bool

The available values for the parameter is 1 (ON) or 0 (OFF). 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 can be any of the values listed. For example,

```
:ACQuire:TYPE <type>
```

```
:ACQuire:TYPE?
```

Wherein, <type> can be set to NORMAL, AVERages, PEAK, or HRESolution.

The query returns NORM, AVER, PEAK, or HRES.

3. Integer

Unless otherwise specified, the parameter can be any integer within the effective value range. Do not set the parameter to a decimal or in scientific notation, otherwise, errors will occur. For example,

```
:DISPlay:GBRrightness <bright>
```

```
:DISPlay:GBRrightness?
```

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

The query returns an integer between 0 and 100.

4. Real

The parameter can be any real-value (in decimal form or in scientific notation) within the effective value range. For example,

```
:FUNCTion:WREPlay:INTerval <interval>
```

```
:FUNCTion:WREPlay:INTerval?
```

Wherein, <interval> can be set to any real number between 0.0000001 and 10; or any real number between (1.000000e-07, namely 100 ns) and (0.1e+02, namely 10 s).

The query returns a real number in scientific notation.

5. ASCII String

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

```
:CALCulate:ADVanced:EXPRession <str>
```

```
:CALCulate:ADVanced:EXPRession?
```

Wherein, <str> can be set to a legitimate expression that consists of any combinations of CH1, CH2, CH3, CH4, and operators. For example, CH1+CH2.

The query returns in strings.

Command Abbreviation

All the commands are case-insensitive. The commands can be all input in uppercase letters or in lowercase letters. For abbreviations, you must enter all the uppercase letters that exist in the command syntax.

For example, :MEASure:ADISplay?

can be abbreviated to :MEAS:ADIS?

Chapter 2 Command System

This chapter introduces the syntax, function, parameters, and usage of each DS4000E command.

Contents in this chapter:

- :AUToscale
- :CLEar
- :RUN
- :STOP
- :SINGle
- :TFORce
- :TLHAIf
- :ACQuire Commands
- :BUS<n> Commands
- :CALCulate Commands
- :CALibrate Commands
- :CHANnel<n> Commands
- :CURSor Commands
- :DISPlay Commands
- :EXT Commands
- :FUNCTion Commands
- IEEE 488.2 Common Commands
- :LAN Commands
- :MASK Commands
- :MEASure Commands
- :RECall Commands
- :REFerence Commands
- :SAVE Commands
- :SYSTem Commands
- :TIMEbase Commands
- :TRIGger Commands
- :WAVEform Commands

Note:

1. Unless otherwise specified, the descriptions and parameter range in this manual all take DS4024E as an example.
2. For the parameter setting command (time, frequency, amplitude, etc.), the digital oscilloscope can only recognize the numbers, unable to recognize the unit sent together with them. The unit of the parameter is a default one. For the default units of various parameters, refer to the descriptions for the specified command.

:AUToscale

Syntax

:AUToscale

Description

Enables the waveform auto setting function. The oscilloscope will automatically adjust the parameters such as vertical scale, horizontal time base, and trigger mode according to the input signal to realize an optimum waveform display. This command functions the same as the **AUTO** key on the front panel.

Remarks

- When the waveform auto setting function is disabled (refer to the :SYSTem:AUToscale command), this command is invalid.

- When the pass/fail test function is enabled (refer to the :MASK:ENABLE command), this command is invalid.
- The waveform auto setting function requires that the frequency of sine waveform is no less than 20 Hz, the duty cycle is greater than 1%, and the amplitude is at least 20 mVpp. Otherwise, the waveform auto setting function may be invalid.

:CLEar

Syntax

:CLEar

Description

Clears all the waveforms on the screen. If the oscilloscope is in the RUN state, after the waveform data is cleared, new waveform data will be displayed. This command functions the same as the **CLEAR** key on the front panel.

:RUN

:STOP

Syntax

:RUN

:STOP

Description

The :RUN command starts the oscilloscope and the :STOP command stops the oscilloscope. This command functions the same as the **Run/Stop** key on the front panel.

Remarks

If the oscilloscope is in a single trigger mode (refer to the :SINGle command), you can use the :RUN command to set the trigger mode of the oscilloscope to "Auto", and keep the oscilloscope in the "Run" state. If the oscilloscope is in a single trigger mode (refer to the :SINGle command) and in WAIT state, you can use the :STOP command to set the trigger mode of the oscilloscope to "Auto", and keep the oscilloscope in the "Stop" state.

:SINGle

Syntax

:SINGle

Description

Sets the trigger mode of the oscilloscope to "Single". This command functions the same as the **Single** key on the front panel.

Remarks

- In the single trigger mode, the oscilloscope performs a single trigger when the trigger conditions are met and then it stops. You can use the :TFORce command to generate a trigger by force.
- If the oscilloscope is in a single trigger mode, you can use the :RUN command to set the trigger mode of the oscilloscope to "Auto", and keep the oscilloscope in the "Run" state.
- If the oscilloscope is in a single trigger mode and in WAIT state, you can use the :STOP command to set the trigger mode of the oscilloscope to "Auto", and keep the oscilloscope in the "Stop" state.

:TFORce

Syntax

:TFORce

Description

Generates a trigger signal forcefully. This command is only applicable to the normal and single trigger modes, refer to the :TRIGger:SWEEp command. This command functions the same as the **FORCE** key in the trigger control area of the front panel.

:TLHAIf

Syntax

:TLHAIf

Description

Sets the trigger level to the vertical midpoint of the amplitude of a trigger signal. This command functions the same as the **50%** key in the trigger control area of the front panel.

:ACQUIRE Commands

Command List^[1]:

- :ACQUIRE:AALias
- :ACQUIRE:AVERages
- :ACQUIRE:MDEPTH
- :ACQUIRE:SRATE?
- :ACQUIRE:TYPE

Note^[1]: In the "Command List" in this manual, the query commands and the parameters in the setting commands are omitted. You can refer to the complete introductions of the commands in the body of the text based on the keywords listed here.

:ACQUIRE:AALias

Syntax

```
:ACQUIRE:AALias <bool>
:ACQUIRE:AALias?
```

Description

Enables or disables the anti-aliasing function of the oscilloscope; or queries the on/off status of the anti-aliasing function.

Parameter

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

Return Format

The query returns 1 or 0.

:ACQUIRE:AVERages

Syntax

```
:ACQUIRE:AVERages <count>
:ACQUIRE:AVERages?
```

Description

Sets or queries the number of averages in the average acquisition mode (refer to the :ACQUIRE:TYPE command).

Parameter

Name	Type	Range	Default
<count>	Integer	2 ⁿ (n indicates an integer between 1 and 13).	2

Remarks

In the average acquisition mode, the oscilloscope will acquire the waveform samples for several times, then make an average on the waveforms, so as to lower the random noises of the input signals and increase its vertical resolution. Greater number of averages can lower the noises and increase the vertical resolution, but will also slow the response of the displayed waveform to the waveform changes.

Return Format

The query returns an integer.

:ACQUIRE:MDEPTH

Syntax

```
:ACQUIRE:MDEPTH <mdep>
:ACQUIRE:MDEPTH?
```

Description

Sets or queries the memory depth of the oscilloscope (namely the number of waveform points that can be stored through sampling in a single trigger). The default unit is pts (points).

Parameter

Name	Type	Range	Default
<mdep>	Discrete	AUTO 7000 70000 700000 7000000	AUTO

Remarks

The formula below describes the relationship among memory depth, sample rate, and waveform length:
 $\text{memory depth} = \text{sample rate} \times \text{waveform length}$

Wherein, waveform length = horizontal time base x number of grids in the horizontal direction on the screen. For DS4000E, the number of grids in the horizontal direction on the screen is a fixed value 14. When <mdep> is set to "AUTO", the oscilloscope will select the memory depth automatically according to the current sample rate and horizontal time base (refer to the :TIMEbase[:MAIN]:SCALE command).

Return Format

The query returns an integer.

:ACQUIRE:SRATE?

Syntax

```
:ACQUIRE:SRATE?
```

Description

Queries the current sample rate of the oscilloscope. The default unit is Sa/s.

Return Format

The query returns the sample rate in scientific notation.

:ACQUIRE:TYPE

Syntax

```
:ACQUIRE:TYPE <type>
:ACQUIRE:TYPE?
```

Description

Sets or queries the data acquisition mode of the oscilloscope.

Parameter

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

Remarks

- **NORMAL**: In this mode, the oscilloscope samples the signal at the same interval to reconstruct the waveform. For most of the waveforms, this mode can realize the best display effects.
- **AVERages**: In this mode, the oscilloscope will acquire the waveform samples for several times, then

make an average on the waveforms, so as to lower the random noises of the input signals and increase its vertical resolution. You can use the `:ACQUIRE:AVERages` command to set the number of averages in this mode.

- **PEAK:** The oscilloscope samples the maximum and minimum value of the signal at the fixed sampling interval to acquire the signal envelope or the narrow pulses that might be lost. This mode can avoid the signal aliasing, but produces greater noises.
- **HRESolution:** The oscilloscope will average the adjacent sample points of the sample waveform to lower the random noises of the input signals and display much more smoother waveforms. If the sample rate of the digital convertor is greater than the storage rate of the acquisition memory, this mode is often adopted.

Return Format

The query returns NORM, AVER, PEAK, or HRES.

:BUS<n> Commands

Command List:

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

:BUS<n>:DATA?

Syntax

:BUS<n>:DATA?

Description

Reads the data in the decoding event table.

Parameter

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

Return Format

Returns the data in the decoding event table with the following formats.

```
#9000000077Parallel
```

```
Time,Data,
```

```
-9.3508796E-04,1,
```

```
6.5072008E-05,1,
```

```
1.0636000E-03,1,
```

Wherein, "#9000000077" is the TMC data block header, which is followed by the data in the event table. The 9-digit data following #9 in the data block header indicates the number of bytes of the effective data. "Parallel" indicates the decoding type. The available decoding type can also be RS232, I2C, SPI, CAN, or Flex. The data are separated by colons, and will automatically switch to the next line according to the line length limit in the decoding list. The data value is related to the set numeral system.

Note: You can save all the data except TMC data block header (#9) and decoding type (Parallel) as the "*.csv" file and view the data in the form of a list.

:BUS<n>:DISPlay

Syntax

```
:BUS<n>:DISPlay <bool>
:BUS<n>:DISPlay?
```

Description

Enables or disables the display of the specified decoding bus; or queries the on/off display status of the specified decoding 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>:EEXPort

Syntax

```
:BUS<n>:EEXPort
```

Description

Exports the decoding information in the specified decoding bus event table to the external USB storage device (if detected) in CSV form.

Parameter

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

:BUS<n>:EVENT

Syntax

```
:BUS<n>:EVENT <bool>
:BUS<n>:EVENT?
```

Description

Enables or disables the event table of the specified decoding bus; or queries the on/off status of the specified decoding bus event table.

Parameter

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

Remarks

Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).

Return Format

The query returns 1 or 0.

:BUS<n>:FORMat

Syntax

```
:BUS<n>:FORMat <format>
:BUS<n>:FORMat?
```

Description

Sets or queries the display format of decoding data of the specified decoding bus.

Parameter

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

Return Format

The query returns HEX, DEC, BIN, or ASC.

:BUS<n>:MODE

Syntax

```
:BUS<n>:MODE <mode>
:BUS<n>:MODE?
```

Description

Sets or queries the decoding type of the specified decoding bus.

Parameter

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

Remarks

RS232 decoding, IIC decoding, SPI decoding, CAN decoding, and FlexRay decoding are optional functions. This command can be used only when you have installed these options.

Return Format

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

:BUS<n>:CAN (Option)

Command List:

- :BUS<n>:CAN:BAUD
- :BUS<n>:CAN:BUSeR
- :BUS<n>:CAN:OFFSet
- :BUS<n>:CAN:SOURce
- :BUS<n>:CAN:SPOint
- :BUS<n>:CAN:STYPe
- :BUS<n>:CAN:THReShold

:BUS<n>:CAN:BAUD

Syntax

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

Description

Sets or queries 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

Remarks

When <baud> is set to "USER", you can use the :BUS<n>:CAN:BUSeR command to self-define the signal rate of CAN decoding on the specified bus.

Return Format

The query returns 100000, 125000, 250000, 400000, 500000, 800000, 1000000, or USER.

:BUS<n>:CAN:BUSeR

Syntax

```
:BUS<n>:CAN:BUSeR <baud>
:BUS<n>:CAN:BUSeR?
```

Description

Sets or queries 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 an integer between 10000 and 1000000.

:BUS<n>:CAN:OFFSet**Syntax**

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

:BUS<n>:CAN:OFFSet?

Description

Sets or queries the vertical position of CAN decoding data line on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DElay:ENABle and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:CAN:SOURce**Syntax**

:BUS<n>:CAN:SOURce <source>

:BUS<n>:CAN:SOURce?

Description

Sets or queries the source channel of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:CAN:SPOint**Syntax**

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

Description

Sets or queries the sample point position of CAN decoding on the specified bus (expressed in %).

Parameter

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

Remarks

The sample point is within the range of the bit time. The oscilloscope samples the bit level at the sample point. The sample point position is expressed as the ratio of "time from the bit start to the sample point" to "bit time", in %.

Return Format

The query returns an integer between 5 and 95.

:BUS<n>:CAN:STYPe**Syntax**

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

Description

Sets or queries the signal type of CAN decoding on the specified bus.

Parameter

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

Remarks

- RX: indicates the Receive signal from the CAN bus transceiver.
- TX: indicates the Transmit signal from the CAN bus transceiver.
- CANH: indicates the actual CAN_H differential bus signal.
- CANL: indicates the actual CAN_L differential bus signal.
- DIFFerential: indicates the CAN differential bus signal connected to an analog channel by using a differential probe. The positive polarity of the differential probe connects the CAN_H bus signal, and the negative polarity connects the CAN_L bus signal.

Return Format

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

:BUS<n>:CAN:THReshold**Syntax**

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

:BUS<n>:CAN:THReshold?

Description

Sets or queries the threshold of the current source channel of CAN decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:FLEXray (Option)

Command List:

- :BUS<n>:FLEXray:BAUD
- :BUS<n>:FLEXray:OFFSet
- :BUS<n>:FLEXray:SOURce
- :BUS<n>:FLEXray:SPoint
- :BUS<n>:FLEXray:STYPe
- :BUS<n>:FLEXray:THReshold

:BUS<n>:FLEXray:BAUD

Syntax

:BUS<n>:FLEXray:BAUD <baud>

:BUS<n>:FLEXray:BAUD?

Description

Sets or queries the signal rate of FlexRay decoding on the specified bus. The default unit is b/s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<baud>	Discrete	{2500000 5000000 10000000}	10000000

Return Format

The query returns 2500000, 5000000, or 10000000.

:BUS<n>:FLEXray:OFFSet

Syntax

:BUS<n>:FLEXray:OFFSet <val>

:BUS<n>:FLEXray:OFFSet?

Description

Sets or queries the vertical position of FlexRay decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DELay:ENABLE and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located

below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:FLEXray:SOURce

Syntax

:BUS<n>:FLEXray:SOURce <source>

:BUS<n>:FLEXray:SOURce?

Description

Sets or queries the source channel of FlexRay decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:FLEXray:SPoint

Syntax

:BUS<n>:FLEXray:SPoint <spo>

:BUS<n>:FLEXray:SPoint?

Description

Sets or queries the sample point position of FlexRay decoding on the specified bus (expressed in %).

Parameter

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

Remarks

The sample point is within the range of the bit time. The oscilloscope samples the bit level at the sample point. The sample point position is expressed as the ratio of "time from the bit start to the sample point" to "bit time", in %.

Return Format

The query returns an integer between 5 and 95.

:BUS<n>:FLEXray:STYPe

Syntax

:BUS<n>:FLEXray:STYPe <type>

:BUS<n>:FLEXray:STYPe?

Description

Sets or queries the signal type of FlexRay decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<type>	Discrete	{BP BM RT}	BP

Return Format

The query returns BP, BM, or RT.

:BUS<n>:FLEXray:THReshold**Syntax**

:BUS<n>:FLEXray:THReshold <thre>

:BUS<n>:FLEXray:THReshold?

Description

Sets or queries the threshold of the current source channel of FlexRay decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:IIC (Option)

Command List:

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

:BUS<n>:IIC:OFFSet

Syntax

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

Description

Sets or queries the vertical position of IIC decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DELay:ENABLE and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:IIC:SCLK:SOURce

Syntax

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

Description

Sets or queries the source channel of the clock line of IIC decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:IIC:SCLK:THReshold**Syntax**

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

Description

Sets or queries the threshold of the current clock line source channel of IIC decoding on the specified bus. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the clock line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the clock line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:IIC:SDA:SOURce**Syntax**

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

Description

Sets or queries the source channel of the data line of IIC decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:IIC:SDA:THReshold**Syntax**

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

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

Description

Sets or queries the threshold of the current data line source channel of IIC decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the data line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:PARAllel

Command List:

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

:BUS<n>:PARAllel:BSET

Syntax

```
:BUS<n>:PARAllel:BSET <b0>[,<b1>[,<b2>[,<b3>]]]
:BUS<n>:PARAllel:BSET?
```

Description

Sets or queries the source channel of each bit of the data line of Parallel decoding on specified bus; or queries the data line source channel of Parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<b0>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<b1>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<b2>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<b3>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

- This command also sets the bit width (ranges from 1 to 4 and equals to the number of the specified channel sources) of Parallel decoding.
- The bit order is LSB first.

Return Format

The query returns the channel source of each bit (with the LSB-first bit order) of the current data line. The channel sources are separated by commas.

:BUS<n>:PARAllel:CLK

Syntax

```
:BUS<n>:PARAllel:CLK <source>
:BUS<n>:PARAllel:CLK?
```

Description

Sets or queries the source channel of the clock line of Parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 OFF}	CHANnel1

Remarks

You can send the :BUS<n>:PARAllel:SLOPe command to sample data channel's data on the rising edge, falling edge, or either of the edges of the clock signal. When <source> is set to "OFF" (disabling the clock channel), sampling is performed when a hop occurs to the data of the data channel during decoding.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or OFF.

:BUS<n>:PARAllel:OFFSet**Syntax**

```
:BUS<n>:PARAllel:OFFSet <val>
:BUS<n>:PARAllel:OFFSet?
```

Description

Sets or queries the vertical position of Parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DElay:ENABle and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:PARAllel:SLOPe**Syntax**

```
:BUS<n>:PARAllel:SLOPe <slope>
:BUS<n>:PARAllel:SLOPe?
```

Description

Sets or queries the edge type of the clock signal of Parallel decoding on the specified bus.

Parameter

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

Remarks

- POSitive: samples the data of the data channel on the rising edge of the clock signal.
NEGative: samples the data of the data channel on the falling edge of the clock signal.
BOTH: samples the data of the data channel on both the rising and falling edge of the clock signal.
- If the clock channel is currently not set (refer to the :BUS<n>:PARAllel:CLK command), you do not need to use the command to set the edge type.

Return Format

The query returns POS, NEG, or BOTH.

:BUS<n>:PARAllel:THReshold**Syntax**

:BUS<n>:PARAllel:THReshold <source>,<thre>

:BUS<n>:PARAllel:THReshold? <source>

Description

Sets or queries the threshold level of the specified analog channel of Parallel decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the specified analog channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the specified analog channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:RS232 (Option)

Command List:

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

:BUS<n>:RS232:BAUD

Syntax

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

Description

Sets or queries the baud rate of data 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 230400 460800 921600 1000000 USER}	9600

Remarks

When <baud> is set to "USER", you can use the :BUS<n>:RS232:BUSeR command to self-define the signal rate of RS232 decoding on the specified bus.

Return Format

The query returns an integer or USER.

:BUS<n>:RS232:BUSeR

Syntax

```
:BUS<n>:RS232:BUSeR <baud>
:BUS<n>:RS232:BUSeR?
```

Description

Sets or queries the user-defined baud rate of data of RS232 decoding on the specified bus. The default unit is bps.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<baud>	Integer	11 to 20000000	9600

Return Format

The query returns an integer.

:BUS<n>:RS232:DBITs**Syntax**

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

:BUS<n>:RS232:DBITs?

Description

Sets or queries the data width (namely the actual number of data bits for each frame of data) 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:ENDian**Syntax**

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

:BUS<n>:RS232:ENDian?

Description

Sets or queries the bit order of data of RS232 decoding on the specified bus.

Parameter

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

Remarks

- LSB: Least Significant Bit. The transmission sequence shall be is in ascending order.
- MSB: Most Significant Bit. The transmission sequence shall be is in descending order.

Return Format

The query returns LSB or MSB.

:BUS<n>:RS232:OFFSet**Syntax**

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

:BUS<n>:RS232:OFFSet?

Description

Sets or queries the vertical position of TX and/or RX of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DElay:ENABle and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:RS232:PACKet**Syntax**

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

Description

Enables or disables the packet display of data of RS232 decoding on the specified bus; or queries the on/off status of data packet display of RS232 decoding on the specified bus.

Parameter

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

Remarks

When the packet display is on, multiple data blocks will be combined based on the currently selected packet end (refer to the :BUS<n>:RS232:PENd command).

Return Format

The query returns 1 or 0.

:BUS<n>:RS232:PARity**Syntax**

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

Description

Sets or queries the parity mode of data of RS232 decoding on the specified bus.

Parameter

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

Remarks

- None: indicates that there is no parity bit in data transmission.
- ODD: indicates the odd parity bit. The total count of occurrences of 1 in the data bit and check bit is an odd number. For example, if 0x55 (01010101) is transmitted, 1 shall be added to the check bit.
- Even: indicates the even parity bit. The total count of occurrences of 1 in the data bit and check bit is an even number. For example, if 0x55 (01010101) is transmitted, 0 shall be added to the check bit.

Return Format

The query returns NONE, ODD, or EVEN.

:BUS<n>:RS232:PEND**Syntax**

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

Description

Sets or queries the packet end of data of RS232 decoding on the specified bus.

Parameter

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

Remarks

- The parameters are represented in hexadecimal as follows:
 NULL: 00
 LF: 0A
 CR: 0D
 SP: 20
 FF: FF
- When the packet display is on (refer to the :BUS<n>:RS232:PACKet command), multiple data blocks will be combined based on the currently selected end of packet (EOP).

Return Format

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

:BUS<n>:RS232:POLarity**Syntax**

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

Description

Sets or queries the polarity of RS232 decoding on the specified bus.

Parameter

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

Remarks

- NEGative: Use negative logic. High level indicates logic "0"; low level indicates logic "1".
- POSitive: Use positive logic. High level indicates logic "1"; low level indicates logic "0".

Return Format

The query returns POS or NEG.

:BUS<n>:RS232:RTHReshold**Syntax**

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

:BUS<n>:RS232:RTHReshold?

Description

Sets or queries the threshold of RX source channel of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<rthre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of RX source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of RX source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:RS232:RX**Syntax**

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

:BUS<n>:RS232:RX?

Description

Sets or queries RX source channel of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 OFF}	OFF

Remarks

- When <source> is set to "OFF", it indicates that no RX source channel will be set.
- TX source channel (refer to the :BUS<n>:RS232:TX command) and RX source channel cannot be both set to "OFF".

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or OFF.

:BUS<n>:RS232:SBITs**Syntax**

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

:BUS<n>:RS232:SBITs?

Description

Sets or queries the number of stop bits following each frame of data of 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:TTHReshold**Syntax**

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

:BUS<n>:RS232:TTHReshold?

Description

Sets or queries the threshold of TX source channel of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<tthre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of TX source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of TX source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:RS232:TX**Syntax**

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

:BUS<n>:RS232:TX?

Description

Sets or queries TX source channel of RS232 decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 OFF}	CHANnel1

Remarks

- When <source> is set to "OFF", it indicates that TX source channel is not set.
- TX source channel and RX source channel (refer to the :BUS<n>:RS232:RX command) cannot be both set to "OFF".

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or OFF.

:BUS<n>:SPI (Option)

Command List:

- :BUS<n>:SPI:DBITs
- :BUS<n>:SPI:ENDian
- :BUS<n>:SPI:MISO:POLarity
- :BUS<n>:SPI:MISO:SOURce
- :BUS<n>:SPI:MISO:THReshold
- :BUS<n>:SPI:MODE
- :BUS<n>:SPI:MOSI:POLarity
- :BUS<n>:SPI:MOSI:SOURce
- :BUS<n>:SPI:MOSI:THReshold
- :BUS<n>:SPI:OFFSet
- :BUS<n>:SPI:SCLK:SLOPe
- :BUS<n>:SPI:SCLK:SOURce
- :BUS<n>:SPI:SCLK:THReshold
- :BUS<n>:SPI:SS:POLarity
- :BUS<n>:SPI:SS:SOURce
- :BUS<n>:SPI:SS:THReshold
- :BUS<n>:SPI:TIMEout:TIME

:BUS<n>:SPI:DBITs

Syntax

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

Description

Sets or queries the bus width of 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

Sets or queries the bit order of data transmission of SPI decoding on the specified bus.

Parameter

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

Remarks

- MSB: Most Significant Bit. The transmission sequence shall be is in descending order.
- LSB: Least Significant Bit. The transmission sequence shall be is in ascending order.

Return Format

The query returns MSB or LSB.

:BUS<n>:SPI:MISO:POLarity**Syntax**

```
:BUS<n>:SPI:MISO:POLarity <pol>
:BUS<n>:SPI:MISO:POLarity?
```

Description

Sets or queries the polarity of MISO data line of SPI decoding on the specified bus.

Parameter

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

Remarks

- If the source channel of MISO data line of SPI decoding on the specified bus is not set (refer to the :BUS<n>:SPI:MISO:SOURce command), the :BUS<n>:SPI:MISO:POLarity <pol>command is invalid.
- LOW: indicates that low level is 1 and high level is 0.
HIGH: indicates that high level is 1 and low level is 0.

Return Format

The query returns HIGH or LOW.

:BUS<n>:SPI:MISO:SOURce**Syntax**

```
:BUS<n>:SPI:MISO:SOURce <source>
:BUS<n>:SPI:MISO:SOURce?
```

Description

Sets or queries the source channel of MISO data line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 OFF}	CHANnel2

Remarks

- When <source> is set to "OFF", it indicates that the source channel of MISO data line is not set.
- If <source> is set to "CHANnel1", "CHANnel2", "CHANnel3", or "CHANnel4", you can use the :BUS<n>:SPI:MISO:THReshold command to set the threshold of the source channel of MISO data line.
- The source channels of MISO data line and MOSI data line (refer to the :BUS<n>:SPI:MOSI:SOURce command) cannot be both set to "OFF".

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or OFF.

:BUS<n>:SPI:MISO:THReshold**Syntax**

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

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

Description

Sets or queries the threshold of the source channel of MISO data line of SPI decoding on the specified bus. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the MISO data line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the MISO data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:SPI:MODE**Syntax**

:BUS<n>:SPI:MODE <mode>

:BUS<n>:SPI:MODE?

Description

Sets or queries the decode mode of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<mode>	Discrete	{CS TIMEout}	TIMEout

Remarks

- TIMEout: When the clock signal keeps in idle state for a specified time (greater than the time-out period), the oscilloscope will sample the data of the source channel of data line on the specified edge of the clock signal.
- CS: When the chip select signal is the specified level, the oscilloscope will sample the data of the source channel of data line on the specified edge of the clock signal.

Return Format

The query returns CS or TIM.

:BUS<n>:SPI:MOSI:POLarity**Syntax**

:BUS<n>:SPI:MOSI:POLarity <pol>

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

Description

Sets or queries the polarity of MOSI data line of SPI decoding on the specified bus.

Parameter

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

Remarks

- If the source channel of MOSI data line of SPI decoding on the specified bus is not set (refer to the :BUS<n>:SPI:MOSI:SOURce command), the :BUS<n>:SPI:MOSI:POLarity <pol> command is invalid.
- LOW: indicates that low level is 1 and high level is 0.
HIGH: indicates that high level is 1 and low level is 0.

Return Format

The query returns HIGH or LOW.

:BUS<n>:SPI:MOSI:SOURce**Syntax**

:BUS<n>:SPI:MOSI:SOURce <source>

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

Description

Sets or queries the source channel of MOSI data line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 OFF}	OFF

Remarks

- When <source> is set to "OFF", it indicates that the source channel of MOSI data line is not set.
- If <source> is set to "CHANnel1", "CHANnel2", "CHANnel3", or "CHANnel4", you can use the :BUS<n>:SPI:MOSI:THReshold command to set the threshold of the source channel of MOSI data line.
- The source channels of MISO data line (refer to the :BUS<n>:SPI:MISO:SOURce command) and MOSI data line cannot be both set to "OFF".

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or OFF.

:BUS<n>:SPI:MOSI:THReshold**Syntax**

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

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

Description

Sets or queries the threshold of the source channel of MOSI data line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the MOSI data line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the MOSI data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:SPI:OFFSet**Syntax**

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

:BUS<n>:SPI:OFFSet?

Description

Sets or queries the vertical position of MISO and/or MOSI data line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<val>	Integer	Refer to Remarks	0

Remarks

- Before using the command, enable the display of the specified decoding bus (refer to the :BUS<n>:DISPlay command).
- The range of <val> is related to the screen display mode and the on/off status of the statistic function (refer to the :MEASure:STATistic:DISPlay command).
When the display mode is "Full Screen" and the statistics function is disabled, the <val> parameter ranges from -166 to +148.
When the display mode is "Full Screen" and the statistics function is enabled, the <val> parameter ranges from -163 to +143.
When the display mode is "Split" (refer to the :TIMEbase:DElay:ENABLE and :CALCulate:FFT:SPLit command), the <val> parameter ranges from -103 to +52.
- When the data line that displays the decoding is located in the middle part of the screen, <val> is 0; when it is located above the middle part of the screen, <val> is a positive value; when it is located below the middle part of the screen, <val> is a negative value.

Return Format

The query returns an integer.

:BUS<n>:SPI:SCLK:SLOPe**Syntax**

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

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

Description

Sets or queries on which type of edges of the clock signal is sampling performed on the data of source channel of data line of SPI decoding on the specified bus.

Parameter

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

Remarks

POSitive: indicates the rising edge. NEGative: indicates the falling edge.

Return Format

The query returns POS or NEG.

:BUS<n>:SPI:SCLK:SOURce**Syntax**

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

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

Description

Sets or queries the source channel of the clock line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:SPI:SCLK:THReshold**Syntax**

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

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

Description

Sets or queries the threshold of the clock channel of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:SPI:SS:POLarity**Syntax**

:BUS<n>:SPI:SS:POLarity <pol>

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

Description

Sets or queries the polarity of CS line of SPI decoding on the specified bus.

Parameter

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

Remarks

- HIGH: indicates that the oscilloscope samples data of the source channel of data line on the specified edge of the clock signal when the CS signal is high level.
- LOW: indicates that the oscilloscope samples data of the source channel of data line on the specified edge of the clock signal when the CS signal is low level.

Return Format

The query returns HIGH or LOW.

:BUS<n>:SPI:SS:SOURce**Syntax**

:BUS<n>:SPI:SS:SOURce <source>

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

Description

Sets or queries the source channel of the CS line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:BUS<n>:SPI:SS:THReshold**Syntax**

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

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

Description

Sets or queries the threshold of the source channel of the CS line of SPI decoding on the specified bus.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the CS line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the CS line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:BUS<n>:SPI:TIMEout:TIME**Syntax**

:BUS<n>:SPI:TIMEout:TIME <time>

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

Description

Sets or queries the timeout value in the timeout decode mode of SPI decoding on the specified bus. The default unit is s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<time>	Real	100 ns to 1 s	1 μ s

Return Format

The query returns the timeout value in scientific notation.

:CALCulate Commands

Command List:

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

:CALCulate:MODE

Syntax

```
:CALCulate:MODE <mod>
:CALCulate:MODE?
```

Description

Sets or queries the type of math operation.

Parameter

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

Remarks

- ADD: adds the waveform voltage value of Source A and that of Source B point by point, then displays the results.
- SUB: subtracts the waveform voltage value of Source B from that of Source A point by point, then displays the results.
- MULTiply: multiplies the waveform voltage value of Source A by that of Source B point by point, then displays the results.
- DIVision: divides the waveform voltage value of Source A by that of Source B at each point, then displays the results. When the waveform voltage value of Source B is 0, the result of the division is treated as 0.
- FFT: quickly performs Fourier transform on the waveform of the source channel, then displays the results.
- LOGic: performs logic operation on the logic level (1 or 0) of the waveform of Source A and that of Source B point by point, then displays the results.
- ADVanced: performs advanced operation based on user-defined operation formula, then displays the results.
- OFF: disables the math operation function.

Return Format

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

:CALCulate:ADD

Command List:

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

:CALCulate:ADD:INVert

Syntax

```
:CALCulate:ADD:INVert <bool>
:CALCulate:ADD:INVert?
```

Description

Enables or disables the invert display of the waveform of addition operation; or queries the on/off status of the invert display of the waveform of addition operation.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:ADD:SA

:CALCulate:ADD:SB

Syntax

```
:CALCulate:ADD:SA <source>
:CALCulate:ADD:SA?
:CALCulate:ADD:SB <source>
:CALCulate:ADD:SB?
```

Description

Sets or queries the channel source of Source A or Source B in "add" operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:ADD:VOFFset**Syntax**

:CALCulate:ADD:VOFFset <offs>

:CALCulate:ADD:VOFFset?

Description

Sets or queries the vertical position of the addition operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the addition operation waveform) to (40 x vertical scale of the addition operation waveform)	0

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:ADD:VSCale**Syntax**

:CALCulate:ADD:VSCale <scale>

:CALCulate:ADD:VSCale?

Description

Sets or queries the vertical scale of the addition operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	2 V/div

Remarks

The default range of <scale> is from 0.02 V/div to 500 V/div. Its actual range is related to the vertical scale of the source channel (refer to the :CHANnel<n>:SCALE command), at 1-2-5 step.

Note: After the vertical scale of the source channel is modified, the range of <scale> will not be changed until the addition operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:ADVanced

Command List:

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

:CALCulate:ADVanced:EXPRession

Syntax

```
:CALCulate:ADVanced:EXPRession <str>
:CALCulate:ADVanced:EXPRession?
```

Description

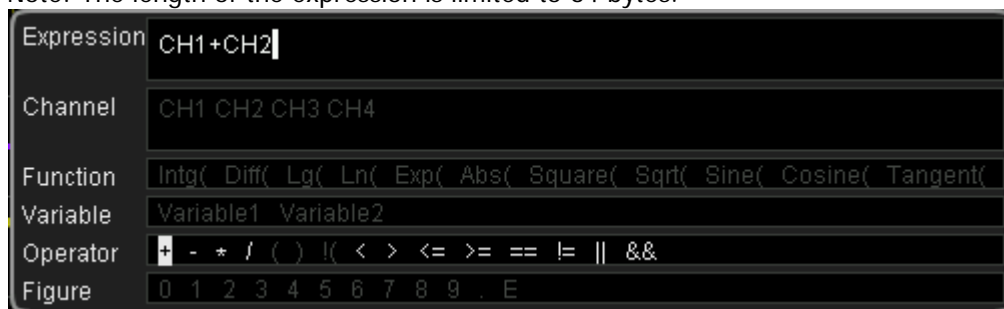
Sets or queries the expression of advanced operation.

Parameter

Name	Type	Range	Default
<str>	ASCII String	Refer to Remarks	CH1+CH2

Remarks

- Please enter legal expression by using the characters shown in the following figure.
Note: The length of the expression is limited to 64 bytes.



- You can specify Variable1 (refer to the :CALCulate:ADVanced:VARiable1 command) and/or Variable2 (refer to the :CALCulate:ADVanced:VARiable2 command) in the expression.

Return Format

The query returns the expression of advanced operation in strings.

:CALCulate:ADVanced:INVert

Syntax

```
:CALCulate:ADVanced:INVert <bool>
:CALCulate:ADVanced:INVert?
```

Description

Enables or disables the invert display of the advanced operation waveform; or queries the on/off status of the invert display of the advanced operation waveform.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:ADVanced:VARIABLE1**:CALCulate:ADVanced:VARIABLE2****Syntax**

:CALCulate:ADVanced:VARIABLE1 <variable>

:CALCulate:ADVanced:VARIABLE1?

:CALCulate:ADVanced:VARIABLE2 <variable>

:CALCulate:ADVanced:VARIABLE2?

Description

Sets or queries Variable1 or Variable2 in the expression of advanced operation.

Parameter

Name	Type	Range	Default
<variable>	Real	Refer to Remarks	0

Remarks

<variable> is in the AeB format. Wherein, A is mantissa, and its available range is from -9.9999 to +9.9999 (with the minimum step of 0.0001, that is, precision to four decimals). B refers to the exponent with 10 as the base, and its available value is an integer ranging from -9 to +9. In addition, <variable> can also be expressed in decimal, and its available range is the same with that of the AeB format.

Return Format

The query returns Variable1 or Variable2 in scientific notation.

:CALCulate:ADVanced:VOFFset**Syntax**

:CALCulate:ADVanced:VOFFset <offs>

:CALCulate:ADVanced:VOFFset?

Description

Sets or queries the vertical position of the advanced operation waveform. The unit is related to the expression of advanced operation.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the advanced operation waveform) to (40 x vertical scale of the advanced operation waveform)	0

Remarks

The expression of advanced operation (refer to the :CALCulate:ADVanced:EXPReSSion command) may contain CH1, CH2, CH3, or CH4.

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:ADVanced:VSCale**Syntax**

```
:CALCulate:ADVanced:VSCale <scale>
:CALCulate:ADVanced:VSCale?
```

Description

Sets or queries the vertical scale of the advanced operation waveform. The unit is related to the expression of advanced operation.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	2 V/div

Remarks

- The default range of <scale> is from 0.02 V/div to 500 V/div. Its actual range is related to the expression of the advanced operation (refer to the :CALCulate:ADVanced:EXPReSSion command), at 1-2-5 step.
- If the expression of advanced operation contains CH1, CH2, CH3, or CH4, then, the actual range of <scale> is related to the vertical scale of the specified channel (refer to the :CHANnel<n>:SCALE command).
For integration and differentiation operations, the actual range of <scale> is related to the current horizontal time base (refer to the :TIMEbase[:MAIN]:SCALE command).
Note: After the vertical scale of the specified channel is modified, the range of <scale> will not be changed until the advanced operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:DIVision

In the division operation, when the waveform voltage value of Source B is 0, the result of the division is treated as 0.

Command List:

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

:CALCulate:DIVision:INVert

Syntax

```
:CALCulate:DIVision:INVert <bool>
:CALCulate:DIVision:INVert?
```

Description

Enables or disables the invert display of the division operation waveform; or queries the on/off status of the invert display of the division operation waveform.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:DIVision:SA

:CALCulate:DIVision:SB

Syntax

```
:CALCulate:DIVision:SA <source>
:CALCulate:DIVision:SA?
:CALCulate:DIVision:SB <source>
:CALCulate:DIVision:SB?
```

Description

Sets or queries the channel source of Source A or Source B in division operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:DIVision:VOFFset**Syntax**

:CALCulate:DIVision:VOFFset <offs>

:CALCulate:DIVision:VOFFset?

Description

Sets or queries the vertical position of the division operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the division operation waveform) to (40 x vertical scale of the division operation waveform)	0

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:DIVision:VSCale**Syntax**

:CALCulate:DIVision:VSCale <scale>

:CALCulate:DIVision:VSCale?

Description

Sets or queries the vertical scale of the division operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	2 U/div

Remarks

The default range of <scale> is from 20 nU/div to 100 MU/div. Its actual range is related to the vertical scale of the source channel (refer to the :CHANnel<n>:SCALE command), at 1-2-5 step.

Note: After the vertical scale of the source channel is modified, the range of <scale> will not be changed until the division operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:FFT

Command List:

- :CALCulate:FFT:HCENter
- :CALCulate:FFT:HOFFset
- :CALCulate:FFT:HSCaLe
- :CALCulate:FFT:HSPan
- :CALCulate:FFT:SOURce
- :CALCulate:FFT:SPLit
- :CALCulate:FFT:VOFFset
- :CALCulate:FFT:VSCale
- :CALCulate:FFT:VSMoDe
- :CALCulate:FFT:WINDow

:CALCulate:FFT:HCENter

Syntax

```
:CALCulate:FFT:HCENter <center>
:CALCulate:FFT:HCENter?
```

Description

Sets or queries the center frequency of FFT operation. The default unit is Hz.

Parameter

Name	Type	Range	Default
<center>	Real	FFT horizontal position + 7 x FFT horizontal scale	8.750 MHz

Return Format

The query returns the center frequency in scientific notation.

:CALCulate:FFT:HOFFset

Syntax

```
:CALCulate:FFT:HOFFset <offs>
:CALCulate:FFT:HOFFset?
```

Description

Sets or queries the horizontal position of the FFT operation waveform. The default unit is Hz.

Parameter

Name	Type	Range	Default
<offs>	Real	Refer to Remarks	0

Remarks

- The range of <offs> is related to the on/off status of the anti-aliasing function, FFT sample rate (Sa), and FFT horizontal scale (Hspan). The relationship is shown as below:
When the anti-aliasing function is disabled, the range of <offs> is from (max{-0.5 x Sa, -14 x Hspan}) to (0.5 x Sa).
When the anti-aliasing function is enabled, the range of <offs> is from (max{-0.4 x Sa, -14 x Hspan}) to (0.4 x Sa).
Note: max{A, B} indicates selecting a greater value from A and B.
- FFT Sample Rate = Number of Pixels Per Grid Horizontally/Horizontal Time Base
Wherein, Number of Pixels Per Grid Horizontally is related to the on/off status of FFT anti-aliasing function. When the function is disabled, Number of Pixels Per Grid Horizontally is 50; when enabled, it

- is 100. For the value of Horizontal Time Base, refer to the :TIMEbase[:MAIN]:SCALE command.
- The FFT horizontal scale is related to the FFT sample rate and FFT horizontal coefficient, refer to the :CALCulate:FFT:HSPan command.

Return Format

The query returns the horizontal position in scientific notation.

:CALCulate:FFT:HSCaLe

Syntax

```
:CALCulate:FFT:HSCaLe <hscale>
:CALCulate:FFT:HSCaLe?
```

Description

Sets or queries the horizontal coefficient of FFT operation.

Parameter

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

Remarks

- This command indirectly sets the horizontal scale of FFT operation (refer to the :CALCulate:FFT:HSPan command). Different FFT horizontal coefficients represent different relationships between the FFT horizontal scale (Hspan) and FFT sample rate (Sa), as shown below.
 - 1: $Hspan = Sa/20$
 - 2: $Hspan = Sa/40$
 - 3: $Hspan = Sa/100$
 - 4: $Hspan = Sa/200$
- FFT Sample Rate = Number of Pixels Per Grid Horizontally/Horizontal Time Base
Wherein, Number of Pixels Per Grid Horizontally is related to the on/off status of FFT anti-aliasing function. When the function is disabled, Number of Pixels Per Grid Horizontally is 50; when enabled, it is 100. For the value of Horizontal Time Base, refer to the :TIMEbase[:MAIN]:SCALE command.

Return Format

The query returns 1, 2, 3, or 4.

:CALCulate:FFT:HSPan

Syntax

```
:CALCulate:FFT:HSPan <span>
:CALCulate:FFT:HSPan?
```

Description

Sets or queries the horizontal scale (namely the frequency value per grid horizontally) of the FFT operation waveform. The default unit is Hz/div.

Parameter

Name	Type	Range	Default
	Real	Refer to Remarks	1.25 MHz/div

Remarks

- The FFT horizontal scale is related to the current FFT sample rate (Sa), and it can be Sa/20, Sa/40, Sa/100, or Sa/200.
- FFT Sample Rate = Number of Pixels Per Grid Horizontally/Horizontal Time Base
Wherein, Number of Pixels Per Grid Horizontally is related to the on/off status of FFT anti-aliasing

function. When the function is disabled, Number of Pixels Per Grid Horizontally is 50; when enabled, it is 100. For the value of Horizontal Time Base, refer to the :TIMEbase[:MAIN]:SCALE command.

- You can set the FFT horizontal scale indirectly by setting the FFT horizontal coefficient (refer to the :CALCulate:FFT:HSCaLe command).

Return Format

The query returns the horizontal scale in scientific notation.

:CALCulate:FFT:SOURce

Syntax

```
:CALCulate:FFT:SOURce <source>
```

```
:CALCulate:FFT:SOURce?
```

Description

Sets or queries the source channel of FFT operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:FFT:SPLit

Syntax

```
:CALCulate:FFT:SPLit <bool>
```

```
:CALCulate:FFT:SPLit?
```

Description

Turns on or off the split display of FFT operation; or queries the on/off status of the split display of FFT operation.

Parameter

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

Remarks

- 1|ON: turns on split display. The source channel waveform and FFT operation waveform are displayed separately, with the time domain and frequency domain signals displayed clearly.
- 0|OFF: turns off split display. The source channel waveform and FFT operation waveform are displayed in the same window (namely full-screen display). You can observe the frequency spectrum more clearly and make more accurate measurements.

Return Format

The query returns 1 or 0.

:CALCulate:FFT:VOFFset**Syntax**

```
:CALCulate:FFT:VOFFset <offs>
:CALCulate:FFT:VOFFset?
```

Description

Sets or queries the horizontal position of the FFT operation waveform. The unit is related to the current vertical scale type of FFT operation and the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the FFT operation waveform) to (40 x vertical scale of the FFT operation waveform)	60 dBV

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:FFT:VScale**Syntax**

```
:CALCulate:FFT:VScale <scale>
:CALCulate:FFT:VScale?
```

Description

Sets or queries the vertical scale of the FFT operation waveform. The unit is related to the current vertical scale type of FFT operation and the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	20 dBV/div

Remarks

The range of <scale> is related to the vertical scale type of FFT operation (refer to the :CALCulate:FFT:VSMODE command).

- When the vertical scale type is "DB", the range of <scale> is from 1 dBV/div to 100 dBV/div, at 1-2-5 step.
- When the vertical scale type is "VRMS", the default range of <scale> is from 0.01 V/div to 200 V/div. Its actual range is related to the vertical scale of the source channel (refer to the :CHANNEL<n>:SCALE command), at 1-2-5 step.

Note: After the vertical scale of the source channel is modified, the range of <scale> will not be changed until the FFT operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:FFT:VSMODE**Syntax**

```
:CALCulate:FFT:VSMODE <vmode>
:CALCulate:FFT:VSMODE?
```

Description

Sets or queries the vertical scale type of FFT operation.

Parameter

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

Remarks

- VRMS: displays the vertical amplitude in linear mode.
- DB: displays the vertical amplitude in log mode.

Return Format

The query returns VRMS or DB.

:CALCulate:FFT:WINDow**Syntax**

```
:CALCulate:FFT:WINDow <window>
:CALCulate:FFT:WINDow?
```

Description

Sets or queries the window function of FFT operation.

Parameter

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

Remarks

- The window function can effectively reduce the spectrum leakage effect.
- Different window functions are applicable to measurements of different waveforms. Please select the proper window function according to the characteristics of the waveform to be measured.

Return Format

The query returns RECT, HANN, HAMM, or BLAC.

:CALCulate:LOGic

Command List:

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

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

Syntax

```
:CALCulate:LOGic:ATHReshold <thre>
:CALCulate:LOGic:ATHReshold?
:CALCulate:LOGic:BTHReshold <thre>
:CALCulate:LOGic:BTHReshold?
```

Description

Sets or queries the threshold of Source A or Source B in logic operation.

Parameter

Name	Type	Range	Default
<thre>	Real	(-4 x VerticalScale - Offset) to (4 x VerticalScale - Offset) Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the threshold level in scientific notation.

:CALCulate:LOGic:INVert

Syntax

```
:CALCulate:LOGic:INVert <bool>
:CALCulate:LOGic:INVert?
```

Description

Enables or disables the invert display of the logic operation waveform; or queries the on/off status of the invert display of the logic operation waveform.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:LOGic:OPERator**Syntax**

```
:CALCulate:LOGic:OPERator <oper>
:CALCulate:LOGic:OPERator?
```

Description

Sets or queries the logic operation formula.

Parameter

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

Return Format

The query returns AND, OR, NOT, or XOR.

**:CALCulate:LOGic:SA
:CALCulate:LOGic:SB****Syntax**

```
:CALCulate:LOGic:SA <source>
:CALCulate:LOGic:SA?
:CALCulate:LOGic:SB <source>
:CALCulate:LOGic:SB?
```

Description

Sets or queries the channel source of Source A or Source B in logic operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

If the logic operation formula (refer to the :CALCulate:LOGic:OPERator command) is "NOT", use the :CALCulate:LOGic:SA command only to specify the source channel.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:LOGic:VOFFset**Syntax**

:CALCulate:LOGic:VOFFset <offs>

:CALCulate:LOGic:VOFFset?

Description

Sets or queries the vertical position of the logic operation waveform. The default unit is U.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the logic operation waveform) to (40 x vertical scale of the logic operation waveform)	0

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:LOGic:VScale**Syntax**

:CALCulate:LOGic:VScale <scale>

:CALCulate:LOGic:VScale?

Description

Sets or queries the vertical scale of the logic operation waveform. The default unit is U.

Parameter

Name	Type	Range	Default
<scale>	Real	0.05 U/div to 100 U/div, at 1-2-5 step	1 U/div

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:MULTIply

Command List:

- :CALCulate:MULTIply:INVert
- :CALCulate:MULTIply:SA
- :CALCulate:MULTIply:SB
- :CALCulate:MULTIply:VOFFset
- :CALCulate:MULTIply:VScale

:CALCulate:MULTIply:INVert

Syntax

```
:CALCulate:MULTIply:INVert <bool>
:CALCulate:MULTIply:INVert?
```

Description

Enables or disables the invert display of the multiplication operation waveform; or queries the on/off status of the multiplication operation waveform.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:MULTIply:SA :CALCulate:MULTIply:SB

Syntax

```
:CALCulate:MULTIply:SA <source>
:CALCulate:MULTIply:SA?
:CALCulate:MULTIply:SB <source>
:CALCulate:MULTIply:SB?
```

Description

Sets or queries the channel source of Source A or Source B in multiplication operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:MULTIply:VOFFset**Syntax**

:CALCulate:MULTIply:VOFFset <offs>

:CALCulate:MULTIply:VOFFset?

Description

Sets or queries the vertical position of the multiplication operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the multiplication operation waveform) to (40 x vertical scale of the multiplication operation waveform)	0

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:MULTIply:VSCale**Syntax**

:CALCulate:MULTIply:VSCale <scale>

:CALCulate:MULTIply:VSCale?

Description

Sets or queries the vertical scale of the multiplication operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	2 U/div

Remarks

The default range of <scale> is from 20 nU/div to 10 MU/div. Its actual range is related to the vertical scale of the source channel (refer to the :CHANnel<n>:SCALE command), at 1-2-5 step.

Note: After the vertical scale of the source channel is modified, the range of <scale> will not be changed until the multiplication operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALCulate:SUB

Command List:

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

:CALCulate:SUB:INVert

Syntax

```
:CALCulate:SUB:INVert <bool>
:CALCulate:SUB:INVert?
```

Description

Enables or disables the invert display of the subtraction operation waveform; or queries the on/off status of the invert display of the subtraction operation waveform.

Parameter

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

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CALCulate:SUB:SA

:CALCulate:SUB:SB

Syntax

```
:CALCulate:SUB:SA <source>
:CALCulate:SUB:SA?
:CALCulate:SUB:SB <source>
:CALCulate:SUB:SB?
```

Description

Sets or queries the channel source of Source A or Source B in subtraction operation.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:CALCulate:SUB:VOFFset**Syntax**

:CALCulate:SUB:VOFFset <offs>
:CALCulate:SUB:VOFFset?

Description

Sets or queries the vertical position of the subtraction operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<offs>	Real	(-40 x vertical scale of the subtraction operation waveform) to (40 x vertical scale of the subtraction operation waveform)	0

Return Format

The query returns the vertical position in scientific notation.

:CALCulate:SUB:VSCale**Syntax**

:CALCulate:SUB:VSCale <scale>
:CALCulate:SUB:VSCale?

Description

Sets or queries the vertical scale of the subtraction operation waveform. The unit is related to the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	2 V/div

Remarks

The default range of <scale> is from 1 pV/div to 200 V/div. Its actual range is related to the vertical scale of the source channel (refer to the :CHANnel<n>:SCALE command), at 1-2-5 step.

Note: After the vertical scale of the source channel is modified, the range of <scale> will not be changed until the subtraction operation is re-enabled.

Return Format

The query returns the vertical scale in scientific notation.

:CALibrate Commands

Command List:

- :CALibrate:DATE?
- :CALibrate:QUIT
- :CALibrate:START
- :CALibrate:TIME?

:CALibrate:DATE?

Syntax

:CALibrate:DATE?

Description

Queries the date when the last self-calibration was performed.

Return Format

The query returns <year>,<month>,<day>. Wherein, <year>, <month>, and <day> represent year, month, and day respectively.

:CALibrate:QUIT

Syntax

:CALibrate:QUIT

Description

Stops performing the self-calibration operation.

Remarks

You can enable the oscilloscope to stop performing the self-calibration operation at any time.

:CALibrate:START

Syntax

:CALibrate:START

Description

Enables the oscilloscope to start executing the self-calibration operation.

Remarks

- The self-calibration operation enables the oscilloscope to work in an optimal state and obtain accurate measurement results.
- Before executing the self-calibration operation, properly connect the calibration signal to the external trigger input channel and four input channels.
- During the self-calibration process, most of the keys are disabled.

:CALibrate:TIME?

Syntax

:CALibrate:TIME?

Description

Queries the time when the last self-calibration was performed.

Return Format

The query returns <hours>,<minutes>,<seconds>. Wherein, <hours>, <minutes>, and <seconds> represent hour, minute, and second respectively.

:CHANnel<n> Commands

Command List:

- :CHANnel<n>:BVOLTage
- :CHANnel<n>:BWLimit
- :CHANnel<n>:COUPling
- :CHANnel<n>:CStArt
- :CHANnel<n>:DISPlay
- :CHANnel<n>:IMPedance
- :CHANnel<n>:INVert
- :CHANnel<n>:OFFSet
- :CHANnel<n>:PEND
- :CHANnel<n>:PROBe
- :CHANnel<n>:SCALe
- :CHANnel<n>:TCALibrate
- :CHANnel<n>:TYPE?
- :CHANnel<n>:UNITs
- :CHANnel<n>:VERNier

:CHANnel<n>:BVOLTage

Syntax

```
:CHANnel<n>:BVOLTage <vol>
:CHANnel<n>:BVOLTage?
```

Description

Sets or queries the bias voltage of the active probe currently connected to the specified analog channel. The oscilloscope provides the bias voltage adjustment function for the active probe. This function is used to adjust the signal under test that exceeds the input dynamic range of the probe amplifier to an appropriate range to ensure the signal integrity.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<vol>	Real	-12 V to 12 V	0

Return Format

The query returns the bias voltage in scientific notation.

:CHANnel<n>:BWLimit

Syntax

```
:CHANnel<n>:BWLimit <type>
:CHANnel<n>:BWLimit?
```

Description

Sets or queries the bandwidth limit of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<type>	Discrete	DS4024E: {20M 100M OFF} DS4014E: {20M OFF}	OFF

Remarks

- 20M|100M: enables the bandwidth limit and sets the bandwidth limit to 20 MHz or 100 MHz. The high-frequency components that are greater than 20 MHz or 100 MHz in the signal under test will be attenuated.
- OFF: disables the bandwidth limit function. The high-frequency components in the signal under test can pass through the channel.

Return Format

The query returns 20M, 100M, or OFF.

:CHANnel<n>:COUPling**Syntax**

```
:CHANnel<n>:COUPling <coupling>
:CHANnel<n>:COUPling?
```

Description

Sets or queries the coupling mode of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<coupling>	Discrete	{AC DC GND}	DC

Remarks

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

Return Format

The query returns AC, DC, or GND.

:CHANnel<n>:CStArt**Syntax**

```
:CHANnel<n>:CStArt
```

Description

Starts calibration for the active probe currently connected to the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--

Remarks

This command is only valid when an active probe is correctly connected.

:CHANnel<n>:DISPlay

Syntax

```
:CHANnel<n>:DISPlay <bool>
:CHANnel<n>:DISPlay?
```

Description

Turns on or off the specified analog channel; or queries the on/off status of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<bool>	Bool	{{1 ON} {0 OFF}}	CH1: 1 ON CH2, CH3, CH4: 0 OFF

Return Format

The query returns 1 or 0.

:CHANnel<n>:IMPedance

Syntax

```
:CHANnel<n>:IMPedance <imped>
:CHANnel<n>:IMPedance?
```

Description

Sets or queries the input impedance of the specified analog channel. The default unit is Ω .

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<imped>	Discrete	{OMEG FIFTy}	OMEG

Remarks

- OMEG: 1 M Ω . This indicates that the input impedance of the oscilloscope is rather high, and the current flowing from the circuit under test to the oscilloscope can be ignored.
- FIFTy: 50 Ω . This indicates that the oscilloscope shall be matched with a device whose output impedance is 50 Ω .

Return Format

The query returns OMEG or FIFT.

:CHANnel<n>:INVert

Syntax

```
:CHANnel<n>:INVert <bool>
:CHANnel<n>:INVert?
```

Description

Turns on or off the invert display of the specified analog channel; or queries the on/off status of the invert display of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<bool>	Bool	{{1 ON} {0 OFF}}	0 OFF

Remarks

- 1|ON: turns the waveform invert on. The waveform voltage values are inverted and then displayed.
- 0|OFF: turns the waveform invert off. The waveform is displayed normally.

Return Format

The query returns 1 or 0.

:CHANnel<n>:OFFSet**Syntax**

```
:CHANnel<n>:OFFSet <offset>
:CHANnel<n>:OFFSet?
```

Description

Sets or queries the vertical position of the specified analog channel. The unit is related to the current amplitude unit of the specified analog channel. The default unit is V.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<offset>	Real	Related to the current input impedance, probe ratio, and the vertical scale (the default unit is V). When the input impedance is 50 Ω and the probe ratio is 1X: 1 mV/div to 124 mV/div: -1.2 V to +1.2 V 125 mV/div to 1 V/div: -12 V to +12 V When the input impedance is 1 M Ω and the probe ratio is 1X: 1 mV/div to 229 mV/div: -2 V to +2 V 230 mV/div to 5 V/div: -40 V to +40 V	0

Return Format

The query returns the vertical position in scientific notation.

:CHANnel<n>:PEND**Syntax**

```
:CHANnel<n>:PEND <type>
:CHANnel<n>:PEND?
```

Description

Sets or queries the probe head type of an active probe currently connected to the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<type>	Discrete	{SEND DIFFerential}	SEND

Remarks

- SEND: indicates a single-ended probe head.
- DIFFerential: indicates a differential probe head.

Return Format

The query returns SEND or DIFF.

:CHANnel<n>:PROBe**Syntax**

```
:CHANnel<n>:PROBe <atten>
:CHANnel<n>:PROBe?
```

Description

Sets or queries the probe ratio of the probe currently connected to the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<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

Remarks

- Probe ratio = displayed amplitude of the signal under test/actual amplitude of the signal under test
The oscilloscope will display the waveforms of the signal under test based on the currently set probe ratio, without affecting the actual amplitude of the signal.
- If you select a different probe ratio, the range for the vertical scale (refer to the :CHANnel<n>:SCALE command) of the analog channel is different.

Return Format

The query returns 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, or 1000.

:CHANnel<n>:SCALE**Syntax**

```
:CHANnel<n>:SCALE <scale>
:CHANnel<n>:SCALE?
```

Description

Sets or queries the vertical scale of the specified analog channel. The unit is related to the current amplitude unit of the specified analog channel. The default unit is V/div.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2}	--
<offset>	Real	Related to the current input impedance and the probe ratio (the default unit is V/div). When the input impedance is 50 Ω and the probe ratio is 1X, the value of <scale> is from 1 mV/div to 1 V/div. When the input impedance is 1 M Ω and the probe ratio is 1X, the value of <scale> is from 1 mV/div to 5 V/div.	1 V/div

Return Format

The query returns the vertical scale in scientific notation.

:CHANnel<n>:TCALibrate

Syntax

```
:CHANnel<n>:TCALibrate <tcal>
:CHANnel<n>:TCALibrate?
```

Description

Sets or queries the delay calibration time (used to calibrate the zero offset) of the specified analog channel. The default unit is s.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<tcal>	Real	-100 ns to +100 ns	0 s

Remarks

When the horizontal time base is greater than or equal to 10 us (refer to the :TIMEbase[:MAIN]:SCALE command), the delay calibration time cannot be adjusted.

Return Format

The query returns the delay calibration time in scientific notation.

:CHANnel<n>:TYPE?

Syntax

```
:CHANnel<n>:TYPE?
```

Description

Sets or queries the type of a probe currently connected to the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--

Return Format

The query returns NORM or DIFF. NORM indicates the normal probe, and DIFF indicates the active probe.

:CHANnel<n>:UNITs

Syntax

```
:CHANnel<n>:UNITs <units>
:CHANnel<n>:UNITs?
```

Description

Sets or queries the amplitude display unit of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<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

Enables or disables the fine adjustment of the vertical scale of the specified analog channel; or queries the on/off status of the fine adjustment function of the vertical scale of the specified analog channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4}	--
<bool>	Bool	{{1 ON} {0 OFF}}	0 OFF

Remarks

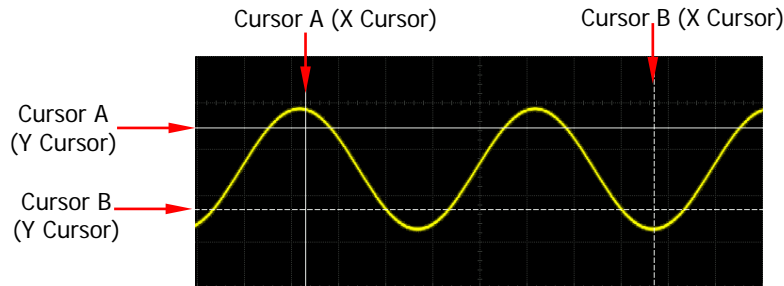
- 1|ON: enables the fine adjustment function. Rotate **VERTICAL**  **SCALE** to further adjust the vertical scale at a relatively smaller step.
0|OFF: disables the fine adjustment function. Rotate **VERTICAL**  **SCALE** to adjust the vertical scale within the adjustable range at 1-2-5 step.
- To better observe the signal details, enable the fine adjustment function to improve the waveform display amplitude if the following conditions occur: the amplitude of the input waveform is a little bit greater than the full scale of the current scale; using the next scale for adjustment makes the amplitude a little bit lower than expected.

Return Format

The query returns 1 or 0.

:CURSor Commands

Cursors are the horizontal and vertical marks that can be used to measure the X-axis values and Y-axis values of the source channel waveform. The cursor measurement function provides X cursors and Y cursors (as shown in the figure below).



- **X Cursor**
X cursor is a vertical solid/dotted line that is used to make horizontal adjustments. It can be used to measure time (s), frequency (Hz), phase ($^{\circ}$), and ratio (%).
 - Cursor A (X cursor) is a vertical solid line, and Cursor B (X cursor) is a vertical dotted line.
 - When the measurement source is FFT, X cursor denotes frequency.
 - In the X-Y cursor mode, X cursor is used to measure the waveform amplitude of CH1 or CH3.
- **Y Cursor**
Y cursor is a horizontal solid/dotted line that is used to make vertical adjustment. It can be used to measure amplitude (the unit is the same as that of the source channel amplitude) and ratio (%).
 - Cursor A (Y cursor) is a horizontal solid line, and Cursor B (Y cursor) is a horizontal dotted line.
 - When the measurement source is MATH, the measurement unit corresponds to the MATH function unit.
 - In the X-Y cursor mode, Y cursor is used to measure the waveform amplitude of CH2 or CH4.

Command List:

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

:CURSor:MODE

Syntax

:CURSor:MODE <mode>
:CURSor:MODE?

Description

Sets or queries the mode of the cursor measurement.

Parameter

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

Remarks

- OFF: disables the cursor measurement function.
- MANual: enables the manual mode of cursor measurement.
- TRACk: enables the track mode of cursor measurement.
- AUTO: enables the auto mode of cursor measurement.

Return Format

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

:CURSor:MANual

Command List:

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

:CURSor:MANual:AXValue?

Syntax

:CURSor:MANual:AXValue?

Description

Queries the X value at Cursor A (X cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected horizontal unit.

Remarks

For the horizontal position of Cursor A (X cursor), refer to the :CURSor:MANual:CAX command.

Return Format

The query returns the X value in scientific notation.

:CURSor:MANual:AYValue?

Syntax

:CURSor:MANual:AYValue?

Description

Queries the Y value at Cursor A (Y cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected vertical unit.

Remarks

For the vertical position of Cursor A (Y cursor), refer to the :CURSor:MANual:CAY command.

Return Format

The query returns the Y value in scientific notation.

:CURSor:MANual:BXValue?**Syntax**

:CURSor:MANual:BXValue?

Description

Queries the X value at Cursor B (X cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected horizontal unit.

Remarks

For the horizontal position of Cursor B (X cursor), refer to the :CURSor:MANual:CBX command.

Return Format

The query returns the X value in scientific notation.

:CURSor:MANual:BYValue?**Syntax**

:CURSor:MANual:BYValue?

Description

Queries the Y value at Cursor B (Y cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected vertical unit.

Remarks

For the vertical position of Cursor B (Y cursor), refer to the :CURSor:MANual:CBY command.

Return Format

The query returns the Y value in scientific notation.

:CURSor:MANual:CAX**Syntax**

:CURSor:MANual:CAX <ax>

:CURSor:MANual:CAX?

Description

Sets or queries the horizontal position of Cursor A (X cursor) in the manual mode of cursor measurement.

Parameter

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

Remarks

The horizontal position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).

Return Format

The query returns an integer between 0 and 699.

:CURSor:MANual:CAY**Syntax**

```
:CURSor:MANual:CAY <ay>
:CURSor:MANual:CAY?
```

Description

Sets or queries the vertical position of Cursor A (Y cursor) in the manual mode of cursor measurement.

Parameter

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

Remarks

The vertical position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen vertically is from 0 to 399 (from top to bottom).

Return Format

The query returns an integer between 0 and 399.

:CURSor:MANual:CBX**Syntax**

```
:CURSor:MANual:CBX <bx>
:CURSor:MANual:CBX?
```

Description

Sets or queries the horizontal position of Cursor B (X cursor) in the manual mode of cursor measurement.

Parameter

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

Remarks

The horizontal position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).

Return Format

The query returns an integer between 0 and 699.

:CURSor:MANual:CBY**Syntax**

```
:CURSor:MANual:CBY <by>
:CURSor:MANual:CBY?
```

Description

Sets or queries the vertical position of Cursor B (Y cursor) in the manual mode of cursor measurement.

Parameter

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

Remarks

The vertical position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen vertically is from 0 to 399 (from top to bottom).

Return Format

The query returns an integer between 0 and 399.

:CURSor:MANual:IXDelta?**Syntax**

:CURSor:MANual:IXDelta?

Description

Queries the reciprocal ($1/\Delta X$) of the difference between X values at Cursor A (X cursor) and Cursor B (X cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected horizontal unit.

Remarks

- For the horizontal position of Cursor A (X cursor), refer to the :CURSor:MANual:CAX command.
- For the horizontal position of Cursor B (X cursor), refer to the :CURSor:MANual:CBX command.

Return Format

The query returns the reciprocal ($1/\Delta X$) of the difference between X values in scientific notation. When ΔX is 0 s, the query returns 9.9e37.

:CURSor:MANual:SOURce**Syntax**

:CURSor:MANual:SOURce <source>
:CURSor:MANual:SOURce?

Description

Sets or queries the source channel of the manual mode of cursor measurement.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH NONE}	CHANnel1

Remarks

- Only the currently enabled channel can be selected as the source channel.
- When <source> is set to "NONE", neither cursors nor measurement results will be displayed.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, MATH, or NONE.

:CURSor:MANual:TUNit**Syntax**

:CURSor:MANual:TUNit <unit>
:CURSor:MANual:TUNit?

Description

Sets or queries the horizontal unit in the manual mode of cursor measurement.

Parameter

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

Remarks

- SECond: when the X value at Cursor A (X cursor), the X value at Cursor B (X cursor), and the difference between the two values (namely A->X, B->X, and ΔX in the measurement results) are queried, the returned values are expressed in s. When the reciprocal of the difference between the two values (namely $1/\Delta X$ in the measurement results) are queried, the returned value is expressed in Hz.
- HZ: when the X value at Cursor A (X cursor), the X value at Cursor B (X cursor), and the difference between the two values (namely A->X, B->X, and ΔX in the measurement results) are queried, the returned values are expressed in Hz. When the reciprocal of the difference between the two values (namely $1/\Delta X$ in the measurement results) are queried, the returned value is expressed in s.
- DEGRee: when the X value at Cursor A (X cursor), the X value at Cursor B (X cursor), and the difference between the two values (namely A->X, B->X, and ΔX in the measurement results) are queried, the returned values are expressed in degree.
- PERCent: when the X value at Cursor A (X cursor), the X value at Cursor B (X cursor), and the difference between the two values (namely A->X, B->X, and ΔX in the measurement results) are queried, the returned values are expressed in percentage.

Return Format

The query returns SEC, HZ, DEGR, or PERC.

:CURSor:MANual:TYPE**Syntax**

```
:CURSor:MANual:TYPE <type>
:CURSor:MANual:TYPE?
```

Description

Sets or queries the cursor type in the manual mode of cursor measurement.

Parameter

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

Remarks

- TIME: represents X cursor.
- AMPLitude: represents Y cursor.

Return Format

The query returns TIME or AMPL.

:CURSor:MANual:VUNit**Syntax**

```
:CURSor:MANual:VUNit <unit>
:CURSor:MANual:VUNit?
```

Description

Sets or queries the vertical unit in the manual mode of cursor measurement.

Parameter

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

Remarks

- SUNit: when the Y value at Cursor A (Y cursor), the Y value at Cursor B (Y cursor), and the difference between the two values (namely A->Y, B->Y, and ΔY in the measurement results) are queried, the returned values are expressed in the current amplitude unit of the source channel.
- PERCent: when the Y value at Cursor A (Y cursor), the Y value at Cursor B (Y cursor), and the difference between the two values (namely A->Y, B->Y, and ΔY in the measurement results) are queried, the returned values are expressed in percentage.

Return Format

The query returns SUN or PERC.

:CURSor:MANual:XDELta?**Syntax**

:CURSor:MANual:XDELta?

Description

Queries the difference (namely ΔX) between the X value at Cursor A (X cursor) and the X value at Cursor B (X cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected horizontal unit.

Remarks

- For the horizontal position of Cursor A (X cursor), refer to the :CURSor:MANual:CAX command.
- For the horizontal position of Cursor B (X cursor), refer to the :CURSor:MANual:CBX command.

Return Format

The query returns the current difference in scientific notation.

:CURSor:MANual:YDELta?**Syntax**

:CURSor:MANual:YDELta?

Description

Queries the difference (namely ΔY) between the Y value at Cursor A (Y cursor) and the Y value at Cursor B (Y cursor) in the manual mode of cursor measurement. The unit is determined by the currently selected vertical unit.

Remarks

- For the vertical position of Cursor A (Y cursor), refer to the :CURSor:MANual:CAY command.
- For the vertical position of Cursor B (Y cursor), refer to the :CURSor:MANual:CBY command.

Return Format

The query returns the current difference in scientific notation.

:CURSor:TRACk

Command List:

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

:CURSor:TRACk:AXValue?

Syntax

:CURSor:TRACk:AXValue?

Description

Queries the X value at Cursor A (X cursor) in the track mode of cursor measurement. The default unit is s.

Remarks

- In the track mode, when Cursor A (Y cursor) is adjusted vertically, Cursor A (X cursor) will automatically track the time or frequency of the waveform of the corresponding track source channel at Cursor A (Y cursor).
- For the horizontal position of Cursor A (X cursor), refer to the :CURSor:TRACk:CAX command.

Return Format

The query returns the X value in scientific notation.

:CURSor:TRACk:AXIS

Syntax

:CURSor:TRACk:AXIS <mode>
:CURSor:TRACk:AXIS?

Description

Sets or queries the track axis in the track mode of cursor measurement.

Parameter

Name	Type	Range	Default
<mode>	Discrete	X Y	Y

Remarks

- When X is selected as the track axis, you can use the :CURSor:TRACk:CAY and :CURSor:TRACk:CBY commands to adjust the vertical position of Y cursor. Then, X cursor will automatically track the time or frequency of the waveform of the corresponding measurement source at Y cursor. Besides, you can also use the :CURSor:TRACk:SEQuence command to set the track type of X cursor.

- When Y is selected as the track axis, you can use the :CURSor:TRACk:CAX and :CURSor:TRACk:CBX commands to adjust the horizontal position of X cursor. Then, Y cursor will automatically track the vertical amplitude of the waveform of the corresponding measurement source at X cursor.

Return Format

The query returns X or Y.

:CURSor:TRACk:AYValue?**Syntax**

:CURSor:TRACk:AYValue?

Description

Queries the Y value at Cursor A (Y cursor) in the track mode of cursor measurement. The unit is related to the current amplitude unit of the track source channel of Cursor A (X cursor).

Remarks

- In the track mode, when Cursor A (X cursor) is adjusted horizontally, Cursor A (Y cursor) will automatically track the vertical amplitude of the waveform of the corresponding track source channel at Cursor A (X cursor).
- For the vertical position of Cursor A (Y cursor), refer to the :CURSor:TRACk:CAY command.

Return Format

The query returns the Y value in scientific notation. When the Y value at Cursor A (Y cursor) exceeds the screen range, the query returns 9.9e37.

:CURSor:TRACk:BXValue?**Syntax**

:CURSor:TRACk:BXValue?

Description

Queries the X value at Cursor B (X cursor) in the track mode of cursor measurement. The default unit is s.

Remarks

- In the track mode, when Cursor B (Y cursor) is adjusted vertically, Cursor B (X cursor) will automatically track the time or frequency of the waveform of the corresponding track source channel at Cursor B (Y cursor).
- For the horizontal position of Cursor B (X cursor), refer to the :CURSor:TRACk:CBX command.

Return Format

The query returns the X value in scientific notation.

:CURSor:TRACk:BYValue?**Syntax**

:CURSor:TRACk:BYValue?

Description

Queries the Y value at Cursor B (Y cursor) in the track mode of cursor measurement. The unit is related to the current amplitude unit of the track source channel of Cursor B (X cursor).

Remarks

- In the track mode, when Cursor B (X cursor) is adjusted horizontally, Cursor B (Y cursor) will automatically track the vertical amplitude of the waveform of the corresponding track source channel at Cursor B (X cursor).
- For the vertical position of Cursor B (Y cursor), refer to the :CURSor:TRACk:CBY command.

Return Format

The query returns the Y value in scientific notation. When the Y value at Cursor B (Y cursor) exceeds the screen range, the query returns 9.9e37.

:CURSor:TRACk:CAX**Syntax**

```
:CURSor:TRACk:CAX <ax>
:CURSor:TRACk:CAX?
```

Description

Sets or queries the horizontal position of Cursor A (X cursor) in the track mode of cursor measurement.

Parameter

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

Remarks

- The horizontal position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- When X is selected as the track axis (refer to the :CURSor:TRACk:AXIS command), the :CURSor:TRACk:CAX <ax> command is invalid.

Return Format

The query returns an integer between 0 and 699.

:CURSor:TRACk:CAY**Syntax**

```
:CURSor:TRACk:CAY <ay>
:CURSor:TRACk:CAY?
```

Description

Sets or queries the vertical position of Cursor A (Y cursor) in the track mode of cursor measurement.

Parameter

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

Remarks

- The vertical position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen vertically is from 0 to 399 (from top to bottom).
- When Y is selected as the track axis (refer to the :CURSor:TRACk:AXIS command), the :CURSor:TRACk:CAY <ay> command is invalid.

Return Format

The query returns an integer between 0 and 399.

:CURSor:TRACk:CBX**Syntax**

:CURSor:TRACk:CBX <bx>

:CURSor:TRACk:CBX?

Description

Sets or queries the horizontal position of Cursor B (X cursor) in the track mode of cursor measurement.

Parameter

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

Remarks

- The horizontal position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- When X is selected as the track axis (refer to the :CURSor:TRACk:AXIS command), the :CURSor:TRACk:CBY <by> command is invalid.

Return Format

The query returns an integer between 0 and 699.

:CURSor:TRACk:CBY**Syntax**

:CURSor:TRACk:CBY <by>

:CURSor:TRACk:CBY?

Description

Sets or queries the vertical position of Cursor B (Y cursor) in the track mode of cursor measurement.

Parameter

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

Remarks

- The vertical position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen vertically is from 0 to 399 (from top to bottom).
- When Y is selected as the track axis (refer to the :CURSor:TRACk:AXIS command), the :CURSor:TRACk:CBY <by> command is invalid.

Return Format

The query returns an integer between 0 and 399.

:CURSor:TRACk:IXDelta?**Syntax**

:CURSor:TRACk:IXDelta?

DescriptionQueries the reciprocal ($1/\Delta X$) of the difference between the X value at Cursor A (X cursor) and the X value at Cursor B (X cursor) in the track mode of cursor measurement. The default unit is Hz.

Remarks

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

Return Format

The query returns the reciprocal of the current difference in scientific notation. When the difference is 0 s, the query returns 9.9e37.

:CURSor:TRACk:SEQuence**Syntax**

```
:CURSor:TRACk:SEQuence <seq>
:CURSor:TRACk:SEQuence?
```

Description

Sets or queries the track type of X cursor when X is selected as the track axis (refer to the :CURSor:TRACk:AXIS command).

Parameter

Name	Type	Range	Default
<seq>	Discrete	{FIRSt LAST}	FIRSt

Remarks

- FIRSt: When you adjust the vertical position of Y cursor, if the waveforms of corresponding measurement channels have formed multiple crossing points along the cursor, then X cursor will be automatically located at the crossing point of the most left side of the screen.
- LAST: When you adjust the vertical position of Y cursor, if the waveforms of corresponding measurement channels have formed multiple crossing points along the cursor, then X cursor will be automatically located at the crossing point of the most right side of the screen.

Return Format

The query return FIRS or LAST.

:CURSor:TRACk:SOURce1**Syntax**

```
:CURSor:TRACk:SOURce1 <source>
:CURSor:TRACk:SOURce1?
```

Description

Sets or queries the track source of Cursor A (X cursor) in the track mode of cursor measurement.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH NONE}	CHANnel1

Remarks

- Only the currently enabled channel can be selected as the source channel.
- When <source> is set to "NONE", it indicates that Cursor A (X cursor) will not be used.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, MATH, or NONE.

:CURSor:TRACk:SOURce2**Syntax**

:CURSor:TRACk:SOURce2 <source>

:CURSor:TRACk:SOURce2?

Description

Sets or queries the track source of Cursor B (X cursor) in the track mode of cursor measurement.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH NONE}	CHANnel1

Remarks

- Only the currently enabled channel can be selected as the source channel.
- When <source> is set to "NONE", it indicates that Cursor B (X cursor) will not be used.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, MATH, or NONE.

:CURSor:TRACk:XDELta?**Syntax**

:CURSor:TRACk:XDELta?

DescriptionQueries the difference (namely ΔX) between the X value at Cursor A (X cursor) and the X value at Cursor B (X cursor) in the track mode of cursor measurement. The default unit is s.**Remarks**

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

Return Format

The query returns the current difference in scientific notation.

:CURSor:TRACk:YDELta?**Syntax**

:CURSor:TRACk:YDELta?

DescriptionQueries the difference (namely ΔY) between the Y value at Cursor A (Y cursor) and the Y value at Cursor B (Y cursor) in the track mode of cursor measurement. The unit is related to the current amplitude unit of the track source channel of Cursor A (X cursor) and Cursor B (X cursor).**Remarks**

- For the vertical position of Cursor A (Y cursor), refer to the :CURSor:TRACk:CAY command.
- For the vertical position of Cursor B (Y cursor), refer to the :CURSor:TRACk:CBY command.

Return Format

The query returns the current difference in scientific notation. When the Y value at Cursor A (Y cursor) and/or the Y value at Cursor B (Y cursor) exceed(s) the screen range; or when the amplitude units of the track source channel of current Cursor A (X cursor) and that of current Cursor B (X cursor) are inconsistent, the query returns 9.9e37.

:DISPlay Commands

Command List:

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

:DISPlay:CLEAr

Syntax

:DISPlay:CLEAr

Description

Clears all the waveforms on the screen. If the oscilloscope is in the RUN state, after the waveform data is cleared, new waveform data will be displayed. This command functions the same as the **CLEAR** key on the front panel.

:DISPlay:DATA?

Syntax

:DISPlay:DATA?

Description

Reads the bitmap data stream of the currently displayed image on the screen.

Remarks

- 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 currently displayed image on the screen to the buffer area of the PC.
- Ensure that there is enough buffer space to receive the data stream; otherwise, errors might occur in reading the program.
- To acquire the standard bitmap data, remove the TMC data block header in the returned string.
- When the length of the data stream is greater than 1 MByte, you need to set a proper timeout time if the communication speed of the interface is not fast enough.
- You need to remove the end mark (\n(0X0A)) at the end of the data.

Return Format

The query returns the bitmap data stream in strings.

The returned value consists of the TMC data block header and BMP data. The format and detailed Remarks of each part are as shown in the table below.

	TMC Data Block Header	BMP Data
Size (Length)	$N^{[1]}+2$	$800 \times 480 \times 3 + 54 = 1152054^{[2]}$
Format	#NX...X	BM...
Remarks	<p>It is used to describe the length of the data stream (the number of bytes). Wherein, # is the start identifier of the data stream; $N \leq 9$ denotes that N-digit data following the start identifier are used to describe the length of the data stream (the number of bytes). For example, #9001152054. Wherein, N is 9, and 001152054 represents that the data stream contains 1152054 bytes of effective data.</p>	Bitmap data

Note^[1]: N is the width of the bits that are used to describe the data length in the TMC data block header. For example, 9 in #9001152054.

Note^[2]: The width is 800, the height is 480, the bit depth is 24 bit (3 bytes), and 54 is the size of the bitmap file header.

:DISPlay:GBRightness**Syntax**

:DISPlay:GBRightness <bright>

:DISPlay:GBRightness?

Description

Sets or queries the display brightness of the screen grid (in percentage).

Parameter

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

Return Format

The query returns an integer between 0 and 100.

:DISPlay:GRADing:TIME**Syntax**

:DISPlay:GRADing:TIME <time>

:DISPlay:GRADing:TIME?

Description

Sets or queries the persistence time. The default 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

Remarks

- MIN: sets the persistence time to its minimum value to view how the waveform changes with high refresh rate.

- 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20: sets the persistence time to a specific value to observe glitch that changes relatively slowly or glitch with low occurrence probability.
- INFinite: sets the persistence time to infinite (the oscilloscope displays the newly acquired waveform without clearing the waveform formerly acquired) to measure noise and jitter as well as capture incidental events.

Return Format

The query returns MIN, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, or INF.

:DISPlay:GRID**Syntax**

:DISPlay:GRID <grid>

:DISPlay:GRID?

Description

Sets or queries the display type of the screen grid.

Parameter

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

Remarks

- FULL: displays the background grid and the coordinate.
- HALF: does not display the background grid, but only the coordinate.
- NONE: neither displays the background grid nor the coordinate.

Return Format

The query returns FULL, HALF, or NONE.

:DISPlay:MPERsistence**Syntax**

:DISPlay:MPERsistence <time>

:DISPlay:MPERsistence?

Description

Sets or queries the menu display time. The default unit is s.

Parameter

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

Return Format

The query returns 1, 2, 5, 10, 20, or INF.

:DISPlay:TYPE

Syntax

:DISPlay:TYPE <type>
:DISPlay:TYPE?

Description

Sets or queries the display type of the waveform.

Parameter

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

Remarks

- 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 waveforms).
- DOTS: displays the sample points directly. You can directly view each sample point and use the cursor to measure X and Y values at this sample point.

Return Format

The query returns VECT or DOTS.

:DISPlay:WBRightness

Syntax

:DISPlay:WBRightness <bright>
:DISPlay:WBRightness?

Description

Sets or queries the display brightness of the waveform on the screen (in percentage).

Parameter

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

Return Format

The query returns an integer between 0 and 100.

:EXT Commands

Command List:

- :EXT:PEND
- :EXT:CStart

:EXT:PEND

Syntax

:EXT:PEND <type>
:EXT:PEND?

Description

Sets or queries the head type of the active probe currently connected to the external trigger channel (namely the [EXT TRIG] connector on the front panel of the instrument).

Parameter

Name	Type	Range	Default
<type>	Discrete	{SEND DIFFerential}	SEND

Remarks

- SEND: indicates a single-ended probe head.
- DIFFerential: indicates a differential probe head.

Return Format

The query returns SEND or DIFF.

:EXT:CStart

Syntax

:EXT:CStart

Description

Enables the calibration for the active probe currently connected to the external trigger channel.

Remarks

This command is only valid when an active probe is correctly connected.

:FUNction Commands

Command List:

- :FUNction:WRMode
- :FUNction:WRECORD
- :FUNction:WREPLAY
- :FUNction:WANALYZE

:FUNction:WRMode

Syntax

:FUNction:WRMode <mode>

:FUNction:WRMode?

Description

Sets or queries the waveform recording mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{OFF RECORD PLAY KEEP ANALYZE}	OFF

Remarks

- RECORD: indicates the recording mode.
PLAY: indicates the playback mode.
KEEP: indicates the "constant-on" mode.
ANALYZE: indicates the analysis mode.
- "PLAY" (playback mode) and "ANALYZE" (analysis mode) are only available when the waveform recording is finished.

Return Format

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

:FUNction:WRECORD

Command List:

- :FUNction:WRECORD:FEND
- :FUNction:WRECORD:FMAX?
- :FUNction:WRECORD:INTERVAL
- :FUNction:WRECORD:OPERATE

:FUNction:WRECORD:FEND

Syntax

```
:FUNction:WRECORD:FEND <frame>
:FUNction:WRECORD:FEND?
```

Description

Sets or queries the end frame of the waveform recording in the recording mode. The oscilloscope stops the recording operation automatically when the number of recorded frames reaches the set end frame.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the maximum number of frames that can be recorded currently	7996

Return Format

The query returns an integer.

:FUNction:WRECORD:FMAX?

Syntax

```
:FUNction:WRECORD:FMAX?
```

Description

Queries the maximum number of frames that can be recorded currently in the recording mode.

Remarks

- The maximum number of frames that can be recorded is the maximum number of end frames of waveform recording that can be set (refer to the :FUNction:WRECORD:FEND command).
- The maximum number of frames that can be recorded is related to the currently selected memory depth (refer to the :ACQUIRE:MDEPTH command).

Memory Depth	Maximum Number of Frames
7 kpts	31986
70 kpts	1999
700 kpts	249
7 Mpts	31
AUTO	Related to the current "Sample Rate" and "Horizontal Time Base" (refer to the :TIMEbase[:MAIN]:SCALE command).

Return Format

The query returns an integer.

:FUNCTION:WRECORD:INTERVAL**Syntax**

:FUNCTION:WRECORD:INTERVAL <interval>

:FUNCTION:WRECORD:INTERVAL?

Description

Sets or queries the interval (namely the time between frames) of the waveform recording in the recording mode. The default unit is s.

Parameter

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

Return Format

The query returns the interval in scientific notation.

:FUNCTION:WRECORD:OPERATE**Syntax**

:FUNCTION:WRECORD:OPERATE <oper>

:FUNCTION:WRECORD:OPERATE?

Description

Starts or stops the waveform recording operation in the recording mode; or queries the status of waveform recording in the recording mode.

Parameter

Name	Type	Range	Default
<oper>	Discrete	{RECORD STOP}	STOP

Remarks

- Before starting the recording operation, turn on the desired channel and adjust the waveform display to the desired state.
- You can send this command to stop the recording operation; or wait for the oscilloscope to stop the recording operation automatically after the oscilloscope completes recording a specified number of waveform frames (end frames, refer to the :FUNCTION:WRECORD:FEND command).

Return Format

The query returns REC or STOP.

:FUNCTION:WREPlay

Command List:

- :FUNCTION:WREPlay:FCURrent
- :FUNCTION:WREPlay:FEND
- :FUNCTION:WREPlay:FMAX?
- :FUNCTION:WREPlay:FStart
- :FUNCTION:WREPlay:INTerval
- :FUNCTION:WREPlay:MODE
- :FUNCTION:WREPlay:OPERate
- :FUNCTION:WREPlay:TTAG
- :FUNCTION:WREPlay:CTAG?

:FUNCTION:WREPlay:FCURrent

Syntax

```
:FUNCTION:WREPlay:FCURrent <frame>
:FUNCTION:WREPlay:FCURrent?
```

Description

Sets or queries the current frame in waveform playback.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames that have been recorded	Number of frames that have been recorded

Remarks

The actual range of the current frame is from the currently set start frame to the end frame of the waveform playback (refer to :FUNCTION:WREPlay:FStart and :FUNCTION:WREPlay:FEND commands).

Return Format

The query returns an integer.

:FUNCTION:WREPlay:FEND

Syntax

```
:FUNCTION:WREPlay:FEND <frame>
:FUNCTION:WREPlay:FEND?
```

Description

Sets or queries the end frame in waveform playback.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames that have been recorded	Number of frames that have been recorded

Remarks

The actual range of the end frame is from the currently set start frame of waveform playback (refer to the :FUNCTION:WREPlay:FStart command) to the number of frames that have been recorded.

Return Format

The query returns an integer.

:FUNcTion:WREPlay:FMAX?**Syntax**

:FUNcTion:WREPlay:FMAX?

Description

Queries the number of frames of recorded waveforms in the waveform playback mode.

Return Format

The query returns an integer.

:FUNcTion:WREPlay:FStart**Syntax**

:FUNcTion:WREPlay:FStart <frame>

:FUNcTion:WREPlay:FStart?

Description

Sets or queries the start frame in waveform playback.

Parameter

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

Remarks

The actual range of the start frame is from 1 to the currently set end frame of waveform playback (refer to the :FUNcTion:WREPlay:FEND command).

Return Format

The query returns an integer.

:FUNcTion:WREPlay:INterval**Syntax**

:FUNcTion:WREPlay:INterval <interval>

:FUNcTion:WREPlay:INterval?

Description

Sets or queries the interval (namely the time between frames) in waveform playback. The default unit is s.

Parameter

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

Return Format

The query returns the interval in scientific notation.

:FUNCTION:WREPlay:MODE**Syntax**

:FUNCTION:WREPlay:MODE <mode>

:FUNCTION:WREPlay:MODE?

Description

Sets or queries the waveform playback mode.

Parameter

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

Remarks

- REPeat: indicates the circular playback. The waveform is played from the start frame to the end frame, then such playback operation is repeated until you stop it manually.
- SINGle: indicates the single playback. The waveform is played from the start frame to the end frame, then the playback operation stops automatically.

Return Format

The query returns REP or SING.

:FUNCTION:WREPlay:OPERate**Syntax**

:FUNCTION:WREPlay:OPERate <oper>

:FUNCTION:WREPlay:OPERate?

Description

Starts, pauses, or stops the waveform playback operation; or queries the current status of the waveform playback operation.

Parameter

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

Return Format

The query returns PLAY, PAUS, or STOP.

:FUNCTION:WREPlay:TTAG**Syntax**

:FUNCTION:WREPlay:TTAG <bool>

:FUNCTION:WREPlay:TTAG?

DescriptionEnables or disables the display of the time tag in the playback mode, or queries the on/off display status of the time tag. When enabled, the time tag information is displayed on the upper right corner of the screen, including the absolute start time of the waveform recording (T_0) and the recording time difference (ΔT).**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

Queries the recording time difference between the currently displayed waveform and the first frame of waveform in the playback mode.

Return Format

The query returns the recording time difference in scientific notation.

:FUNCTION:WANalyze

Command List:

- :FUNCTION:WANalyze:CANCEl
- :FUNCTION:WANalyze:CMASk
- :FUNCTION:WANalyze:ECDiff?
- :FUNCTION:WANalyze:ECURrent
- :FUNCTION:WANalyze:EFCount?
- :FUNCTION:WANalyze:FCURrent
- :FUNCTION:WANalyze:MODE
- :FUNCTION:WANalyze:NEXT
- :FUNCTION:WANalyze:PREVious
- :FUNCTION:WANalyze:SETup:EFRame
- :FUNCTION:WANalyze:SETup:SFRame
- :FUNCTION:WANalyze:SETup:SSEnd
- :FUNCTION:WANalyze:SETup:SStart
- :FUNCTION:WANalyze:SETup:THReshold
- :FUNCTION:WANalyze:SETup:XMASk
- :FUNCTION:WANalyze:SETup:YMASk
- :FUNCTION:WANalyze:SOURce
- :FUNCTION:WANalyze:STARt
- :FUNCTION:WANalyze:STEMplate
- :FUNCTION:WANalyze:TDISp

:FUNCTION:WANalyze:CANCEl

Syntax

:FUNCTION:WANalyze:CANCEl

Description

Stops the waveform analysis.

Remarks

After the waveform analysis is stopped, you can use the :FUNCTION:WANalyze:STARt command to restart the waveform analysis.

:FUNCTION:WANalyze:CMASk

Syntax

:FUNCTION:WANalyze:CMASk

Description

Creates the test mask according to the current settings (the test mask range, horizontal tolerance range, and vertical tolerance range).

:FUNCTION:WANalyze:ECDiff?

Syntax

:FUNCTION:WANalyze:ECDiff?

Description

Queries the current frame difference.

Remarks

- When the waveform analysis mode is "Trace" (refer to the :FUNCTION:WANalyze:MODE command), the "Current Frame Difference" (namely the relative difference) is the normalized value of the difference between the current frame and the template.
- When the waveform analysis mode is "Pass/Fail" (refer to the :FUNCTION:WANalyze:MODE command), the "Current Frame Difference" is 100% (the frame is correct) or 0% (the frame is wrong).

Return Format

The query returns an integer between 0 and 100.

:FUNCTION:WANalyze:ECURrent**Syntax**

```
:FUNCTION:WANalyze:ECURrent <frame>
:FUNCTION:WANalyze:ECURrent?
```

Description

Sets or queries the current error frame.

Parameter

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

Return Format

The query returns an integer.

:FUNCTION:WANalyze:EFCOUNT?**Syntax**

```
:FUNCTION:WANalyze:EFCOUNT?
```

Description

Queries the total number of error frames found in this waveform analysis.

Remarks

The number of error frames is related to the currently set threshold of the (refer to the :FUNCTION:WANalyze:SETup:THReshold command) error frames.

Return Format

The query returns an integer.

:FUNCTION:WANalyze:FCURrent**Syntax**

```
:FUNCTION:WANalyze:FCURrent <frame>
:FUNCTION:WANalyze:FCURrent?
```

Description

Sets or queries the current frame in waveform analysis.

Parameter

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

Return Format

The query returns an integer.

:FUNCTION:WANalyze:MODE**Syntax**

```
:FUNCTION:WANalyze:MODE <mode>
:FUNCTION:WANalyze:MODE?
```

Description

Sets or queries the waveform analysis mode.

Parameter

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

Remarks

- TRACe: indicates the trace mode. The waveform is analyzed according to the user-defined template.
- MASK: indicates the pass/fail test mode. The waveform is analyzed according to the pass/fail test mask created by users.

Return Format

The query returns TRAC or MASK.

:FUNCTION:WANalyze:NEXT**Syntax**

```
:FUNCTION:WANalyze:NEXT
```

Description

Locates the current frame to the next error frame.

:FUNCTION:WANalyze:PREVious**Syntax**

```
:FUNCTION:WANalyze:PREVious
```

Description

Locates the current frame to the previous error frame.

:FUNCTION:WANalyze:SETup:EFRame**Syntax**

```
:FUNCTION:WANalyze:SETup:EFRame <frame>
:FUNCTION:WANalyze:SETup:EFRame?
```

Description

Sets or queries the end frame in waveform analysis.

Parameter

Name	Type	Range	Default
<frame>	Integer	1 to the number of frames that have been recorded	Number of frames that have been recorded

Remarks

The actual range of the end frame is from the currently set start frame of waveform analysis (refer to the :FUNCTION:WANalyze:SETup:SFRame command) to the number of frames that have been recorded.

Return Format

The query returns an integer.

:FUNCTION:WANalyze:SETup:SFRame**Syntax**

:FUNCTION:WANalyze:SETup:SFRame <frame>

:FUNCTION:WANalyze:SETup:SFRame?

Description

Sets or queries the start frame in waveform analysis.

Parameter

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

Remarks

The actual available range of the start frame is from 1 to the currently set end frame of waveform analysis (refer to the :FUNCTION:WANalyze:SETup:EFRame command).

Return Format

The query returns an integer.

:FUNCTION:WANalyze:SETup:SSEnd**Syntax**

:FUNCTION:WANalyze:SETup:SSEnd <point>

:FUNCTION:WANalyze:SETup:SSEnd?

Description

Sets or queries the screen end point (in pixel) in waveform analysis.

Parameter

Name	Type	Range	Default
<point>	Integer	15 to 695	695

Remarks

- The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- The actual range of the screen end point is from "currently set screen start point + 10" to 695.

Return Format

The query returns an integer between 15 and 695.

:FUNCTION:WANalyze:SETup:SStart**Syntax**

:FUNCTION:WANalyze:SETup:SStart <point>

:FUNCTION:WANalyze:SETup:SStart?

Description

Sets or queries the screen start point (in pixel) in waveform analysis.

Parameter

Name	Type	Range	Default
<point>	Integer	5 to 685	5

Remarks

- The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- The actual range of the screen start point is from 5 to "currently set screen end point - 10".

Return Format

The query returns an integer between 5 and 685.

:FUNCTION:WANalyze:SETup:THReshold**Syntax**

:FUNCTION:WANalyze:SETup:THReshold <thre>

:FUNCTION:WANalyze:SETup:THReshold?

Description

Sets or queries the error frame threshold in waveform analysis.

Parameter

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

Remarks

The error frame threshold is used to judge whether the data frame is an error frame. In different waveform analysis modes (refer to the :FUNCTION:WANalyze:MODE command), the methods for judging the error frame are different.

Return Format

The query returns an integer between 1 and 99.

:FUNCTION:WANalyze:SETup:XMASK**Syntax**

:FUNCTION:WANalyze:SETup:XMASk <mask>

:FUNCTION:WANalyze:SETup:XMASk?

Description

Sets or queries the horizontal tolerance range of the pass/fail test mask when the waveform analysis mode is "Pass/Fail". The default unit is div (in the horizontal direction).

Parameter

Name	Type	Range	Default
<mask>	Real	0.02 to 4 (with a step of 0.02)	0.24

Return Format

The query returns the horizontal tolerance range in scientific notation.

:FUNction:WANalyze:SETup:YMAsk**Syntax**

```
:FUNction:WANalyze:SETup:YMAsk <mask>
```

```
:FUNction:WANalyze:SETup:YMAsk?
```

Description

Sets or queries the vertical tolerance range of the pass/fail test mask when the waveform analysis mode is "Pass/Fail". The default unit is div (in the vertical direction).

Parameter

Name	Type	Range	Default
<mask>	Real	0.03125 to 4 (with a step of 0.03125)	0.375

Remarks

For the vertical tolerance range, the oscilloscope only displays the number to two decimal places (round-up). For example, when the vertical tolerance range is 0.0625 div, 0.06 is displayed; when the vertical tolerance range is 0.125 div, 0.13 is displayed.

Return Format

The query returns the vertical tolerance range in scientific notation.

:FUNction:WANalyze:SOURce**Syntax**

```
:FUNction:WANalyze:SOURce <source>
```

```
:FUNction:WANalyze:SOURce?
```

Description

Sets or queries the source channel in waveform analysis.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Only the currently enabled channel (and whose waveforms are included in the recorded waveforms) can be selected as the source channel.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:FUNCTION:WANalyze:START**Syntax**

:FUNCTION:WANalyze:START

Description

Starts the waveform analysis.

Remarks

- During the analysis process, the progress bar is displayed and users cannot modify the waveform analysis settings.
- After the analysis operation is completed, the analysis results (including "Error Frames", "Current Error" and "CurFrame Diff") are displayed on the screen, and the current frame is located on the first error frame.

:FUNCTION:WANalyze:STEMplate**Syntax**

:FUNCTION:WANalyze:STEMplate

Description

When the waveform analysis mode is "Trace", use this command to set the waveform frame currently displayed on the screen to be the template for the waveform analysis.

Remarks

After the analysis starts (refer to the :FUNCTION:WANalyze:START command), the oscilloscope compares each frame of data measured with the data in the template to judge whether it is an error frame according to the threshold set (refer to the :FUNCTION:WANalyze:SETup:THReshold command).

:FUNCTION:WANalyze:TDisp**Syntax**

:FUNCTION:WANalyze:TDisp <bool>

:FUNCTION:WANalyze:TDisp?

Description

Turns on or off the template display in the trace mode; or queries the on/off status of the template display in the trace mode.

Parameter

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

Return Format

The query returns 1 or 0.

IEEE 488.2 Common Commands

IEEE 488.2 standard defines some common commands that are used for querying the basic information of the instrument or executing basic operations. These commands usually start with "*", and the keywords in a command contain 3 characters.

Command List:

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

*CLS

Syntax

*CLS

Description

Clears the event registers in all the register sets and clears the error queue.

*ESE

Syntax

*ESE <mask>

*ESE?

Description

Sets or queries the enable register of the standard event register set.

Parameter

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

Remarks

<mask> is the binary-weighted sum of all the bits from bit 0 to bit 7. "1" denotes enabling the corresponding bit; and "0" denotes disabling the corresponding bit. The bits in the standard event register are defined as follows:

Bit	Weight	Name	Enable
7	128	PON	Power On
6 (Not used)	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 (Not used)	2	RQL	Request Control
0	1	OPC	Operation Complete

Return Format

The query returns an integer (corresponds to the binary-weighted sum of all the bits) between 0 and 255.

ESR?*Syntax**

*ESR?

Description

Queries the event status register of the standard event register set.

Remarks

- For the definitions of the bits in the standard event register, refer to the *ESE command.
- Querying the event status register will clear this register.

Return Format

The query returns an integer (corresponds to the binary-weighted sum of all the bits from bit 0 to bit 7) between 0 and 255.

IDN?*Syntax**

*IDN?

Description

Queries the instrument information.

Return Format

The query returns RIGOL TECHNOLOGIES,<model>,<serial number>,<software version>.

Wherein,

<model>: indicates the model number of the instrument.

<serial number>: indicates the serial number of the instrument.

<software version>: indicates the software version of the instrument.

OPC*Syntax**

*OPC

Description

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

OPC?*Syntax**

*OPC?

Description

Queries whether the current operation is finished.

Return Format

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

RST*Syntax**

*RST

Description

Restores the instrument to its factory default settings.

SRE*Syntax**

*SRE <mask>

*SRE?

Description

Sets or queries the enable register of the status byte register set.

Parameter

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

Remarks

<mask> is the binary-weighted sum of all the bits from bit 0 to bit 7. "1" denotes enabling the corresponding bit; and "0" denotes disabling the corresponding bit. The bits in the status byte register are defined as follows:

Bit	Weight	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 (Not used)	2	USR	User
0 (Not used)	1	TRG	Trigger

Return Format

The query returns an integer (corresponds to the binary-weighted sum of all the bits) between 0 and 255.

STB?*Syntax**

*STB?

Description

Queries the condition register of the status byte register set.

Remarks

For the definitions of the bits in the status byte register, refer to the *SRE command.

Return Format

The query returns an integer (corresponds to the binary-weighted sum of all the bits) between 0 and 255.

TST?*Syntax**

*TST?

Description

Performs a self-test and queries the self-test result.

Remarks

The self-test result is expressed as a 32-bit binary number. "0" denotes that the corresponding item passes the self-test; "1" denotes that the self-test of the corresponding items fails.

The self-test item corresponding to each bit is as shown below. Bits that are not used are always 0.

BIT0: SYSTEM VOLTAGE 3.3

BIT1: ANA VOL

BIT2: STORAGE VOL

BIT3: DIG CORE VOL

BIT4: DIG PER VOL

BIT8: BATT

BIT9: FAN1

BIT10: FAN2

BIT12: TEMPE1

BIT13: TEMPE2

BIT16: TMO

Return Format

The query returns a decimal integer (corresponds to the binary-weighted sum of all the bits).

:LAN Commands

Command List:

- :LAN:APPLy
- :LAN:AUTOip
- :LAN:DHCP
- :LAN:DNS
- :LAN:GATeway
- :LAN:INITiate
- :LAN:IPADdress
- :LAN:MAC?
- :LAN:MANual
- :LAN:SMASK
- :LAN:STATus?
- :LAN:VISA?

:LAN:APPLy

Syntax

:LAN:APPLy

Description

Applies the current network parameter configuration.

Remarks

After the configuration for the network parameters is finished, the new configuration for network parameters will only take effect when you apply the current network parameter configuration.

:LAN:AUTOip

Syntax

:LAN:AUTOip <bool>

:LAN:AUTOip?

Description

Turns on or off the auto IP configuration mode; or queries the on/off status of the auto IP configuration mode.

Parameter

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

Remarks

- The high-to-low priority of the three IP configuration modes is "DHCP", "Auto IP" and "Static IP". The three IP configuration modes cannot be all turned off at the same time. To use the auto IP configuration mode, turn on this configuration mode and turn off the DHCP configuration mode.
- When the auto IP configuration mode is valid, the oscilloscope will get the IP addresses from 169.254.0.1 to 169.254.255.254 and the subnet mask 255.255.0.0 automatically according to the current network configuration; besides, you can define the gateway address (refer to the :LAN:GATeway command) and the DNS server address (refer to the :LAN:DNS command).

Return Format

The query returns 1 or 0.

:LAN:DHCP

Syntax

```
:LAN:DHCP <bool>
:LAN:DHCP?
```

Description

Turns on or off the DHCP configuration mode; or queries the on/off status of the current DHCP configuration mode.

Parameter

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

Remarks

- The high-to-low priority of the three IP configuration modes is "DHCP", "Auto IP" and "Static IP". The three IP configuration modes cannot be all turned off at the same time. To use the DHCP configuration mode, turn on this configuration mode.
- When the DHCP configuration mode is valid, the DHCP server in the current network will assign the network parameters (such as the IP address, the subnet mask, the gateway address, and the DNS server address) to the oscilloscope.

Return Format

The query returns 1 or 0.

:LAN:DNS

Syntax

```
:LAN:DNS <string>
:LAN:DNS?
```

Description

Sets or queries the DNS server address.

Parameter

Name	Type	Range	Default
<string>	ASCII String	Refer to Remarks	--

Remarks

- The format of <string> is nnn,nnn,nnn,nnn. The range of the first section of "nnn" is from 1 to 223 (except 127), and the ranges of the other three sections of "nnn" are from 0 to 255.
- When the DHCP configuration mode is valid (refer to the :LAN:DHCP command), the DHCP server in the current network will assign the DNS server address to the oscilloscope. You can use this command to query the current DNS server address.
When the auto IP (refer to the :LAN:AUTOip command) or static IP (refer to the :LAN:MANual command) configuration mode is valid, you can use this command to set or query the DNS server address.

Return Format

The query returns the DNS server address in strings.

:LAN:GATeway

Syntax

```
:LAN:GATeway <string>
:LAN:GATeway?
```

Description

Sets or queries the gateway address.

Parameter

Name	Type	Range	Default
<string>	ASCII String	Refer to Remarks	--

Remarks

- The format of <string> is nnn,nnn,nnn,nnn. The range of the first section of "nnn" is from 1 to 223 (except 127), and the ranges of the other three sections of "nnn" are from 0 to 255.
- When the DHCP configuration mode is valid (refer to the :LAN:DHCP command), the DHCP server in the current network will assign the gateway address to the oscilloscope. You can use this command to query the current gateway address.
When the auto IP (refer to the :LAN:AUTOip command) or static IP (refer to the :LAN:MANual command) configuration mode is valid, you can use this command to set or query the gateway address.

Return Format

The query returns the gateway address in strings.

:LAN:INITiate

Syntax

```
:LAN:INITiate
```

Description

Initializes the network parameters (namely restores the network parameters to the default).

Remarks

This command is only valid when the oscilloscope has been connected to the network properly.

:LAN:IPADdress

Syntax

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

Description

Sets or queries the IP address.

Parameter

Name	Type	Range	Default
<string>	ASCII String	Refer to Remarks	--

Remarks

- The format of <string> is nnn,nnn,nnn,nnn. The range of the first section of "nnn" is from 1 to 223 (except 127), and the ranges of the other three sections of "nnn" are from 0 to 255.
- When the DHCP configuration mode is valid (refer to the :LAN:DHCP command), the DHCP server in the current network will assign the IP address to the oscilloscope. You can use this command to query the current IP address.
When the auto IP configuration mode is valid (refer to the :LAN:AUTOip command), the oscilloscope will get the IP address ranging from 169.254.0.1 to 169.254.255.254 automatically according to the current network configuration. You can use this command to query the current IP address.
When the static IP configuration mode (refer to the :LAN:MANual command) is valid, you can use this command to set or query the IP address.

Return Format

The query returns the IP address in strings.

:LAN:MAC?**Syntax**

:LAN:MAC?

Description

Queries the MAC address of the instrument.

Remarks

The MAC address of each oscilloscope is unique. When assigning an IP address for an oscilloscope, you can identify the instrument by its MAC address.

Return Format

The query returns the MAC address in strings.

:LAN:MANual**Syntax**

:LAN:MANual <bool>

:LAN:MANual?

Description

Turns on or off the static IP configuration mode; or queries the on/off status of the static IP configuration mode.

Parameter

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

Remarks

- The high-to-low priority of the three IP configuration modes is "DHCP", "Auto IP" and "Static IP". The three IP configuration modes cannot be all turned off at the same time. To use the static IP configuration mode, turn on this configuration mode, and turn off both the DHCP configuration mode and auto IP configuration mode.
- When the static IP configuration mode is valid, you can define the network parameters, such as the IP address (refer to the :LAN:IPAddress command), the subnet mask (refer to the :LAN:SMASK command), the gateway address (refer to the :LAN:GATeway command), and the DNS server address (refer to the :LAN:DNS command).

Return Format

The query returns 1 or 0.

:LAN:SMASK

Syntax

```
:LAN:SMASK <string>
:LAN:SMASK?
```

Description

Sets or queries the subnet mask.

Parameter

Name	Type	Range	Default
<string>	ASCII String	Refer to Remarks	--

Remarks

- The format of <string> is nnn,nnn,nnn,nnn. The range of the section "nnn" is from 0 to 255.
- When the DHCP configuration mode is valid (refer to the :LAN:DHCP command), the DHCP server in the current network will assign the subnet mask to the oscilloscope. You can use this command to query the current subnet mask.
When the auto IP configuration mode is valid (refer to the :LAN:AUTOip command), the oscilloscope will get the subnet mask 255.255.0.0 automatically according to the current network configuration. You can use this command to query the current subnet mask.
When the static IP configuration mode (refer to the :LAN:MANual command) is valid, you can use this command to set or query the subnet mask.

Return Format

The query returns the subnet mask in strings.

:LAN:STATUs?

Syntax

```
:LAN:STATUs?
```

Description

Queries the current network status.

Return Format

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

UNLINK: indicates not connected.

INIT: indicates that the instrument is acquiring an IP address.

IPCONFLICT: indicates that there is an IP address conflict.

CONFIGURED: indicates that the network configuration has been successfully configured.

DHCPFAILED: indicates that the DHCP configuration has failed.

:LAN:VISA?

Syntax

```
:LAN:VISA?
```

Description

Queries the VISA address of the instrument.

Return Format

The query returns the VISA address in strings.

:MASK Commands

Command List:

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

:MASK:CREate

Syntax

:MASK:CREate

Description

Creates the pass/fail test mask according to the current setting.

Remarks

- This command is invalid after the pass/fail test operation starts (refer to the :MASK:OPERate command).
- For the horizontal tolerance range in the pass/fail test mask, refer to the :MASK:X command; for the vertical tolerance range in the pass/fail test mask, refer to the :MASK:Y command.

:MASK:DATA

Syntax

:MASK:DATA <mask>
:MASK:DATA?

Description

Sends or reads the data stream of the pass/fail test mask.

Parameter

Name	Type	Range	Default
<mask>	ASCII String	Refer to Remarks	--

Remarks

- <mask> is a binary data block, which consists of the TMC data block header and MASK data.
 - The format of the TMC data block header is **#NX...X**. Wherein, # is the start identifier of the data stream; the **N** figures "X...X"(N≤9) following the start identifier indicate the length of the data stream (the number of bytes).
For example, #9000001408.
Wherein, N is 9, 000001408 following it represents that the data stream contains 1408 bytes of effective data.
 - The MASK data is in ASCII format.

- When sending the command, directly place the data stream after the command string, then complete the whole sending process in one time. When reading the data stream, ensure that there is enough buffer space to receive the data stream; otherwise, errors might occur in reading the program.

:MASK:ENABLE

Syntax

```
:MASK:ENABLE <bool>
:MASK:ENABLE?
```

Description

Enables or disables the pass/fail function; or queries the on/off status of the pass/fail function.

Parameter

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

Remarks

The pass/fail test function cannot be enabled in any of the following conditions:

- In the X-Y horizontal time base mode (refer to the :TIMEbase:MODE command);
- In the Roll horizontal time base mode;
- In the Y-T horizontal time base mode and when the horizontal time base is set to 200 ms/div or slower (refer to the :TIMEbase[:MAIN]:SCALE command; in this case, the instrument enters the "Slow Sweep" mode);
- When the waveform recording function is enabled (refer to the :FUNCTION:WRMode command);
- When no analog channel (CH1 to CH4) is turned on (refer to the :CHANnel<n>:DISPlay command).

Return Format

The query returns 1 or 0.

:MASK:FAILED?

Syntax

```
:MASK:FAILED?
```

Description

Queries the number of failed frames in the pass/fail test results.

Return Format

The query returns an integer.

:MASK:MDISplay

Syntax

```
:MASK:MDISplay <bool>
:MASK:MDISplay?
```

Description

Turns on or off the display of the statistic information of the pass/fail test results; or queries the on/off status of the display of the statistic information of the pass/fail test results.

Parameter

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

Remarks

The display of the statistic information of the pass/fail test results can only be turned on when the pass/fail test function is enabled (refer to the :MASK:ENABle command).

Return Format

The query returns 1 or 0.

:MASK:OPERate**Syntax**

:MASK:OPERate <oper>

:MASK:OPERate?

Description

Runs or stops the pass/fail test operation.

Parameter

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

Remarks

You can only run the pass/fail test operation when the pass/fail test function is enabled (refer to the :MASK:ENABle command).

Return Format

The query returns RUN or STOP.

:MASK:OUTPut**Syntax**

:MASK:OUTPut <type>

:MASK:OUTPut?

Description

Enables or disables the alarm function; or queries the on/off status of the alarm function.

Parameter

Name	Type	Range	Default
<type>	Discrete	{FAIL FSound}	FAIL

Remarks

- 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 regardless of the on/off status (refer to the :SYSTem:BEEPer command) of the beeper.

Return Format

The query returns FAIL or FSO.

:MASK:PASSed?

Syntax

:MASK:PASSed?

Description

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

Return Format

The query returns an integer.

:MASK:RESet

Syntax

:MASK:RESet

Description

Resets the pass/fail test results.

Remarks

After this command is sent, the number of frames that pass the pass/fail test (refer to the :MASK:PASSed? command), the number of frames that fail the pass/fail test (refer to the :MASK:FAILed? command), and the total number of frames (refer to the :MASK:TOTal? command) are all reset to 0.

:MASK:SOOutput

Syntax

:MASK:SOOutput <bool>

:MASK:SOOutput?

Description

Enables or disables the Stop On Fail function; or queries the on/off status of the Stop On Fail function.

Parameter

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

Remarks

- 1|ON: indicates that the Stop On Fail function is enabled. When a failed waveform is detected, the oscilloscope stops the test and enters the "Stop" state. In this case, the last statistic results are displayed on the screen if the display of the statistic information of the pass/fail test results is turned on (refer to the :MASK:MDISplay command); a pulse is output from the [Trig Out/Calibration] connector on the rear panel if the connector is configured to output the pass/fail test signal (refer to the :SYSTem:AOUTput command).
- 0|OFF: indicates that Stop On Fail function is disabled. When a failed waveform is detected, the oscilloscope will continue with the test. In this case, the statistic information of the test results on the screen will be updated in real time if the display of the statistic information of the pass/fail test results is turned on (refer to the :MASK:MDISplay command); if the [Trig Out/Calibration] connector is configured to output the pass/fail test signal (refer to the :SYSTem:AOUTput command), a pulse will be output from the connector on the rear panel each time when a failed waveform is detected.

Return Format

The query returns 1 or 0.

:MASK:SOURce

Syntax

```
:MASK:SOURce <source>
:MASK:SOURce?
```

Description

Sets or queries the source channel of the pass/fail test.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Only the currently enabled channel (refer to the :CHANnel<n>:DISPlay command) can be selected as the source channel.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:MASK:TOTal?

Syntax

```
:MASK:TOTal?
```

Description

Queries the total number of frames in the pass/fail test results.

Return Format

The query returns an integer.

:MASK:X

Syntax

```
:MASK:X <x>
:MASK:X?
```

Description

Sets or queries the horizontal tolerance range of the pass/fail test mask. The default unit is div (in the horizontal direction).

Parameter

Name	Type	Range	Default
<x>	Real	0.02 to 4 (with a step of 0.02)	0.24

Return Format

The query returns the horizontal tolerance range in scientific notation.

:MASK:Y

Syntax

:MASK:Y <y>
:MASK:Y?

Description

Sets or queries the vertical tolerance range of the pass/fail test mask. The default unit is div (in the vertical direction).

Parameter

Name	Type	Range	Default
<y>	Real	0.03125 to 4 (with a step of 0.03125)	0.375

Remarks

For the vertical tolerance range, the oscilloscope only displays the number to two decimal places (round-up). For example, when the vertical tolerance range is 0.0625 div, 0.06 is displayed; when the vertical tolerance range is 0.125 div, 0.13 is displayed.

Return Format

The query returns the vertical tolerance range in scientific notation.

:MEASure Commands

Command List:

- :MEASure:ADISplay
- :MEASure:AMSource
- :MEASure:AREA
- :MEASure:CLear
- :MEASure:COUNter:SOURce
- :MEASure:COUNter:VALue?
- :MEASure:CREGion:CAX
- :MEASure:CREGion:CBX
- :MEASure:FDElay
- :MEASure:F2RDelay
- :MEASure:FPHase
- :MEASure:F2RPhase
- :MEASure:FREQuency
- :MEASure:FTIME
- :MEASure:HISTory:DISPlay
- :MEASure:HISTory:DMODE
- :MEASure:MARea
- :MEASure:MPARea
- :MEASure:NDUTy
- :MEASure:NWIDth
- :MEASure:OVERshoot
- :MEASure:PDUTy
- :MEASure:PERiod
- :MEASure:PREShoot
- :MEASure:PVRMs
- :MEASure:PWIDth
- :MEASure:RECover
- :MEASure:RDElay
- :MEASure:R2FDelay
- :MEASure:RPHase
- :MEASure:R2FPhase
- :MEASure:RTIME
- :MEASure:SETup:DSA
- :MEASure:SETup:DSB
- :MEASure:SETup:MAX
- :MEASure:SETup:MID
- :MEASure:SETup:MIN
- :MEASure:SETup:PSA
- :MEASure:SETup:PSB
- :MEASure:SETup:TYPE
- :MEASure:STATistic:DISPlay
- :MEASure:STATistic:MODE
- :MEASure:STATistic:RESet
- :MEASure:SOURce
- :MEASure:VAMP
- :MEASure:VAVG
- :MEASure:VBASe
- :MEASure:VMAX
- :MEASure:VMIN
- :MEASure:VPP
- :MEASure:VRMS
- :MEASure:VTOP

:MEASure:ADISplay

Syntax

```
:MEASure:ADISplay <bool>
:MEASure:ADISplay?
```

Description

Enables or disables the all measurement function; or queries the on/off status of the all measurement function.

Parameter

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

Remarks

- The all measurement function can measure all the time, voltage, and area parameters of the specified channel(s) and display the measurement results on the screen. The specified channel(s) refer to one or multiple channels among CH1-CH4 and MATH. Each measurement source has 21 waveform parameters, as shown below.
8 time parameters: period, frequency, rise time, fall time, positive pulse width, negative pulse width, positive duty cycle, and negative duty cycle.
11 voltage parameters: maximum, minimum, peak-peak, top, base, amplitude, average, Vrms, Per. Vrms, overshoot, and preshoot.
2 area parameters: area and period area.
- Vrms: indicates the root mean square value of the voltage values of the waveform points (relative to the ground). The operation formula is as follows:

$$RMS = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

Wherein, x_i is the measurement result of the i th point being measured; n is the number of points being measured.

Per. Vrms: indicates the root mean square value of the voltage values of the waveform points (relative to the ground) within a single period. The operation formula is as shown above.

Area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of the waveform. The default unit is volt-second.

Period area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of a single period of waveform. The default unit is volt-second.

Note: If the waveform within the current measurement range is less than a period, the measurement results of "Per. Vrms" and "Period area" are displayed as *****.

Return Format

The query returns 1 or 0.

:MEASure:AMSource

Syntax

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

Description

Sets or queries the source channel(s) of the all measurement function.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	CHANnel1

Remarks

You can perform the all measurement function on one or multiple channels among CH1-CH4 and MATH at the same time.

Return Format

The query returns the source channel(s) (CHAN1, CHAN2, CHAN3, CHAN4, or MATH) in strings. These source channels are separated by commas.

:MEASure:AREA**Syntax**

```
:MEASure:AREA <area>
:MEASure:AREA?
```

Description

Sets or queries the measurement range.

Parameter

Name	Type	Range	Default
<area>	Discrete	{SCReen CREGion}	SCReen

Remarks

- SCReen: indicates the screen area.
- CREGion: indicates the cursor area. The measurement range is specified by the area between 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:CLear**Syntax**

```
:MEASure:CLear <item>
```

Description

Clears any one or all of the 5 measurement items that have been turned on last time.

Parameter

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

Remarks

- The 5 measurement items turned on last time are determined by the order in which you turned them on (the last item turned on is ITEM5), and they will not be affected if you delete one or multiple measurement items.
- You can use the :MEASure:RECover command to recover the measurement items that have been cleared.

:MEASure:COUNter:SOURce

Syntax

```
:MEASure:COUNter:SOURce <source>
:MEASure:COUNter:SOURce?
```

Description

Sets or queries the measurement source of the frequency counter.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 EXT OFF}	OFF

Remarks

When <source> is "OFF", it indicates that the frequency counter function will be disabled.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, EXT, or OFF.

:MEASure:COUNter:VALue?

Syntax

```
:MEASure:COUNter:VALue?
```

Description

Queries the measurement results of the frequency counter. The default unit is Hz.

Return Format

The query returns the measurement results of the frequency counter in scientific notation. The query returns 9.9e37 if the frequency counter function is disabled (refer to the :MEASure:COUNter:SOURce command).

:MEASure:CREGion:CAX

Syntax

```
:MEASure:CREGion:CAX <cax>
:MEASure:CREGion:CAX?
```

Description

Sets or queries the position of Cursor A when the measurement range is the "cursor area".

Parameter

Name	Type	Range	Default
<cax>	Integer	0 to 691	300

Remarks

- The position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- The actual range of <cax> is related to the position of Cursor B (refer to the :MEASure:CREGion:CBX command). The range is from 0 to (the current position of cursor B - 6).

Return Format

The query returns an integer between 0 and 691.

:MEASure:CREGion:CBX

Syntax

```
:MEASure:CREGion:CBX <cbx>
:MEASure:CREGion:CBX?
```

Description

Sets or queries the position of Cursor B when the measurement range is the "cursor area".

Parameter

Name	Type	Range	Default
<cbx>	Integer	6 to 697	400

Remarks

- The position of the cursor is defined by the pixel coordinate of the screen. The range of the pixel coordinate on the screen horizontally is from 0 to 699 (from left to right).
- The actual range of <cbx> is related to the position of Cursor A (refer to the :MEASure:CREGion:CAX command). The range is from (the current position of cursor A + 6) to 697.

Return Format

The query returns an integer between 6 and 697.

:MEASure:FDElay

Syntax 1

```
:MEASure:FDElay [<chanA>,<chanB>]
```

Description 1

Measures the delay (falling edge-falling edge) between the two specified source channels.

Syntax 2

```
:MEASure:FDElay? [<chanA>,<chanB>]
```

Description 2

Measures and queries the delay (falling edge-falling edge) between the two specified source channels. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FDElay:SAverage
:MEASure:FDElay:SCURrent
:MEASure:FDElay:SDEVIation
:MEASure:FDElay:SMAximum
:MEASure:FDElay:SMINimum

Syntax 1

```

:MEASure:FDElay:SAverage [<chanA>,<chanB>]
:MEASure:FDElay:SCURrent [<chanA>,<chanB>]
:MEASure:FDElay:SDEVIation [<chanA>,<chanB>]
:MEASure:FDElay:SMAximum [<chanA>,<chanB>]
:MEASure:FDElay:SMINimum [<chanA>,<chanB>]

```

Description 1

Measures the delay (falling edge-falling edge) between the two specified source channels, and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:FDElay:SAverage? [<chanA>,<chanB>]
:MEASure:FDElay:SCURrent? [<chanA>,<chanB>]
:MEASure:FDElay:SDEVIation? [<chanA>,<chanB>]
:MEASure:FDElay:SMAximum? [<chanA>,<chanB>]
:MEASure:FDElay:SMINimum? [<chanA>,<chanB>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the delay (falling edge-falling edge) measurement results when the delay (falling edge-falling edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RDelay

Syntax 1

```
:MEASure:F2RDelay [<chanA>,<chanB>]
```

Description 1

Measures the delay (falling edge-rising edge) between the two specified source channels.

Syntax 2

```
:MEASure:F2RDelay? [<chanA>,<chanB>]
```

Description 2

Measures the delay (falling edge-rising edge) between the two specified source channels. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RDelay:SAverage

:MEASure:F2RDelay:SCURrent

:MEASure:F2RDelay:SDEVIation

:MEASure:F2RDelay:SMAximum

:MEASure:F2RDelay:SMINimum

Syntax 1

```
:MEASure:F2RDelay:SAverage [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SCURrent [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SDEVIation [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SMAximum [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SMINimum [<chanA>,<chanB>]
```

Description 1

Measures the delay (falling edge-rising edge) between the two specified source channels, and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:F2RDelay:SAverage? [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SCURrent? [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SDEVIation? [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SMAximum? [<chanA>,<chanB>]
```

```
:MEASure:F2RDelay:SMINimum? [<chanA>,<chanB>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the delay (falling edge-rising edge) measurement results when the delay (falling edge-rising edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FPHase

Syntax 1

:MEASure:FPHase [<chanA>,<chanB>]

Description 1

Measures the phase deviation (falling edge-falling edge) between the two specified source channels.

Syntax 2

:MEASure:FPHase? [<chanA>,<chanB>]

Description 2

Measures and queries the phase deviation (falling edge-falling edge) between the two specified source channels. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FPHase:SAverage
:MEASure:FPHase:SCURrent
:MEASure:FPHase:SDEVIation
:MEASure:FPHase:SMAximum
:MEASure:FPHase:SMINimum

Syntax 1

```

:MEASure:FPHase:SAverage [<chanA>,<chanB>]
:MEASure:FPHase:SCURrent [<chanA>,<chanB>]
:MEASure:FPHase:SDEVIation [<chanA>,<chanB>]
:MEASure:FPHase:SMAximum [<chanA>,<chanB>]
:MEASure:FPHase:SMINimum [<chanA>,<chanB>]

```

Description 1

Measures the phase deviation (falling edge-falling edge) between the two specified source channels, and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:FPHase:SAverage? [<chanA>,<chanB>]
:MEASure:FPHase:SCURrent? [<chanA>,<chanB>]
:MEASure:FPHase:SDEVIation? [<chanA>,<chanB>]
:MEASure:FPHase:SMAximum? [<chanA>,<chanB>]
:MEASure:FPHase:SMINimum? [<chanA>,<chanB>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the phase deviation (falling edge-falling edge) measurement results when the phase deviation (falling edge-falling edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RPhase

Syntax 1

```
:MEASure:F2RPhase [<chanA>,<chanB>]
```

Description 1

Measures the phase deviation (falling edge-rising edge) between the two specified source channels.

Syntax 2

```
:MEASure:F2RPhase? [<chanA>,<chanB>]
```

Description 2

Measures the phase deviation (falling edge-rising edge) between the two specified source channels. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:F2RPhase:SAverage

:MEASure:F2RPhase:SCURrent

:MEASure:F2RPhase:SDEVIation

:MEASure:F2RPhase:SMAximum

:MEASure:F2RPhase:SMINimum

Syntax 1

```
:MEASure:F2RPhase:SAverage [<chanA>,<chanB>]
:MEASure:F2RPhase:SCURrent [<chanA>,<chanB>]
:MEASure:F2RPhase:SDEVIation [<chanA>,<chanB>]
:MEASure:F2RPhase:SMAximum [<chanA>,<chanB>]
:MEASure:F2RPhase:SMINimum [<chanA>,<chanB>]
```

Description 1

Measures the phase deviation (falling edge-rising edge) between the two specified source channels, and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:F2RPhase:SAverage? [<chanA>,<chanB>]
:MEASure:F2RPhase:SCURrent? [<chanA>,<chanB>]
:MEASure:F2RPhase:SDEVIation? [<chanA>,<chanB>]
:MEASure:F2RPhase:SMAximum? [<chanA>,<chanB>]
:MEASure:F2RPhase:SMINimum? [<chanA>,<chanB>]
```


Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the phase deviation (falling edge-rising edge) measurement results when the phase deviation (falling edge-rising edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FREQuency**Syntax 1**

:MEASure:FREQuency [<chan>]

Description 1

Measures the frequency of the specified source channel.

Syntax 2

:MEASure:FREQuency? [<chan>]

Description 2

Measures and queries the frequency of the specified source channel. The default unit is Hz.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FREQuency:SAverage
:MEASure:FREQuency:SCURrent
:MEASure:FREQuency:SDEViation
:MEASure:FREQuency:SMAXimum
:MEASure:FREQuency:SMINimum

Syntax 1

```
:MEASure:FREQuency:SAverage [<chan>]
:MEASure:FREQuency:SCURrent [<chan>]
:MEASure:FREQuency:SDEViation [<chan>]
:MEASure:FREQuency:SMAXimum [<chan>]
:MEASure:FREQuency:SMINimum [<chan>]
```

Description 1

Measures the frequency of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:FREQuency:SAverage? [<chan>]
:MEASure:FREQuency:SCURrent? [<chan>]
:MEASure:FREQuency:SDEViation? [<chan>]
:MEASure:FREQuency:SMAXimum? [<chan>]
:MEASure:FREQuency:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of frequency measurement results when the frequency measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is Hz.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FTIME**Syntax 1**

```
:MEASure:FTIME [<chan>]
```

Description 1

Measures the fall time of the specified source channel.

Syntax 2

```
:MEASure:FTIME? [<chan>]
```

Description 2

Measures and queries the fall time of the specified source channel. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:FTIME:SAverage
:MEASure:FTIME:SCURrent
:MEASure:FTIME:SDEVIation
:MEASure:FTIME:SMAximum
:MEASure:FTIME:SMINimum

Syntax 1

```
:MEASure:FTIME:SAverage [<chan>]
:MEASure:FTIME:SCURrent [<chan>]
:MEASure:FTIME:SDEVIation [<chan>]
:MEASure:FTIME:SMAximum [<chan>]
:MEASure:FTIME:SMINimum [<chan>]
```

Description 1

Measures the fall time of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:FTIME:SAverage? [<chan>]
:MEASure:FTIME:SCURrent? [<chan>]
:MEASure:FTIME:SDEVIation? [<chan>]
:MEASure:FTIME:SMAximum? [<chan>]
:MEASure:FTIME:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of fall time measurement results when the fall time measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".

- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:HISTory:DISPlay

Syntax

```
:MEASure:HISTory:DISPlay <bool>
:MEASure:HISTory:DISPlay?
```

Description

Turns on or off the measurement history; or queries the on/off status of the measurement history.

Parameter

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

Remarks

- The measurement history cannot be turned on when there is no measurement item.
- You can use the :MEASure:HISTory:DMODE command to set the display form of the history data.

Return Format

The query returns 1 or 0.

:MEASure:HISTory:DMODE

Syntax

```
:MEASure:HISTory:DMODE <mode>
:MEASure:HISTory:DMODE?
```

Description

Sets or queries the display form of the history data.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{TABLE GRAPH}	GRAPH

Remarks

- TABLE: displays the measurement history in table. The last 10 measurement results of at most 5 measurement items that are turned on last time can be displayed.
- GRAPH: displays the measurement history in graph. The measurement points are connected through the linear interpolation.

Return Format

The query returns TABL or GRAP.

:MEASure:MARea

Syntax 1

```
:MEASure:MARea [<chan>]
```

Description 1

Measures the area of the specified source channel.

Syntax 2

```
:MEASure:MARea? [<chan>]
```

Description 2

Measures and queries the area of the specified source channel. The default unit is volt-second.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of the waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

```
:MEASure:MARea:SAverage
:MEASure:MARea:SCURrent
:MEASure:MARea:SDEVIation
:MEASure:MARea:SMAXimum
:MEASure:MARea:SMINimum
```

Syntax 1

```
:MEASure:MARea:SAverage [<chan>]
:MEASure:MARea:SCURrent [<chan>]
:MEASure:MARea:SDEVIation [<chan>]
:MEASure:MARea:SMAXimum [<chan>]
:MEASure:MARea:SMINimum [<chan>]
```

Description 1

Measures the area of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:MARea:SAverage? [<chan>]
:MEASure:MARea:SCURrent? [<chan>]
:MEASure:MARea:SDEVIation? [<chan>]
:MEASure:MARea:SMAXimum? [<chan>]
:MEASure:MARea:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the area measurement results when the area measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is volt-second.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of the waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:MPARea**Syntax 1**

:MEASure:MPARea [<chan>]

Description 1

Measures the period area of the specified source channel.

Syntax 2

:MEASure:MPARea? [<chan>]

Description 2

Measures and queries the period area of the specified source channel. The default unit is volt-second.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Period Area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of a single period of waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:MPARea:SAverage
:MEASure:MPARea:SCURrent
:MEASure:MPARea:SDEViation
:MEASure:MPARea:SMAximum
:MEASure:MPARea:SMINimum

Syntax 1

```

:MEASure:MPARea:SAverage [<chan>]
:MEASure:MPARea:SCURrent [<chan>]
:MEASure:MPARea:SDEViation [<chan>]
:MEASure:MPARea:SMAximum [<chan>]
:MEASure:MPARea:SMINimum [<chan>]

```

Description 1

Measures the period area of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:MPARea:SAverage? [<chan>]
:MEASure:MPARea:SCURrent? [<chan>]
:MEASure:MPARea:SDEViation? [<chan>]
:MEASure:MPARea:SMAximum? [<chan>]
:MEASure:MPARea:SMINimum? [<chan>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the period area measurement results when the period area measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is volt-second.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Period Area: The horizontal axis denotes time and the vertical axis denotes waveform amplitude. The oscilloscope calculates the area (namely the integral of the time and amplitude) of a single period of waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NDUTy

Syntax 1

:MEASure:NDUTy [<chan>]

Description 1

Measures the negative duty cycle of the specified source channel.

Syntax 2

:MEASure:NDUTy? [<chan>]

Description 2

Measures and queries the negative duty cycle of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NDUTy:SAverage

:MEASure:NDUTy:SCURrent

:MEASure:NDUTy:SDEViation

:MEASure:NDUTy:SMAximum

:MEASure:NDUTy:SMINimum

Syntax 1

:MEASure:NDUTy:SAverage [<chan>]

:MEASure:NDUTy:SCURrent [<chan>]

:MEASure:NDUTy:SDEViation [<chan>]

:MEASure:NDUTy:SMAximum [<chan>]

:MEASure:NDUTy:SMINimum [<chan>]

Description 1

Measures the negative duty cycle of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:NDUTy:SAverage? [<chan>]

:MEASure:NDUTy:SCURrent? [<chan>]

:MEASure:NDUTy:SDEViation? [<chan>]

:MEASure:NDUTy:SMAximum? [<chan>]

:MEASure:NDUTy:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the negative duty cycle measurement results when the negative duty cycle measurement function of the specified source channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NWIDth**Syntax 1**

:MEASure:NWIDth [<chan>]

Description 1

Measures the negative pulse width of the specified source channel.

Syntax 2

:MEASure:NWIDth? [<chan>]

Description 2

Measures and queries the negative pulse width of the specified source channel. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:NWIDth:SAverage
:MEASure:NWIDth:SCURrent
:MEASure:NWIDth:SDEViation
:MEASure:NWIDth:SMAximum
:MEASure:NWIDth:SMINimum

Syntax 1

```
:MEASure:NWIDth:SAverage [<chan>]
:MEASure:NWIDth:SCURrent [<chan>]
:MEASure:NWIDth:SDEViation [<chan>]
:MEASure:NWIDth:SMAximum [<chan>]
:MEASure:NWIDth:SMINimum [<chan>]
```

Description 1

Measures the negative pulse width of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:NWIDth:SAverage? [<chan>]
:MEASure:NWIDth:SCURrent? [<chan>]
:MEASure:NWIDth:SDEViation? [<chan>]
:MEASure:NWIDth:SMAximum? [<chan>]
:MEASure:NWIDth:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the negative pulse width measurement results when the negative pulse width measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:OVERshoot**Syntax 1**

```
:MEASure:OVERshoot [<chan>]
```

Description 1

Measures the overshoot of the specified source channel.

Syntax 2

```
:MEASure:OVERshoot? [<chan>]
```

Description 2

Measures and queries the overshoot of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:OVERshoot:SAverage
:MEASure:OVERshoot:SCURrent
:MEASure:OVERshoot:SDEVIation
:MEASure:OVERshoot:SMAximum
:MEASure:OVERshoot:SMINimum

Syntax 1

```
:MEASure:OVERshoot:SAverage [<chan>]
:MEASure:OVERshoot:SCURrent [<chan>]
:MEASure:OVERshoot:SDEVIation [<chan>]
:MEASure:OVERshoot:SMAximum [<chan>]
:MEASure:OVERshoot:SMINimum [<chan>]
```

Description 1

Measures the overshoot of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:OVERshoot:SAverage? [<chan>]
:MEASure:OVERshoot:SCURrent? [<chan>]
:MEASure:OVERshoot:SDEVIation? [<chan>]
:MEASure:OVERshoot:SMAximum? [<chan>]
:MEASure:OVERshoot:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the overshoot measurement results when the overshoot measurement function of the specified source channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".

- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PDUTy

Syntax 1

```
:MEASure:PDUTy [<chan>]
```

Description 1

Measures the positive duty cycle of the specified source channel.

Syntax 2

```
:MEASure:PDUTy? [<chan>]
```

Description 2

Measures and queries the positive duty cycle of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PDUTy:SAverage
:MEASure:PDUTy:SCURrent
:MEASure:PDUTy:SDEVIation
:MEASure:PDUTy:SMAXimum
:MEASure:PDUTy:SMINimum

Syntax 1

```
:MEASure:PDUTy:SAverage [<chan>]  

:MEASure:PDUTy:SCURrent [<chan>]  

:MEASure:PDUTy:SDEVIation [<chan>]  

:MEASure:PDUTy:SMAXimum [<chan>]  

:MEASure:PDUTy:SMINimum [<chan>]
```

Description 1

Measures the positive duty cycle of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:PDUTy:SAverage? [<chan>]
:MEASure:PDUTy:SCURrent? [<chan>]
:MEASure:PDUTy:SDEVIation? [<chan>]
:MEASure:PDUTy:SMAximum? [<chan>]
:MEASure:PDUTy:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the positive duty cycle measurement results when the positive duty cycle measurement function of the specified source channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PERiod**Syntax 1**

```
:MEASure:PERiod [<chan>]
```

Description 1

Measures the period of the specified source channel.

Syntax 2

```
:MEASure:PERiod? [<chan>]
```

Description 2

Measures and queries the period of the specified source channel. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PERiod:SAverage
:MEASure:PERiod:SCURrent
:MEASure:PERiod:SDEViation
:MEASure:PERiod:SMAximum
:MEASure:PERiod:SMINimum

Syntax 1

```
:MEASure:PERiod:SAverage [<chan>]
:MEASure:PERiod:SCURrent [<chan>]
:MEASure:PERiod:SDEViation [<chan>]
:MEASure:PERiod:SMAximum [<chan>]
:MEASure:PERiod:SMINimum [<chan>]
```

Description 1

Measures the period of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:PERiod:SAverage? [<chan>]
:MEASure:PERiod:SCURrent? [<chan>]
:MEASure:PERiod:SDEViation? [<chan>]
:MEASure:PERiod:SMAximum? [<chan>]
:MEASure:PERiod:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the period measurement results when the period measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PREShoot**Syntax 1**

```
:MEASure:PREShoot [<chan>]
```

Description 1

Measures the preshoot of the specified source channel.

Syntax 2

```
:MEASure:PREShoot? [<chan>]
```

Description 2

Measures and queries the preshoot of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PREShoot:SAverage
:MEASure:PREShoot:SCURrent
:MEASure:PREShoot:SDEVIation
:MEASure:PREShoot:SMAximum
:MEASure:PREShoot:SMINimum

Syntax 1

```
:MEASure:PREShoot:SAverage [<chan>]
:MEASure:PREShoot:SCURrent [<chan>]
:MEASure:PREShoot:SDEVIation [<chan>]
:MEASure:PREShoot:SMAximum [<chan>]
:MEASure:PREShoot:SMINimum [<chan>]
```

Description 1

Measures the preshoot of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:PREShoot:SAverage? [<chan>]
:MEASure:PREShoot:SCURrent? [<chan>]
:MEASure:PREShoot:SDEVIation? [<chan>]
:MEASure:PREShoot:SMAximum? [<chan>]
:MEASure:PREShoot:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the preshoot measurement results when the preshoot measurement function of the specified source channel and the statistic function of the measurement results are enabled.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.

- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PVRMs

Syntax 1

```
:MEASure:PVRMs <chan>
```

Description 1

Measures the period amplitude effective value (Per. Vrms) of the specified source channel.

Syntax 2

```
:MEASure:PVRMs? <chan>
```

Description 2

Measures and queries the period amplitude effective value (Per. Vrms) of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Period amplitude effective value (Per. Vrms): indicates the amplitude root mean square value of a single period of waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PVRMs:SAverage

:MEASure:PVRMs:SCURrent

:MEASure:PVRMs:SDEViation

:MEASure:PVRMs:SMAximum

:MEASure:PVRMs:SMINimum

Syntax 1

```
:MEASure:PVRMs:SAverage [<chan>]
```

```
:MEASure:PVRMs:SCURrent [<chan>]
```

```
:MEASure:PVRMs:SDEViation [<chan>]
```

```
:MEASure:PVRMs:SMAximum [<chan>]
```

```
:MEASure:PVRMs:SMINimum [<chan>]
```


Description 1

Measures the period amplitude effective value (Per. Vrms) of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:PVRMs:SAverage? [<chan>]
:MEASure:PVRMs:SCURrent? [<chan>]
:MEASure:PVRMs:SDEVIation? [<chan>]
:MEASure:PVRMs:SMAximum? [<chan>]
:MEASure:PVRMs:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the measurement results of the period amplitude effective value when the measurement function of the period amplitude effective value of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Period amplitude effective value (Per. Vrms): indicates the amplitude root mean square value of a single period of waveform within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PWIDth

Syntax 1

```
:MEASure:PWIDth [<chan>]
```

Description 1

Measures the positive pulse width of the specified source channel.

Syntax 2

```
:MEASure:PWIDth? [<chan>]
```

Description 2

Measures and queries the positive pulse width of the specified source channel. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.

- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:PWIDth:SAverage
:MEASure:PWIDth:SCURrent
:MEASure:PWIDth:SDEVIation
:MEASure:PWIDth:SMAximum
:MEASure:PWIDth:SMINimum

Syntax 1

```
:MEASure:PWIDth:SAverage [<chan>]
:MEASure:PWIDth:SCURrent [<chan>]
:MEASure:PWIDth:SDEVIation [<chan>]
:MEASure:PWIDth:SMAximum [<chan>]
:MEASure:PWIDth:SMINimum [<chan>]
```

Description 1

Measures the positive pulse width of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:PWIDth:SAverage? [<chan>]
:MEASure:PWIDth:SCURrent? [<chan>]
:MEASure:PWIDth:SDEVIation? [<chan>]
:MEASure:PWIDth:SMAximum? [<chan>]
:MEASure:PWIDth:SMINimum? [<chan>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the positive pulse width measurement results when the positive pulse width measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RECover

Syntax

:MEASure:RECover <item>

Description

Recovers the measurement items that have been cleared.

Parameter

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

Remarks

After you have recovered the measurement items that have been cleared, you can also use the :MEASure:CLEAr command to clear them again.

:MEASure:RDElay

Syntax 1

:MEASure:RDElay [<chanA>,<chanB>]

Description 1

Measures the delay (rising edge-rising edge) between the two specified source channels.

Syntax 2

:MEASure:RDElay? [<chanA>,<chanB>]

Description 2

Measures and queries the delay (rising edge-rising edge) between the two specified source channels. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RDElay:SAverage
:MEASure:RDElay:SCURrent
:MEASure:RDElay:SDEVIation
:MEASure:RDElay:SMAXimum
:MEASure:RDElay:SMINimum

Syntax 1

:MEASure:RDElay:SAverage [<chanA>,<chanB>]
 :MEASure:RDElay:SCURrent [<chanA>,<chanB>]
 :MEASure:RDElay:SDEVIation [<chanA>,<chanB>]
 :MEASure:RDElay:SMAXimum [<chanA>,<chanB>]
 :MEASure:RDElay:SMINimum [<chanA>,<chanB>]

Description 1

Measures the delay (rising edge-rising edge) between the two specified source channels, and enables the statistic function of the measurement results.

Syntax 2

:MEASure:RDElay:SAverage? [<chanA>,<chanB>]
 :MEASure:RDElay:SCURrent? [<chanA>,<chanB>]
 :MEASure:RDElay:SDEVIation? [<chanA>,<chanB>]
 :MEASure:RDElay:SMAXimum? [<chanA>,<chanB>]
 :MEASure:RDElay:SMINimum? [<chanA>,<chanB>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the delay (rising edge-rising edge) measurement results when the delay (rising edge-rising edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FDelay

Syntax 1

```
:MEASure:R2FDelay [<chanA>,<chanB>]
```

Description 1

Measures the delay (rising edge-falling edge) between the two specified source channels.

Syntax 2

```
:MEASure:R2FDelay? [<chanA>,<chanB>]
```

Description 2

Measures and queries the delay (rising edge-falling edge) between the two specified source channels. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FDelay:SAverage

:MEASure:R2FDelay:SCURrent

:MEASure:R2FDelay:SDEViation

:MEASure:R2FDelay:SMAximum

:MEASure:R2FDelay:SMINimum

Syntax 1

```
:MEASure:R2FDelay:SAverage [<chanA>,<chanB>]
:MEASure:R2FDelay:SCURrent [<chanA>,<chanB>]
:MEASure:R2FDelay:SDEViation [<chanA>,<chanB>]
:MEASure:R2FDelay:SMAximum [<chanA>,<chanB>]
:MEASure:R2FDelay:SMINimum [<chanA>,<chanB>]
```

Description 1

Measures the delay (rising edge-falling edge) between the two specified source channels and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:R2FDelay:SAverage? [<chanA>,<chanB>]
:MEASure:R2FDelay:SCURrent? [<chanA>,<chanB>]
:MEASure:R2FDelay:SDEViation? [<chanA>,<chanB>]
:MEASure:R2FDelay:SMAximum? [<chanA>,<chanB>]
:MEASure:R2FDelay:SMINimum? [<chanA>,<chanB>]
```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the delay (rising edge-falling edge) measurement results when the delay (rising edge-falling edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:DSA command) and Source B (refer to the :MEASure:SETup:DSB command) of delay measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RPHase**Syntax 1**

:MEASure:RPHase [<chanA>,<chanB>]

Description 1

Measures the phase deviation (rising edge-rising edge) between the two specified source channels.

Syntax 2

:MEASure:RPHase? [<chanA>,<chanB>]

Description 2

Measures and queries the phase deviation (rising edge-rising edge) between the two specified source channels. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RPHase:SAverage
:MEASure:RPHase:SCURrent
:MEASure:RPHase:SDEVIation
:MEASure:RPHase:SMAximum
:MEASure:RPHase:SMINimum

Syntax 1

```

:MEASure:RPHase:SAverage [<chanA>,<chanB>]
:MEASure:RPHase:SCURrent [<chanA>,<chanB>]
:MEASure:RPHase:SDEVIation [<chanA>,<chanB>]
:MEASure:RPHase:SMAximum [<chanA>,<chanB>]
:MEASure:RPHase:SMINimum [<chanA>,<chanB>]

```

Description 1

Measures the phase deviation (rising edge-rising edge) between the two specified source channels and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:RPHase:SAverage? [<chanA>,<chanB>]
:MEASure:RPHase:SCURrent? [<chanA>,<chanB>]
:MEASure:RPHase:SDEVIation? [<chanA>,<chanB>]
:MEASure:RPHase:SMAximum? [<chanA>,<chanB>]
:MEASure:RPHase:SMINimum? [<chanA>,<chanB>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the phase deviation (rising edge-rising edge) measurement results when the phase deviation (rising edge-rising edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FPhase

Syntax 1

```
:MEASure:R2FPhase [<chanA>,<chanB>]
```

Description 1

Measures the phase deviation (rising edge-falling edge) between the two specified source channels.

Syntax 2

```
:MEASure:R2FPhase? [<chanA>,<chanB>]
```

Description 2

Measures and queries the phase deviation (rising edge-falling edge) between the two specified source channels. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:R2FPhase:SAverage

:MEASure:R2FPhase:SCURrent

:MEASure:R2FPhase:SDEVIation

:MEASure:R2FPhase:SMAximum

:MEASure:R2FPhase:SMINimum

Syntax 1

```
:MEASure:R2FPhase:SAverage [<chanA>,<chanB>]
:MEASure:R2FPhase:SCURrent [<chanA>,<chanB>]
:MEASure:R2FPhase:SDEVIation [<chanA>,<chanB>]
:MEASure:R2FPhase:SMAximum [<chanA>,<chanB>]
:MEASure:R2FPhase:SMINimum [<chanA>,<chanB>]
```

Description 1

Measures the phase deviation (rising edge-falling edge) between the two specified source channels and enables the statistic function of the measurement results.

Syntax 2

```
:MEASure:R2FPhase:SAverage? [<chanA>,<chanB>]
:MEASure:R2FPhase:SCURrent? [<chanA>,<chanB>]
:MEASure:R2FPhase:SDEVIation? [<chanA>,<chanB>]
:MEASure:R2FPhase:SMAximum? [<chanA>,<chanB>]
:MEASure:R2FPhase:SMINimum? [<chanA>,<chanB>]
```


Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the phase deviation (rising edge-falling edge) measurement results when the phase deviation (rising edge-falling edge) measurement function between the two specified source channels and the statistic function of the measurement results are enabled. The default unit is °.

Parameter

Name	Type	Range	Default
<chanA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--
<chanB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When [<chanA>,<chanB>] is omitted, this command will be applied to Source A (refer to the :MEASure:SETup:PSA command) and Source B (refer to the :MEASure:SETup:PSB command) of phase measurement currently set by default.

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RTIME**Syntax 1**

:MEASure:RTIME [<chan>]

Description 1

Measures the rise time of the specified source channel.

Syntax 2

:MEASure:RTIME? [<chan>]

Description 2

Measures and queries the rise time of the specified source channel. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:RTIME:SAverage
:MEASure:RTIME:SCURrent
:MEASure:RTIME:SDEVIation
:MEASure:RTIME:SMAximum
:MEASure:RTIME:SMINimum

Syntax 1

```

:MEASure:RTIME:SAverage [<chan>]
:MEASure:RTIME:SCURrent [<chan>]
:MEASure:RTIME:SDEVIation [<chan>]
:MEASure:RTIME:SMAximum [<chan>]
:MEASure:RTIME:SMINimum [<chan>]

```

Description 1

Measures the rise time of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:RTIME:SAverage? [<chan>]
:MEASure:RTIME:SCURrent? [<chan>]
:MEASure:RTIME:SDEVIation? [<chan>]
:MEASure:RTIME:SMAximum? [<chan>]
:MEASure:RTIME:SMINimum? [<chan>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of rise time measurement results when the rise time measurement function of the specified source channel and the statistic function of the measurement results are enabled. The default unit is s.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:SETup:DSA :MEASure:SETup:DSB

Syntax

```
:MEASure:SETup:DSA <sourA>
:MEASure:SETup:DSA?
:MEASure:SETup:DSB <sourB>
:MEASure:SETup:DSB?
```

Description

Sets or queries the channel source of Source A or Source B in delay measurement.

Parameter

Name	Type	Range	Default
<sourA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<sourB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Remarks

The delay measurement function is used to measure the following four kinds of delays between the specified channels:

- Source A rising edge-Source B rising edge (refer to the :MEASure:RDElay command)
- Source A rising edge-Source B falling edge (refer to the :MEASure:R2FDelay command)
- Source A falling edge-Source B falling edge (refer to the :MEASure:FDElay command)
- Source A falling edge-Source B rising edge (refer to the :MEASure:F2RDElay command)

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

: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

Sets or queries the upper limit, middle value, and lower limit (in percentage) of the threshold in the auto measurement of the analog channel.

Parameter

Name	Type	Range	Default
<max>	Integer	7 to 95	90
<mid>	Integer	6 to 94	50
<min>	Integer	5 to 93	10

Remarks

- The upper limit, middle value, and lower limit of the threshold are expressed as the percentages of the vertical amplitude. Setting the threshold will affect the measurement results of the time, delay and phase parameters.
- The <max> value must be at least 1 greater than the <mid> value. When the specified <max> value is smaller than or equal to the current <mid> value, the <mid> value (even the <min> value) will be automatically decreased so as to keep itself smaller than the <max> value.
- The <min> value must be at least 1 smaller than the <mid> value. When the specified <min> value is greater than or equal to the current <mid> value, the <mid> value (even the <max> value) will be automatically increased so as to keep itself greater than the <min> value.
- The actual range of the <mid> value is related to the current <max> and <min> values. It ranges from (the current <min> value plus 1) to (the current <max> value minus 1).

Return Format

The query returns an integer.

:MEASure:SETup:PSA

:MEASure:SETup:PSB

Syntax

```
:MEASure:SETup:PSA <sourA>
:MEASure:SETup:PSA?
:MEASure:SETup:PSB <sourB>
:MEASure:SETup:PSB?
```

Description

Sets or queries Source A and Source B of phase measurement.

Parameter

Name	Type	Range	Default
<sourA>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1
<sourB>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Remarks

The phase measurement function is used to measure the following four kinds of phase deviations between the specified channels:

Source A rising edge-Source B rising edge (refer to the :MEASure:RPHase command)

Source A rising edge-Source B falling edge (refer to the :MEASure:R2FPhase command)

Source A falling edge-Source B falling edge (refer to the :MEASure:FPHase command)

Source A falling edge-Source B rising edge (refer to the :MEASure:F2RPhase command)

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:MEASure:SETup:TYPE

Syntax

```
:MEASure:SETup:TYPE <type>
:MEASure:SETup:TYPE?
```

Description

Sets or queries the type of the measurement setting.

Parameter

Name	Type	Range	Default
<type>	Discrete	{DElay PHASe THReshold}	DElay

Return Format

The query returns DEL, PHAS, or THR.

:MEASure:STATistic:DISPlay

Syntax

```
:MEASure:STATistic:DISPlay <bool>
:MEASure:STATistic:DISPlay?
```

Description

Enables or disables the statistic function of the measurement results; or queries the on/off status of the statistic function of the measurement results.

Parameter

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

Remarks

When the statistic function is enabled, the instrument makes statistics of the measurement results for at most 5 measurement items that are turned on last time and displays the specified statistic items in the statistic results (the items to be displayed are related to the statistic mode currently selected (refer to the :MEASure:STATistic:MODE command)) at the bottom of the screen.

Return Format

The query returns 1 or 0.

:MEASure:STATistic:MODE

Syntax

```
:MEASure:STATistic:MODE <mode>
:MEASure:STATistic:MODE?
```

Description

Sets or queries the statistic mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{EXTRemum DIFFerence}	EXTRemum

Remarks

- EXTRemum: The current value, average value, minimum value, and maximum value are displayed at the bottom of the screen.
- DIFFerence: The current value, average value, standard deviation, and count value are displayed at the bottom of the screen.

Return Format

The query returns EXTR or DIFF.

:MEASure:STATistic:RESet**Syntax**

:MEASure:STATistic:RESet

Description

Clears the history statistic data, makes statistics again, and displays the results.

:MEASure:SOURce**Syntax**

:MEASure:SOURce <source>

:MEASure:SOURce?

Description

Sets or queries the source channel of the time, voltage, and area parameter measurement.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	CHANnel1

Remarks

- When the math operation type is FFT (refer to the :CALCulate:MODE command), <source> cannot be set to "MATH".
- You need to specify two source channels for delay and phase parameter measurements. For the source channel settings of delay parameter measurements, refer to the :MEASure:SETup:DSA and :MEASure:SETup:DSB commands. For the source channel settings of phase parameter measurements, refer to the :MEASure:SETup:PSA and :MEASure:SETup:PSB commands.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or MATH.

:MEASure:VAMP

Syntax 1

:MEASure:VAMP [<chan>]

Description 1

Measures the amplitude of the specified source channel.

Syntax 2

:MEASure:VAMP? [<chan>]

Description 2

Measures and queries the amplitude of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VAMP:SAverage
:MEASure:VAMP:SCURrent
:MEASure:VAMP:SDEVIation
:MEASure:VAMP:SMAximum
:MEASure:VAMP:SMINimum

Syntax 1

:MEASure:VAMP:SAverage [<chan>]
 :MEASure:VAMP:SCURrent [<chan>]
 :MEASure:VAMP:SDEVIation [<chan>]
 :MEASure:VAMP:SMAximum [<chan>]
 :MEASure:VAMP:SMINimum [<chan>]

Description 1

Measures the amplitude of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VAMP:SAverage? [<chan>]
 :MEASure:VAMP:SCURrent? [<chan>]
 :MEASure:VAMP:SDEVIation? [<chan>]
 :MEASure:VAMP:SMAximum? [<chan>]
 :MEASure:VAMP:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the amplitude measurement results when the amplitude measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VAVG**Syntax 1**

:MEASure:VAVG [<chan>]

Description 1

Measures the amplitude average value of the specified source channel.

Syntax 2

:MEASure:VAVG? [<chan>]

Description 2

Measures and queries the amplitude average value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VAVG:SAverage
:MEASure:VAVG:SCURrent
:MEASure:VAVG:SDEVIation
:MEASure:VAVG:SMAximum
:MEASure:VAVG:SMINimum

Syntax 1

```

:MEASure:VAVG:SAverage [<chan>]
:MEASure:VAVG:SCURrent [<chan>]
:MEASure:VAVG:SDEVIation [<chan>]
:MEASure:VAVG:SMAximum [<chan>]
:MEASure:VAVG:SMINimum [<chan>]

```

Description 1

Measures the amplitude average value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:VAVG:SAverage? [<chan>]
:MEASure:VAVG:SCURrent? [<chan>]
:MEASure:VAVG:SDEVIation? [<chan>]
:MEASure:VAVG:SMAximum? [<chan>]
:MEASure:VAVG:SMINimum? [<chan>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the amplitude average value measurement results when the amplitude average value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VBASe

Syntax 1

:MEASure:VBASe [<chan>]

Description 1

Measures the amplitude base value of the specified source channel.

Syntax 2

:MEASure:VBASe? [<chan>]

Description 2

Measures and queries the amplitude base value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VBASe:SAverage
:MEASure:VBASe:SCURrent
:MEASure:VBASe:SDEVIation
:MEASure:VBASe:SMAximum
:MEASure:VBASe:SMINimum

Syntax 1

:MEASure:VBASe:SAverage [<chan>]
 :MEASure:VBASe:SCURrent [<chan>]
 :MEASure:VBASe:SDEVIation [<chan>]
 :MEASure:VBASe:SMAximum [<chan>]
 :MEASure:VBASe:SMINimum [<chan>]

Description 1

Measures the amplitude base value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VAVG:SAverage? [<chan>]
 :MEASure:VAVG:SCURrent? [<chan>]
 :MEASure:VAVG:SDEVIation? [<chan>]
 :MEASure:VAVG:SMAximum? [<chan>]
 :MEASure:VAVG:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the amplitude base value measurement results when the amplitude base value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMAX**Syntax 1**

:MEASure:VMAX [<chan>]

Description 1

Measures the maximum amplitude value of the specified source channel.

Syntax 2

:MEASure:VMAX? [<chan>]

Description 2

Measures and queries the maximum amplitude value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMAX:SAverage
:MEASure:VMAX:SCURrent
:MEASure:VMAX:SDEViation
:MEASure:VMAX:SMAXimum
:MEASure:VMAX:SMINimum

Syntax 1

```

:MEASure:VMAX:SAverage [<chan>]
:MEASure:VMAX:SCURrent [<chan>]
:MEASure:VMAX:SDEViation [<chan>]
:MEASure:VMAX:SMAXimum [<chan>]
:MEASure:VMAX:SMINimum [<chan>]

```

Description 1

Measures the maximum amplitude value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

```

:MEASure:VMAX:SAverage? [<chan>]
:MEASure:VMAX:SCURrent? [<chan>]
:MEASure:VMAX:SDEViation? [<chan>]
:MEASure:VMAX:SMAXimum? [<chan>]
:MEASure:VMAX:SMINimum? [<chan>]

```

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the measurement results for the maximum amplitude value when the maximum amplitude value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMIN

Syntax 1

:MEASure:VMIN [<chan>]

Description 1

Measures the minimum amplitude value of the specified source channel.

Syntax 2

:MEASure:VMIN? [<chan>]

Description 2

Measures and queries the minimum amplitude value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VMIN:SAverage

:MEASure:VMIN:SCURrent

:MEASure:VMIN:SDEVIation

:MEASure:VMIN:SMAximum

:MEASure:VMIN:SMINimum

Syntax 1

:MEASure:VMIN:SAverage [<chan>]

:MEASure:VMIN:SCURrent [<chan>]

:MEASure:VMIN:SDEVIation [<chan>]

:MEASure:VMIN:SMAximum [<chan>]

:MEASure:VMIN:SMINimum [<chan>]

Description 1

Measures the minimum amplitude value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VMIN:SAverage? [<chan>]

:MEASure:VMIN:SCURrent? [<chan>]

:MEASure:VMIN:SDEVIation? [<chan>]

:MEASure:VMIN:SMAximum? [<chan>]

:MEASure:VMIN:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the measurement results for the minimum amplitude value when the minimum amplitude value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VPP**Syntax 1**

:MEASure:VPP [<chan>]

Description 1

Measures the peak-peak value of the specified source channel.

Syntax 2

:MEASure:VPP? [<chan>]

Description 2

Measures and queries the peak-peak value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VPP:SAverage
:MEASure:VPP:SCURrent
:MEASure:VPP:SDEVIation
:MEASure:VPP:SMAximum
:MEASure:VPP:SMINimum

Syntax 1

:MEASure:VPP:SAverage [<chan>]
 :MEASure:VPP:SCURrent [<chan>]
 :MEASure:VPP:SDEVIation [<chan>]
 :MEASure:VPP:SMAximum [<chan>]
 :MEASure:VPP:SMINimum [<chan>]

Description 1

Measures the peak-peak value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VPP:SAverage? [<chan>]
 :MEASure:VPP:SCURrent? [<chan>]
 :MEASure:VPP:SDEVIation? [<chan>]
 :MEASure:VPP:SMAximum? [<chan>]
 :MEASure:VPP:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the peak-peak value measurement results when the peak-peak value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VRMS

Syntax 1

:MEASure:VRMS [<chan>]

Description 1

Measures the amplitude effective value (Vrms) of the specified source channel.

Syntax 2

:MEASure:VRMS? [<chan>]

Description 2

Measures and queries the amplitude effective value (Vrms) of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Amplitude effective value (Vrms): indicates the root mean square value of the waveform amplitude within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VRMS:SAverage
:MEASure:VRMS:SCURrent
:MEASure:VRMS:SDEVIation
:MEASure:VRMS:SMAximum
:MEASure:VRMS:SMINimum

Syntax 1

:MEASure:VRMS:SAverage [<chan>]
 :MEASure:VRMS:SCURrent [<chan>]
 :MEASure:VRMS:SDEVIation [<chan>]
 :MEASure:VRMS:SMAximum [<chan>]
 :MEASure:VRMS:SMINimum [<chan>]

Description 1

Measures the amplitude effective value (Vrms) of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VRMS:SAverage? [<chan>]
 :MEASure:VRMS:SCURrent? [<chan>]
 :MEASure:VRMS:SDEVIation? [<chan>]
 :MEASure:VRMS:SMAximum? [<chan>]
 :MEASure:VRMS:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the measurement results of the amplitude effective value (Vrms) when the measurement function of the amplitude effective value (Vrms) of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Amplitude effective value (Vrms): indicates the root mean square value of the waveform amplitude within the current measurement range (refer to the :MEASure:AREA command).
- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VTOP**Syntax 1**

:MEASure:VTOP [<chan>]

Description 1

Measures the amplitude top value of the specified source channel.

Syntax 2

:MEASure:VTOP? [<chan>]

Description 2

Measures and queries the amplitude top value of the specified source channel. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the measurement results in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:MEASure:VTOP:SAverage
:MEASure:VTOP:SCURrent
:MEASure:VTOP:SDEViation
:MEASure:VTOP:SMAximum
:MEASure:VTOP:SMINimum

Syntax 1

:MEASure:VTOP:SAverage [<chan>]
:MEASure:VTOP:SCURrent [<chan>]
:MEASure:VTOP:SDEViation [<chan>]
:MEASure:VTOP:SMAximum [<chan>]
:MEASure:VTOP:SMINimum [<chan>]

Description 1

Measures the amplitude top value of the specified source channel and enables the statistic function of the measurement results.

Syntax 2

:MEASure:VTOP:SAverage? [<chan>]
:MEASure:VTOP:SCURrent? [<chan>]
:MEASure:VTOP:SDEViation? [<chan>]
:MEASure:VTOP:SMAximum? [<chan>]
:MEASure:VTOP:SMINimum? [<chan>]

Description 2

Queries the average value, current value, standard deviation, maximum value, or minimum value of the amplitude top value measurement results when the amplitude top value measurement function of the specified source channel and the statistic function of the measurement results are enabled. The unit is related to the current amplitude unit of the specified source channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	--

Remarks

- Before making measurements, turn on the channels to be measured.
- When the math operation type is FFT (refer to the :CALCulate:MODE command), <chan> cannot be set to "MATH".
- When [<chan>] is omitted, the command, by default, applies to the currently set measurement source (refer to the :MEASure:SOURce command).

Return Format

The query returns the average value, current value, standard deviation, maximum value, or minimum value in scientific notation. When the measurement results are invalid, the query returns 9.9e37.

:RECall Commands

Command List:

- :RECall:MTESt
- :RECall:REFeRence
- :RECall:SEtUp
- :RECall:TRACe
- :RECall:WAVEform

:RECall:MTESt

Syntax

:RECall:MTESt <file_spec>

Description

Recalls the pass/fail test mask file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.pf	--

Remarks

Before using the command to recall the pass/fail test mask file, send the :MASK:ENABLE command first to enable the pass/fail test function and ensure that the specified file has been stored in the specified location. otherwise, this command is invalid.

:RECall:REFeRence

Syntax

:RECall:REFeRence <file_spec>

Description

Recalls the reference waveform file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.ref	--

Remarks

Before using the command to recall the reference waveform file, send the :REFeRence:DISPlay command first to enable the REF function and ensure that the specified file has been stored in the specified location. otherwise, this command is invalid.

:RECall:SETup

Syntax

:RECall:SETup <file_spec>

Description

Recalls the setup file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.stp	--

Remarks

Before using the command to recall the setting file, ensure that the specified file has been stored in the specified location. otherwise, this command is invalid.

:RECall:TRACe

Syntax

:RECall:TRACe <file_spec>

Description

Recalls the trace file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.trc	--

Remarks

Before using the command to recall the trace file, ensure that the specified file has been stored in the specified location. otherwise, this command is invalid.

:RECall:WAVeform

Syntax

:RECall:WAVeform <file_spec>

Description

Recalls the waveform file stored in the external memory.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.wfm	--

Remarks

Before using the command to recall the waveform file, ensure that the specified file has been stored in the specified location. otherwise, this command is invalid.

:REference Commands

Command List:

- :REference:COLor
- :REference:CURRent?
- :REference:DISPlay
- :REference:RESet
- :REference:SAVe
- :REference:SOURce
- :REference:VOFFset
- :REference:VSCale
- :REference<n>:CURRent
- :REference<n>:ENABle

:REference:COLor

Syntax

```
:REference:COLor <color>
:REference:COLor?
```

Description

Sets or queries the color of the current reference waveform.

Parameter

Name	Type	Range	Default
<color>	Discrete	{GRAY GREEen LBLue MAGenta ORANge}	GRAY

Return Format

The query returns GRAY, GREE, LBL, MAG, or ORAN.

:REference:CURRent?

Syntax

```
:REference:CURRent?
```

Description

Queries the current reference waveform channel.

Remarks

You can use the :REference<n>:CURRent command to set the current reference waveform channel.

Return Format

The query returns REF1, REF2, REF3, REF4, REF5, REF6, REF7, REF8, REF9, or REF10.

:REFeRence:DISPlay

Syntax

```
:REFeRence:DISPlay <bool>
:REFeRence:DISPlay?
```

Description

Turns on or off the REF function; or queries the on/off status of the REF function.

Parameter

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

Remarks

When the REF function is enabled or disabled, the display of the currently enabled reference waveform channel(s) will be turned on or off (refer to the :REFeRence<n>:ENABle command).

Return Format

The query returns 1 or 0.

:REFeRence:RESet

Syntax

```
:REFeRence:RESet
```

Description

After the save operation was executed, reset the vertical scale and vertical position of the current reference waveform to that of the source channel settings in last save operation.

Remarks

You need to save the reference waveform (refer to the :REFeRence:SAVe command) before using this command.

:REFeRence:SAVe

Syntax

```
:REFeRence:SAVe
```

Description

Saves the waveform (screen region) of the specified source channel to the internal memory as the reference waveform of the current reference waveform channel and displays it on the screen.

Remarks

- This operation only saves the reference waveform in the volatile memory and the waveform will be cleared at power-off.
- You can set the color of the reference waveform (refer to the :REFeRence:COLor command), adjust the vertical scale (refer to the :REFeRence:VSCale command) and vertical position (refer to the :REFeRence:VOFFset command) of the reference waveform.

:REFeRence:SOURce

Syntax

```
:REFeRence:SOURce <source>
:REFeRence:SOURce?
```

Description

Sets or queries the source channel of the current reference waveform channel.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH}	CHANnel1

Remarks

Only the currently enabled channel can be selected as the source channel of the reference waveform.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or MATH.

:REFeRence:VOFFset

Syntax

```
:REFeRence:VOFFset <voffset>
:REFeRence:VOFFset?
```

Description

Sets or queries the vertical position of the current reference waveform.

Parameter

Name	Type	Range	Default
<voffset>	Integer	-192 to +192	0

Remarks

When <voffset> is 0, the vertical position of the reference waveform is the same as that of the source channel waveform before the save operation is executed. Increasing or reducing <voffset> will move the reference waveform up or down vertically relative to the original position.

Return Format

The query returns an integer between -192 and +192.

:REFeRence:VSCale

Syntax

```
:REFeRence:VSCale <vscale>
:REFeRence:VSCale?
```

Description

Sets or queries the vertical scale of the current reference waveform.

Parameter

Name	Type	Range	Default
<vscale>	Integer	1 to 10	Null

Remarks

Defines the saved vertical scale of the reference waveform as **Vscale0**, the currently set vertical scale of the reference waveform as **Vscale1**. Different values of <vscale> indicate different ratios 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 between 1 and 10. The query returns Null if no reference waveform is saved for the current reference waveform channel.

:REFerence<n>:CURRent**Syntax**

```
:REFerence<n>:CURRent
```

Description

Sets the specified reference waveform channel as the current reference waveform channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1 2 3 4 5 6 7 8 9 10}	1

Remarks

- Only reference waveform channels currently enabled (refer to the :REFerence<n>:ENABle command) can be selected as the current reference waveform channel.
- You can use the :REFerence:CURRent? command to query the current reference waveform channel.

:REFerence<n>:ENABle**Syntax**

```
:REFerence<n>:ENABle <bool>
:REFerence<n>:ENABle?
```

Description

Turns on or off the specified reference waveform channel; or queries the on/off status of the specified reference waveform channel.

Parameter

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

Return Format

The query returns 1 or 0.

:SAVE Commands

Command List:

- :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:CSV[:START]

Syntax

:SAVE:CSV[:START] <file_spec>

Description

Saves the waveform data to the external memory in "*.csv" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.csv	--

Remarks

- If the specified storage location already contains a file with the same filename, the original file will be overwritten.
- The stored "*.csv" file includes the current horizontal time base, start point time, and voltage value corresponding to each point of the enabled channel. You can open and edit the file via Excel.

:SAVE:CSV:FACTors

Syntax

:SAVE:CSV:FACTors <bool>
:SAVE:CSV:FACTors?

Description

Enables or disables the parameter save function when saving the "*.csv" file; or queries the on/off status of the parameter save function when saving the "*.csv" file.

Parameter

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

Remarks

After this function is enabled, when you send the :SAVE:CSV[:START] command to save the "*.csv" file, a ".txt" file with the same filename will also be saved. This file includes the model, serial number, hardware and software version number, 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

Sets or queries the data length type in saving the "*.csv" file.

Parameter

Name	Type	Range	Default
<len>	Discrete	{DISPlay MAXimum}	DISPlay

Remarks

- DISPlay: only stores the points (1,400 points) within the screen region.
- MAXimum: stores all the points in the internal memory (equal to the current memory depth).

Return Format

The query returns DISP or MAX.

:SAVE:FORMat**Syntax**

```
:SAVE:FORMat <format>
:SAVE:FORMat?
```

Description

Sets or queries 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

Stores the contents displayed on the screen into the external memory in image format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. The suffix of the filename can be .bmp, .png, .jpeg, or .tiff. For example, E:\123.png	--

Remarks

If the specified storage location already contains a file with the same filename, the original file will be overwritten.

:SAVE:IMAGe:TYPE

Syntax

:SAVE:IMAGe:TYPE <type>
:SAVE:IMAGe:TYPE?

Description

Sets or queries in what format is the image saved.

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

Enables or disables the parameter save function when saving the image; or queries whether the parameter save function is enabled when saving the image.

Parameter

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

Remarks

After this function is enabled, when you send the :SAVE:IMAGe[:START] command to save the image file, a ".txt" file with the same filename will also be saved. This file includes the model, serial number, hardware and software version number, 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] <file_spec>

Description

Saves the current parameter settings of the oscilloscope to the external memory in "*.stp" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, D:\123.stp	--

Remarks

- If the specified storage location already contains a file with the same filename, the original file will be overwritten.
- DS4000E does not support running a command to save the setting file to the internal memory for now. If required, save the file by performing the save operation on the front panel of the oscilloscope.

:SAVE:TRACe[:START]**Syntax**

:SAVE:TRACe[:START] {<file_spec>}

Description

Saves the waveform trace to the external memory in "*.trc" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.trc	--

Remarks

If the specified storage location already contains a file with the same filename, the original file will be overwritten.

:SAVE:WAVeform[:START]

Syntax

```
:SAVE:WAVeform[:START] {<file_spec>}
```

Description

Saves the waveform data to the external memory in "*.wfm" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.wfm	--

Remarks

If the specified storage location already contains a file with the same filename, the original file will be overwritten.

:SAVE:REFerence[:START]

Syntax

```
:SAVE:REFerence[:START] <file_spec>
```

Description

Saves the reference waveform currently stored in the oscilloscope to the external memory in "*.ref" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.ref	--

Remarks

- Before using this command to save the reference waveform file, send the :REFerence:SAVe command to save the reference waveform of the current reference channel, and send the :REFerence:DISPlay command to enable the REF function. otherwise, this command is invalid.
- If the specified storage location already contains a file with the same filename, the original file will be overwritten.
- DS4000E does not support running a command to save the reference waveform file to the internal memory for now. If required, save the file by performing the save operation on the front panel of the oscilloscope.

:SAVE:MTEST[:START]**Syntax**

:SAVE:MTEST[:START] <file_spec>

Description

Saves the current pass/fail test mask to the external memory in "*.pf" format.

Parameter

Name	Type	Range	Default
<file_spec>	ASCII String	<file_spec> includes the file storage location and the filename with a suffix. Its length cannot exceed 64 characters. If the USB storage device is inserted into the USB HOST interface of the rear panel, the storage location is E:\; if inserted into the USB HOST interface of the front panel, the storage location is D:\. For example, E:\123.pf	--

Remarks

- Before using the command to save the pass/fail test mask file, send the :MASK:ENABLE command first to enable the pass/fail test function. otherwise, this command is invalid.
- If the specified storage location already contains a file with the same filename, the original file will be overwritten.
- DS4000E does not support running a command to save the pass/fail test mask file to the internal memory for now. If required, save the file by performing the save operation on the front panel of the oscilloscope.

:SYSTem Commands

Command List:

- :SYSTem:AOUTput
- :SYSTem:AUToscale
- :SYSTem:BEEPer
- :SYSTem:DATE
- :SYSTem:ERRor[:NEXT]?
- :SYSTem:ETIMpedence
- :SYSTem:EXPand
- :SYSTem:GAMount?
- :SYSTem:GPIB
- :SYSTem:LANGuage
- :SYSTem:OPTion:INSTall
- :SYSTem:OPTion:UNINSTall
- :SYSTem:PON
- :SYSTem:PSTatus
- :SYSTem:RAMount?
- :SYSTem:RCLOck
- :SYSTem:RESet
- :SYSTem:SETup
- :SYSTem:SSAVer:TIME
- :SYSTem:TIME
- :SYSTem:UDEVice
- :SYSTem:VERSion?

:SYSTem:AOUTput

Syntax

```
:SYSTem:AOUTput <aoutput>
:SYSTem:AOUTput?
```

Description

Sets or queries the type of the signal output from the **[Trig Out/Calibration]** connector on the rear panel.

Parameter

Name	Type	Range	Default
<aoutput>	Discrete	{TOUT QEDGE GND PFAil}	TOUT

Remarks

- TOUT: indicates that each time the oscilloscope triggers, a signal that can reflect the current capture rate of the oscilloscope will be output from the **[Trig Out/Calibration]** connector on the rear panel.
- QEDGE: indicates that a fast edge signal whose rise time is 500 ps will be output from the [Trig Out/Calibration] connector on the rear panel. The signal can be used for the self-calibration of the oscilloscope.
- GND: indicates that a ground level will be output from the [Trig Out/Calibration] connector on the rear panel.
- PFAil: indicates that when a failed waveform is detected by the oscilloscope, a pulse will be output from the [Trig Out/Calibration] connector on the rear panel.

Return Format

The query returns TOUT, QEDG, GND, or PFA.

:SYSTem:AUToscale

Syntax

```
:SYSTem:AUToscale <bool>
:SYSTem:AUToscale?
```

Description

Enables or disables the Auto function; or queries the on/off status of the Auto function.

Parameter

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

Remarks

- 1|ON: enables the Auto function. After it is enabled, you can use the :AUToscale command (or press **AUTO** on the front panel) to make the oscilloscope perform a waveform auto setting operation.
- 0|OFF: disables the Auto function.

Return Format

The query returns 1 or 0.

:SYSTem:BEEPer

Syntax

```
:SYSTem:BEEPer <bool>
:SYSTem:BEEPer?
```

Description

Turns on or off the beeper; or queries the on/off status of the beeper.

Parameter

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

Remarks

- 1|ON: turns on the beeper. After it is turned on, the beeper sounds when you operate the menu or when a prompt message is displayed.
- 0|OFF: turns off the beeper.

Return Format

The query returns 1 or 0.

:SYSTem:DATE

Syntax

```
:SYSTem:DATE <year>,<month>,<day>
:SYSTem:DATE?
```

Description

Sets or queries the system date.

Parameter

Name	Type	Range	Default
<year>	Integer	1999 to 2099	--
<month>	Integer	1 to 12	--
<day>	Integer	1 to 31 (28, 29, or 30)	--

Return Format

The query returns the system date in strings. The year, month, and date are separated by commas.

:SYSTem:ERRor[:NEXT]?

Syntax

```
:SYSTem:ERRor[:NEXT]?
```

Description

Queries and deletes the last system error message.

Return Format

The query returns the system error message in strings. The format is <Message Number>,<Message Content>; wherein, <Message Number> is an integer and <Message Content> is a double-quoted ASCII string. For example, -113,"Undefined header; keyword cannot be found".

:SYSTem:ETIMpedence

Syntax

```
:SYSTem:ETIMpedence <imped>
:SYSTem:ETIMpedence?
```

Description

Sets or queries the external trigger impedance (namely the input impedance of the [EXT TRIG] connector on the front panel of the instrument).

Parameter

Name	Type	Range	Default
<imped>	Discrete	{OMEG FIFTy}	OMEG

Remarks

- OMEG: indicates 1 M Ω .
- FIFTy: indicates 50 Ω .

Return Format

The query returns OMEG or FIFT.

:SYSTem:EXPand

Syntax

```
:SYSTem:EXPand <exp>
:SYSTem:EXPand?
```

Description

Sets or queries the vertical reference.

Parameter

Name	Type	Range	Default
<exp>	Discrete	{CENTer GROund}	GROund

Remarks

- **CENTer**: when the vertical scale of the channel is modified, the waveform of the corresponding channel will be zoomed in or out vertically relative to the screen center.
- **GROund**: when the vertical scale of the channel is modified, the waveform of the corresponding channel will be zoomed in or out vertically relative to the ground level.

Return Format

The query returns CENT or GRO.

:SYSTem:GAMount?

Syntax

```
:SYSTem:GAMount?
```

Description

Queries the number of grids on the screen horizontally.

Return Format

For this oscilloscope, the query always returns 14.

:SYSTem:GPIB

Syntax

```
:SYSTem:GPIB <adr>
:SYSTem:GPIB?
```

Description

Sets or queries 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:LANGuage

Syntax

```
:SYSTem:LANGuage <lang>
:SYSTem:LANGuage?
```

Description

Sets or queries the system language.

Parameter

Name	Type	Range	Default
<lang>	Discrete	{SCHinese TCHinese ENGLish FRENch GERMan RUSSian PORTuguese KORean JAPanese POLish}	--

Return Format

The query returns SCH, TCH, ENGL, FREN, GERM, RUSS, PORT, KOR, JAP, or POL.

:SYSTem:OPTion:INSTall

Syntax

```
:SYSTem:OPTion:INSTall <license>
```

Description

Installs an option.

Parameter

Name	Type	Range	Default
<license>	ASCII String	Refer to Remarks	--

Remarks

To install an option, you need an option license (<license>, and each instrument has a unique license). The option license code is a 28-character string, which consists of English letters and numbers. After you purchase an option, you will obtain a key (used for obtaining the license). Then, you can install the option according to the following steps.

1. Obtain an option license

- 1) Log in to the **RIGOL** official website (www.rigol.com), click **SERVICE** → **Software License Register** to enter the "Registered product license code" interface.
- 2) In the interface, enter the correct key, serial number (press **System**, and select the "Info." tab to obtain the serial number of the instrument), and verification code. Then click **Generate** to obtain the option license for the parameter <license>.

Note: The hyphens in the option license should be omitted for the parameter <license>.

2. Install the option

Send the :SYSTem:OPTion:INSTall <license> command.

:SYSTem:OPTion:UNINSTall

Syntax

```
:SYSTem:OPTion:UNINSTall
```

Description

Uninstalls the option.

:SYSTem:PON

Syntax

```
:SYSTem:PON <pon>
:SYSTem:PON?
```

Description

Sets or queries the system configuration recalled by the oscilloscope when it is powered on again after power-off.

Parameter

Name	Type	Range	Default
<pon>	Discrete	{LATest DEFAult}	--

Remarks

- LATest: restores the oscilloscope to the system configuration at the last power-off.
- DEFAult: restores the oscilloscope to the factory setting.

Return Format

The query returns LAT or DEF.

:SYSTem:PStatus

Syntax

```
:SYSTem:PStatus <status>
:SYSTem:PStatus?
```

Description

Sets or queries the power status of the oscilloscope after power-on.

Parameter

Name	Type	Range	Default
<status>	Discrete	{DEFAult OPEN}	--

Remarks

- DEFAult: after the oscilloscope is powered on, you need to press the power key on the front panel to start the oscilloscope.
- OPEN: after the oscilloscope is powered on, it starts directly. In this case, you can still press the power key on the front panel to turn on or off the instrument.

Return Format

The query returns DEF or OPEN.

:SYSTem:RAMount?

Syntax

```
:SYSTem:RAMount?
```

Description

Queries the number of analog channels of the instrument.

Return Format

For this oscilloscope, the query always returns 4.

:SYSTem:RCLOck

Syntax

```
:SYSTem:RCLOck <clock>
:SYSTem:RCLOck?
```

Description

Sets or queries the type of the reference clock.

Parameter

Name	Type	Range	Default
<clock>	Discrete	{COUtput CINPut}	COUtput

Remarks

- COUtput: indicates clock output. The oscilloscope outputs the internal 10 MHz clock signal from the [10MHz In/Out] connector on the rear panel.
- CINPut: indicates clock input. The oscilloscope receives the external 10 MHz signal input from the [10MHz In/Out] connector on the rear panel as the clock signal.

Return Format

The query returns COU or CINP.

:SYSTem:RESet

Syntax

```
:SYSTem:RESet
```

Description

Powers on the system again.

:SYSTem:SETup

Syntax

```
:SYSTem:SETup <setup>
:SYSTem:SETup?
```

Description

Sends or reads the data stream of the system setup file.

Parameter

Name	Type	Range	Default
<setup>	ASCII String	Refer to Remarks	--

Remarks

- <setup> is a binary data block, which consists of the TMC data block header and SETUP data.
 - The format of the TMC data block header is #NX...X. Wherein, # is the start identifier of the data stream; the N-digit data "X...X" (**N≤9**) following the start identifier indicate the length of the data stream (the number of bytes).
For example, #9000002506.
Wherein, **N** is 9, 000002506 following it represents that the data stream contains 2506 bytes of effective data.
 - The SETUP data is in ASCII format.

- When sending the command, directly place the data stream after the command string, then complete the whole sending process in one time. When reading the data stream, ensure that there is enough buffer space to receive the data stream; otherwise, errors might occur in reading the program.

:SYSTem:SSAVer:TIME

Syntax

:SYSTem:SSAVer:TIME <time>

:SYSTem:SSAVer:TIME?

Description

Sets or queries the screen saver time.

Parameter

Name	Type	Range	Default
<time>	Discrete	{1MIN 2MIN 5MIN 15MIN 30MIN 45MIN 60MIN 2HOur 5HOur OFF}	OFF

Remarks

After the oscilloscope enters the idle state and holds for a specified period of time (screen saver time), the screen saver program will be enabled automatically. When <time> is "OFF", it indicates that the screen saver function is disabled.

Return Format

The query returns 1MIN, 2MIN, 5MIN, 15MIN, 30MIN, 45MIN, 60MIN, 2HO, 5HO, or OFF.

:SYSTem:TIME

Syntax

:SYSTem:TIME <hour>, <minute>, <second>

:SYSTem:TIME?

Description

Sets or queries the system time.

Parameter

Name	Type	Range	Default
<hour>	Integer	0 to 23	--
<minute>	Integer	0 to 59	--
<second>	Integer	0 to 59	--

Remarks

There is a certain delay between the return time value and the set time value due to the command response time and other factors.

Return Format

The query returns the system time in strings.

:SYSTem:UDEVice

Syntax

```
:SYSTem:UDEVice <udv>
:SYSTem:UDEVice?
```

Description

Sets or queries the type of the device connected to the USB Device interface.

Parameter

Name	Type	Range	Default
<udv>	Discrete	{COMPUter PICTbridge}	COMPUter

Remarks

- COMPUter: The oscilloscope can communicate with a PC via the USB DEVICE interface on the rear panel.
- PICTbridge: The oscilloscope can communicate with a PictBridge printer via the USB DEVICE interface on the rear panel.

Return Format

When <udv> is "COMPUter", the query returns COMP. When <udv> is "PICTbridge", the oscilloscope cannot communicate with the PC; therefore, you cannot perform the query operation.

:SYSTem:VERSion?

Syntax

```
:SYSTem:VERSion?
```

Description

Queries the SCPI version of the system.

Return Format

The query always returns 1999.0.

:TIMebase Commands

Command List:

- :TIMebase:DELay:ENABle
- :TIMebase:DELay:OFFSet
- :TIMebase:DELay:SCALe
- :TIMebase:HREF:MODE
- :TIMebase:HREF:POSition
- :TIMebase:MODE
- :TIMebase:VERNier
- :TIMebase:XY1:DISPlay
- :TIMebase:XY2:DISPlay
- :TIMebase[:MAIN]:OFFSet
- :TIMebase[:MAIN]:SCALe

:TIMebase:DELay:ENABle

Syntax

```
:TIMebase:DELay:ENABle <bool>
:TIMebase:DELay:ENABle?
```

Description

Turns on or off the delayed sweep; or queries the on/off status of the delayed sweep.

Parameter

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

Remarks

Only when the horizontal time base mode is Y-T (refer to the :TIMebase:MODE command) and the pass/fail test function is disabled (refer to the :MASK:ENABle command), can the delayed sweep be turned on.

Return Format

The query returns 1 or 0.

:TIMebase:DELay:OFFSet

Syntax

```
:TIMebase:DELay:OFFSet <offset>
:TIMebase:DELay:OFFSet?
```

Description

Sets or queries the horizontal position of the delayed sweep. The default unit is s.

Parameter

Name	Type	Range	Default
<offset>	Real	Refer to Remarks	0

Remarks

The range of <offset> is from (LeftTime + DelayRange/2) to (RightTime – DelayRange/2).

Wherein,

LeftTime = -7 x MainScale + MainOffset;

RightTime = 7 x MainScale + MainOffset;

DelayRange = 14 x DelayScale.

MainScale is the main time base, refer to the :TIMEbase[:MAIN]:SCALE command; MainOffset is the horizontal position (normal sweep), refer to the :TIMEbase[:MAIN]:OFFSet command; DelayScale is the horizontal time base of the delayed sweep, refer to the :TIMEbase:DELAy:SCALE command.

Return Format

The query returns the horizontal position of the delayed sweep in scientific notation.

:TIMEbase:DELAy:SCALE

Syntax

```
:TIMEbase:DELAy:SCALE <scale>
:TIMEbase:DELAy:SCALE?
```

Description

Sets or queries the horizontal time base of the delayed sweep. The default unit is s/div.

Parameter

Name	Type	Range	Default
<scale>	Real	The minimum value of <scale> is related to the current sample rate. It must satisfy the formula $(1 \times 50 / \text{real-time sample rate} \times 1/40)$ and should not be less than 2 ns. The maximum value of <scale> is the current main time base.	500 ns/div

Return Format

The query returns the horizontal time base of the delayed sweep in scientific notation.

:TIMEbase:HREF:MODE

Syntax

```
:TIMEbase:HREF:MODE <href>
:TIMEbase:HREF:MODE?
```

Description

Sets or queries the horizontal reference.

Parameter

Name	Type	Range	Default
<href>	Discrete	{CENTer TPOsition USER}	CENTer

Remarks

- CENTer: when the horizontal time base is modified, the waveform displayed will be expanded or compressed horizontally relative to the screen center.
TPOsition: when the horizontal time base is modified, the waveform displayed will be expanded or compressed horizontally relative to the trigger position.
USER: when the horizontal time base is modified, the waveform displayed will be expanded or compressed horizontally relative to the user-defined reference position (refer to the :TIMEbase:HREF:POsition command).
- Only when the horizontal time base mode is Y-T (refer to the :TIMEbase:MODE command) and the delayed sweep is off (refer to the :TIMEbase:DELAy:ENABLe command), can this command be valid.

Return Format

The query returns CENT, TPOS, or USER.

:TIMebase:HREF:POSition

Syntax

```
:TIMebase:HREF:POSition <pos>
:TIMebase:HREF:POSition?
```

Description

Sets or queries the user-defined horizontal reference position when the horizontal reference is set to "USER" (refer to the :TIMebase:HREF:MODE command).

Parameter

Name	Type	Range	Default
<pos>	Integer	-350 to +350	0

Remarks

The leftmost, rightmost, and center of the screen are 350, -350, and 0 respectively.

Return Format

The query returns an integer between -350 and +350.

:TIMebase:MODE

Syntax

```
:TIMebase:MODE <mode>
:TIMebase:MODE?
```

Description

Sets or queries the horizontal time base mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{MAIN XY ROLL}	MAIN

Remarks

- MAIN: indicates the Y-T mode.
- XY: indicates the X-Y mode.
- ROLL: indicates the Roll mode.

Return Format

The query returns MAIN, XY, or ROLL.

:TIMebase:VERNier

Syntax

```
:TIMebase:VERNier <bool>
:TIMebase:VERNier?
```



Description

Enables or disables the fine adjustment function of the horizontal time base; or queries the on/off status of the fine adjustment function of the horizontal time base.

Parameter

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

Remarks

- 1|ON: enables the fine adjustment function. Rotate **Horizontal**  **SCALE** to further adjust the horizontal time base at a relatively smaller step.
- 0|OFF: disables the fine adjustment function. Rotate **Horizontal**  **SCALE** to adjust the horizontal time base within the adjustable range at 1-2-5 step.

Return Format

The query returns 1 or 0.

:TIMebase:XY1:DISPlay**Syntax**

:TIMebase:XY1:DISPlay <bool>

:TIMebase:XY1:DISPlay?

Description

Turns on or off the display of the XY1 area when the horizontal time base mode is "X-Y" (refer to the :TIMebase:MODE command); or queries the on/off status of the display of the XY1 area.

Parameter

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

Return Format

The query returns 1 or 0.

:TIMebase:XY2:DISPlay**Syntax**

:TIMebase:XY2:DISPlay <bool>

:TIMebase:XY2:DISPlay?

Description

Turns on or off the display of the XY2 area when the horizontal time base mode is "X-Y" (refer to the :TIMebase:MODE command); or queries the on/off status of the display of the XY2 area.

Parameter

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

Return Format

The query returns 1 or 0.

:TIMebase[:MAIN]:OFFSet**Syntax**

:TIMebase[:MAIN]:OFFSet <offset>

:TIMebase[:MAIN]:OFFSet?

Description

Sets or queries the horizontal position (normal sweep). The default unit is s.

Parameter

Name	Type	Range	Default
<offset>	Real	Refer to Remarks	0

Remarks

The range of <offset> is related to the current horizontal time base mode (refer to the :TIMEbase:MODE command) and the operating state of the oscilloscope.

- Y-T mode
In the Run state: When TimeScale is less than 20 ms/div, the range of <offset> is from (-MemDepth/SamplingRate) to 1 s; when TimeScale is greater than or equal to 20 ms/div, the range of <offset> is from (-MemDepth/SamplingRate) to (100 x TimeScale).
In the Stop state: -7000 s to 7000 s
- Roll mode
In the Run state: This command is not available.
In the Stop state: -7000 s to 0 s

Wherein, MemDepth is the current memory depth of the oscilloscope, refer to the :ACQuire:MDEPth command.

SamplingRate is the current sample rate of the oscilloscope, refer to the :ACQuire:SRATE? command.

TimeScale is the horizontal time base (normal sweep), refer to the :TIMEbase[:MAIN]:SCALE command.

Return Format

The query returns the horizontal position (normal sweep) in scientific notation.

:TIMEbase[:MAIN]:SCALE**Syntax**

:TIMEbase[:MAIN]:SCALE <scale>

:TIMEbase[:MAIN]:SCALE?

Description

Sets or queries the horizontal time base. The default unit is s/div.

Parameter

Name	Type	Range	Default
<scale>	Real	Refer to Remarks	1 us

Remarks

The range of <scale> is related to the current horizontal time base mode (refer to the :TIMEbase:MODE command) and the model of the oscilloscope.

- Y-T mode
DS4024E: 2 ns to 1000 s
DS4014E: 5 ns to 1000 s
- Roll mode
200 ms to 1000 s

Return Format

The query returns the horizontal time base in scientific notation.

:TRIGger Commands

Command List:

- :TRIGger:COUPling
- :TRIGger:HOLDoff
- :TRIGger:MODE
- :TRIGger:STATus?
- :TRIGger:SWEEp
- :TRIGger:NREJect
- :TRIGger:CAN
- :TRIGger:EDGE
- :TRIGger:IIC
- :TRIGger:PATtern
- :TRIGger:PULSe
- :TRIGger:RUNT
- :TRIGger:NEDGE
- :TRIGger:RS232
- :TRIGger:SLOPe
- :TRIGger:SPI
- :TRIGger:USB
- :TRIGger:VIDeo
- :TRIGger:FLEXray

:TRIGger:COUPling

Syntax

```
:TRIGger:COUPling <couple>
:TRIGger:COUPling?
```

Description

Sets or queries the trigger coupling type.

Parameter

Name	Type	Range	Default
<couple>	Discrete	{DC AC LFReject HFReject}	DC

Remarks

- DC: allows DC and AC components to pass the trigger path.
AC: blocks all the DC components and attenuates signals below 8 Hz.
LFReject: blocks the DC components and rejects the low frequency components below 5 kHz.
HFReject: rejects the high frequency components above 50 kHz.
- Trigger coupling is only valid in Edge trigger (refer to the :TRIGger:MODE command).

Return Format

The query returns DC, AC, LFR, or HFR.

:TRIGger:HOLDoff

Syntax

```
:TRIGger:HOLDoff <value>
:TRIGger:HOLDoff?
```

Description

Sets or queries the trigger holdoff time. The default unit is s.

Parameter

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

Remarks

The trigger types that support the holdoff include Edge trigger, Pulse trigger, Runt trigger, Slope trigger, and Pattern trigger.

Return Format

The query returns the trigger holdoff time in scientific notation.

:TRIGger:MODE

Syntax

```
:TRIGger:MODE <mode>
:TRIGger:MODE?
```

Description

Sets or queries the trigger type.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{EDGE PULSe RUNT NEDG SLOPe VIDeo PATTern RS232 IIC SPI CAN FLEXray USB}	EDGE

Return Format

The query returns EDGE, PULS, RUNT, NEDG, SLOP, VID, PATT, RS232, IIC, SPI, CAN, FLEX, or USB.

:TRIGger:STATus?

Syntax

```
:TRIGger:STATus?
```

Description

Queries the current operating state.

Remarks

The operating states include RUN, STOP, T'D (triggered), WAIT, and AUTO.

Return Format

The query returns RUN, STOP, TD, WAIT, or AUTO.

:TRIGger:SWEep

Syntax

```
:TRIGger:SWEep <sweep>
:TRIGger:SWEep?
```

Description

Sets or queries the trigger mode.

Parameter

Name	Type	Range	Default
<sweep>	Discrete	{AUTO NORMal SINGle}	AUTO

Remarks

- AUTO: indicates the auto trigger. In this trigger mode, if the specified trigger condition is not found, the oscilloscope will force a trigger and data acquisition to display the waveform.
- NORMal: indicates the normal trigger. In this trigger mode, only when the specified trigger condition is found, will the oscilloscope perform a trigger and data acquisition.
- SINGle: indicates the single trigger. In this trigger mode, when the specified trigger condition is found, the oscilloscope performs a single trigger and data acquisition, and then stops.

Return Format

The query returns AUTO, NORM, or SING.

:TRIGger:NREJect

Syntax

```
:TRIGger:NREJect <bool>
:TRIGger:NREJect?
```

Description

Turns on or off noise rejection; or queries the on/off status of noise rejection.

Parameter

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

Return Format

The query returns 1 or 0.

:TRIGger:CAN

Command List:

- :TRIGger:CAN:BAUD
- :TRIGger:CAN:BUSer
- :TRIGger:CAN:FTYPE
- :TRIGger:CAN:LEVel
- :TRIGger:CAN:SOURce
- :TRIGger:CAN:SPOint
- :TRIGger:CAN:STYPE
- :TRIGger:CAN:WHEN

:TRIGger:CAN:BAUD

Syntax

```
:TRIGger:CAN:BAUD <baud>
:TRIGger:CAN:BAUD?
```

Description

Sets or queries the signal rate of CAN trigger. The default unit is b/s.

Parameter

Name	Type	Range	Default
<baud>	Discrete	{10000 20000 33300 50000 62500 83300 100000 125000 250000 500000 800000 1000000 USER}	10000

Remarks

When <baud> is set to "USER", you can use the :TRIGger:CAN:BUSer command to self-define the signal rate of CAN trigger.

Return Format

The query returns 10000, 20000, 33300, 50000, 62500, 83300, 100000, 125000, 250000, 500000, 800000, 1000000, or USER.

:TRIGger:CAN:BUSer

Syntax

```
:TRIGger:CAN:BUSer <baud>
:TRIGger:CAN:BUSer?
```

Description

Sets or queries the user-defined signal rate of CAN trigger. The default unit is b/s.

Parameter

Name	Type	Range	Default
<baud>	Integer	10000 to 1000000	10000

Return Format

The query returns an integer between 10000 and 10000000.

:TRIGger:CAN:FTYPE**Syntax**

:TRIGger:CAN:FTYPE <ftype>

:TRIGger:CAN:FTYPE?

Description

Sets or queries the frame type of CAN trigger when the trigger condition is "FTYPE" (refer to the :TRIGger:CAN:WHEN command).

Parameter

Name	Type	Range	Default
<ftype>	Discrete	{DATA REMOte ERRor OVERload}	DATA

Remarks

- DATA: indicates data frame.
- REMote: indicates remote frame.
- ERRor: indicates error frame.
- OVERload: indicates overload frame.

Return Format

The query returns DATA, REM, ERR, or OVER.

:TRIGger:CAN:LEVel**Syntax**

:TRIGger:CAN:LEVel <level>

:TRIGger:CAN:LEVel?

Description

Sets or queries the trigger level of CAN trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:CAN:SOURce**Syntax**

:TRIGger:CAN:SOURce <source>

:TRIGger:CAN:SOURce?

Description

Sets or queries the source channel of CAN trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:CAN:SPOint**Syntax**

```
:TRIGger:CAN:SPOint <spo>
:TRIGger:CAN:SPOint?
```

Description

Sets or queries the sample point position of CAN trigger (expressed in %).

Parameter

Name	Type	Range	Default
<spo>	Integer	5 to 95	50

Remarks

The sample point is within the range of the bit time. The oscilloscope samples the bit level at the sample point. The sample point position is expressed as the ratio of "time from the bit start to the sample point" to "bit time", in %.

Return Format

The query returns an integer between 5 and 95.

:TRIGger:CAN:STYPe**Syntax**

```
:TRIGger:CAN:STYPe <stype>
:TRIGger:CAN:STYPe?
```

Description

Sets or queries the signal type of CAN trigger.

Parameter

Name	Type	Range	Default
<stype>	Discrete	{RX TX H L DIFFerential}	RX

Remarks

- RX: indicates the Receive signal from the CAN bus transceiver.
- TX: indicates the Transmit signal from the CAN bus transceiver.
- H: indicates the actual CAN_H differential bus signal.
- L: indicates the actual CAN_L differential bus signal.
- DIFFerential: indicates the CAN differential bus signal connected to an analog channel by using a

differential probe. The positive polarity of the differential probe connects the CAN_H bus signal, and the negative polarity connects the CAN_L bus signal.

Return Format

The query returns RX, TX, H, L, or DIFF.

:TRIGger:CAN:WHEN

Syntax

:TRIGger:CAN:WHEN <cond>

:TRIGger:CAN:WHEN?

Description

Sets or queries the trigger condition of CAN trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{SOF EOF FTYPE FERRor}	SOF

Remarks

- SOF: indicates start of frame. It indicates that the oscilloscope triggers at the start of a data frame.
EOF: indicates end of frame. It indicates that the oscilloscope triggers at the end of a data frame.
FTYPE: indicates frame type. It indicates that the oscilloscope triggers on the specified type of a frame.
FERRor: indicates the frame error. It indicates that the oscilloscope triggers on the frame that has a specified error type.
- When <cond> is "FTYPE", you can use the :TRIGger:CAN:FTYPE command to set the frame type of CAN trigger.

Return Format

The query returns SOF, EOF, FTYP, or FERR.

:TRIGger:EDGE

Command List:

- :TRIGger:EDGE:LEVel
- :TRIGger:EDGE:SLOPe
- :TRIGger:EDGE:SOURce

:TRIGger:EDGE:LEVel

Syntax

```
:TRIGger:EDGE:LEVel <level>
:TRIGger:EDGE:LEVel?
```

Description

Sets or queries the trigger level of Edge trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	Refer to Remarks	0

Remarks

The range of <level> is related to the type of the source channel of Edge trigger.

- **Analog channel (CH1-CH4)**
The range of <level> is from $(-6 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen).
Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.
- **External trigger channel (EXT or EXT/5)**
The range of <level> is from -800 mV to +800 mV (EXT) or from -4 V to +4 V (EXT/5). The unit is the same as the current amplitude unit of CH1.
- **AC line**
You do not need to set the trigger level.

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:EDGE:SLOPe

Syntax

```
:TRIGger:EDGE:SLOPe <slope>
:TRIGger:EDGE:SLOPe?
```

Description

Sets or queries the edge type of Edge trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive NEGative RFAlI}	POSitive

Remarks

- POSitive: indicates that the oscilloscope triggers at the crossing point where the rising edge of the input signal meets the preset trigger level.

- **NEGative**: indicates that the oscilloscope triggers at the crossing point where the falling edge of the input signal meets the preset trigger level.
- **RFALL**: indicates that the oscilloscope triggers at the crossing point where the rising or falling edge of the input signal meets the preset trigger level.

Return Format

The query returns POS, NEG, or RFAL.

:TRIGger:EDGE:SOURce

Syntax

```
:TRIGger:EDGE:SOURce <source>
```

```
:TRIGger:EDGE:SOURce?
```

Description

Sets or queries the source channel of Edge trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 EXT EXT5 ACLIne}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, EXT, EXT5, or ACL.

:TRIGger:IIC

Command List:

- :TRIGger:IIC:ADDRess
- :TRIGger:IIC:AWIDth
- :TRIGger:IIC:CLEVel
- :TRIGger:IIC:DATA
- :TRIGger:IIC:DIRection
- :TRIGger:IIC:DLEVel
- :TRIGger:IIC:SCL
- :TRIGger:IIC:SDA
- :TRIGger:IIC:WHEN

:TRIGger:IIC:ADDRess

Syntax

```
:TRIGger:IIC:ADDRess <address>
:TRIGger:IIC:ADDRess?
```

Description

Sets or queries the address of IIC trigger when the trigger condition is "ADDRess" or "ADATa" (refer to the :TRIGger:IIC:WHEN command).

Parameter

Name	Type	Range	Default
<address>	Integer	Refer to Remarks	1

Remarks

The value of <address> is related to the current address width (set to n, refer to the :TRIGger:IIC:AWIDth command). Its range is from 0 to $(2^n - 1)$.

Return Format

The query returns an integer.

:TRIGger:IIC:AWIDth

Syntax

```
:TRIGger:IIC:AWIDth <awidth>
:TRIGger:IIC:AWIDth?
```

Description

Sets or queries the address width of IIC trigger when the trigger condition is "ADDRess" or "ADATa" (refer to the :TRIGger:IIC:WHEN command).

Parameter

Name	Type	Range	Default
<awidth>	Discrete	{7 8 10}	7

Return Format

The query returns 7, 8, or 10.

:TRIGger:IIC:CLeVel**Syntax**

:TRIGger:IIC:CLeVel <level>

:TRIGger:IIC:CLeVel?

Description

Sets or queries the trigger level of the clock signal of IIC trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the clock line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the clock line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:IIC:DATA**Syntax**

:TRIGger:IIC:DATA <data>

:TRIGger:IIC:DATA?

Description

Sets or queries the data value of IIC trigger when the trigger condition is "DATA" or "ADATa" (refer to the :TRIGger:IIC:WHEN command).

Parameter

Name	Type	Range	Default
<data>	Integer	The range of <data> is from 0 to $(2^{8 \times n} - 1)$. Wherein, "n" indicates the current data byte length, which is an integer between 1 and 5.	0

Return Format

The query returns an integer.

:TRIGger:IIC:DIRection**Syntax**

:TRIGger:IIC:DIRection <dir>

:TRIGger:IIC:DIRection?

Description

Sets or queries the data direction of IIC trigger when the trigger condition is "ADDRess" or "ADATa" (refer to the :TRIGger:IIC:WHEN command).

Parameter

Name	Type	Range	Default
<dir>	Discrete	{READ WRITe RWRite}	READ

Remarks

You do not need to set the data direction when the address width of IIC trigger is 8 bits (refer to the :TRIGger:IIC:AWIDth command).

Return Format

The query returns READ, WRIT, or RWR.

:TRIGger:IIC:DLEVel**Syntax**

:TRIGger:IIC:DLEVel <level>
:TRIGger:IIC:DLEVel?

Description

Sets or queries the trigger level of the data signal of IIC trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the data line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:IIC:SCL**Syntax**

:TRIGger:IIC:SCL <source>
:TRIGger:IIC:SCL?

Description

Sets or queries the source channel of the clock line of IIC trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:IIC:SDA**Syntax**

:TRIGger:IIC:SDA <source>

:TRIGger:IIC:SDA?

Description

Sets or queries the source channel of the data line of IIC trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:IIC:WHEN**Syntax**

:TRIGger:IIC:WHEN <cond>

:TRIGger:IIC:WHEN?

Description

Sets or queries the trigger condition of IIC trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{START REStart STOP NACKnowledge ADDRess DATA ADATa}	START

Remarks

- **START:** indicates that the oscilloscope triggers when the clock line is high level and the data line hops from high level to low level.
REStart: indicates that the oscilloscope triggers when another start condition occurs before a stop condition.
STOP: indicates that the oscilloscope triggers when the clock line is high level and the data line hops from low level to high level.
NACKnowledge: indicates that the oscilloscope triggers when the data line is high level during the acknowledgement of the clock line bit.
ADDRess: searches for the specified address, and then triggers on the acknowledgement of the clock line bit.
DATA: searches for the specified data from the data line, and then triggers on the acknowledgement of the clock line bit that follows the data value.
ADATa: indicates that the oscilloscope searches for the specified address and data, and then triggers when both the address and data meet the conditions.
- When <cond> is set to "ADDRess" or "ADATa", use the :TRIGger:IIC:ADDRess command to set the address. When <cond> is set to "DATA" or "ADATa", use the :TRIGger:IIC:DATA command to set the data.

Return Format

The query returns STAR, REST,STOP, NACK, ADDR, DATA, or ADAT.

:TRIGger:PATtern

Command List:

- :TRIGger:PATtern:LEVel
- :TRIGger:PATtern:PATtern
- :TRIGger:PATtern:SOURce

:TRIGger:PATtern:LEVel

Syntax

```
:TRIGger:PATtern:LEVel [<chan>,<level>]
:TRIGger:PATtern:LEVel? [<chan>]
```

Description

Sets or queries the trigger level of the specified channel of Pattern trigger. If <chan> is omitted, the command sets or queries the trigger level of the current channel (refer to the :TRIGger:PATtern:SOURce command). The unit is related to the type of the channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 EXT}	CHANnel1
<level>	Real	Refer to Remarks	0

Remarks

The range of <level> is related to the type of the source channel.

- **Analog channel (CH1-CH4)**

The range of <level> is from $(-6 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen). The unit is the same as the amplitude unit of the specified channel. Wherein, VerticalScale is the vertical scale of the specified channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the specified channel, refer to the :CHANnel<n>:OFFSet command.

- **External trigger channel (EXT)**

The range of <level> is from -800 mV to +800 mV. The unit is the same as the current amplitude unit of CH1.

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:PATtern:PATtern

Syntax

```
:TRIGger:PATtern:PATtern <pch1>[,<pch2>[,<pch3>[,<pch4>[,<pext>]]]]
:TRIGger:PATtern:PATtern?
```

Description

Sets or queries the channel pattern of Pattern trigger.

Parameter

Name	Type	Range	Default
<pch1>	Discrete	{H L X R F}	X
<pch2>	Discrete	{H L X R F}	X
<pch3>	Discrete	{H L X R F}	X
<pch4>	Discrete	{H L X R F}	X
<pext>	Discrete	{H L X R F}	X

Remarks

- <pch1>-<pch4> represent the patterns of the analog channels (CH1-CH4) respectively; <pext> represents the pattern of the external trigger channel (EXT TRIG). By default, the instrument sets the patterns of the channels (CH1-CH4) first, and then the external trigger channel EXT TRIG. You can use 5 parameters to set the patterns of all the channels; or only use n ($1 \leq n < 5$) parameters to set the patterns of the first n channels (at this time, the state of the patterns of the other channels remain unchanged).
- H: indicates high level; higher than the trigger level of the channel.
L: indicates low level; lower than the trigger level of the channel.
X: ignores this channel, which indicates that you can ignore the state of this channel when judging the pattern. If the patterns of all the channels are set to X, the oscilloscope will not trigger.
R, F: indicates the rising edge and falling edge. In the pattern, you can only specify one edge (rising edge or falling edge). If one edge item has been defined, and you choose another channel and define its edge item, then the edge item defined previously will be replaced by "X".

Return Format

The query returns the channel patterns in strings (5 in total, the pattern sequence is from CH1-CH4 to EXT TRIG). The patterns are separated by commas.

:TRIGger:PATtern:SOURce**Syntax**

```
:TRIGger:PATtern:SOURce <source>
:TRIGger:PATtern:SOURce?
```

Description

Sets or queries the current channel of Pattern trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 EXT}	CHANnel1

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or EXT.

:TRIGger:PULSe

Command List:

- :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

Sets or queries the trigger level of Pulse trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	Refer to Remarks	0

Remarks

The range of <level> is related to the type of the source channel of Pulse trigger.

- **Analog channel (CH1-CH4)**

The range of <level> is from $(-6 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen).

Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.

- **External trigger channel (EXT)**

The range of <level> is from -800 mV to +800 mV. The unit is the same as the current amplitude unit of CH1.

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:PULSe:LWIDth

Syntax

```
:TRIGger:PULSe:LWIDth <lwidth>
:TRIGger:PULSe:LWIDth?
```

Description

Sets or queries the lower limit of the pulse width of Pulse trigger when the trigger condition is "PGReater", "NGReater", "PGLess", or "NGLess" (refer to the :TRIGger:PULSe:WHEN command). The default unit is s.

Parameter

Name	Type	Range	Default
<lwidth>	Real	When the trigger condition is "PGReater" or "NGReater": 4 ns to 4 s When the trigger condition is "PGLess" or "NGLess": 4 ns to 3.99 s	1 us

Remarks

When the trigger condition is "PGLess" or "NGLess" (refer to the :TRIGger:PULSe:WHEN command), the lower limit of the pulse width must be smaller than the upper limit of the current pulse width (refer to the :TRIGger:PULSe:UWIDth command).

Return Format

The query returns the lower limit of the pulse width in scientific notation.

:TRIGger:PULSe:SOURce**Syntax**

:TRIGger:PULSe:SOURce <source>

:TRIGger:PULSe:SOURce?

Description

Sets or queries the source channel of Pulse trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 EXT}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, or EXT.

:TRIGger:PULSe:UWIDth**Syntax**

:TRIGger:PULSe:UWIDth <uwidth>

:TRIGger:PULSe:UWIDth?

Description

Sets or queries the upper limit of the pulse width of Pulse trigger when the trigger condition is "PLESs", "NLESs", "PGLess", or "NGLess" (refer to the :TRIGger:PULSe:WHEN command). The default unit is s.

Parameter

Name	Type	Range	Default
<uwidth>	Real	When the trigger condition is "PLESs" or "NLESs": 4 ns to 4 s When the trigger condition is "PGLess" or "NGLess": 12 ns to 4 s	2 us

Remarks

When the trigger condition is "PGLess" or "NGLess" (refer to the :TRIGger:PULSe:WHEN command), the upper limit of the pulse width must be greater than the lower limit of the current pulse width (refer to the :TRIGger:PULSe:LWIDth command).

Return Format

The query returns the upper limit of the pulse width in scientific notation.

:TRIGger:PULSe:WHEN**Syntax**

:TRIGger:PULSe:WHEN <cond>

:TRIGger:PULSe:WHEN?

Description

Sets or queries the trigger condition of Pulse trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{PGReater PLESs NGReater NLESs PGLess NGLess}	PGReater

Remarks

- PGReater: indicates that the oscilloscope triggers when the positive pulse width of the input signal is greater than the specified pulse width (refer to the :TRIGger:PULSe:LWIDth command).
- PLESs: indicates that the oscilloscope triggers when the positive pulse width of the input signal is smaller than the specified pulse width (refer to the :TRIGger:PULSe:UWIDth command).
- NGReater: indicates that the oscilloscope triggers when the negative pulse width of the input signal is greater than the specified pulse width (refer to the :TRIGger:PULSe:LWIDth command).
- NLESs: indicates that the oscilloscope triggers when the negative pulse width of the input signal is smaller than the specified pulse width (refer to the :TRIGger:PULSe:UWIDth command).
- PGLess: indicates that the oscilloscope triggers when the positive pulse width of the input signal is greater than the lower limit of the specified pulse width (refer to the :TRIGger:PULSe:LWIDth command) and smaller than the upper limit of the specified pulse width (refer to the :TRIGger:PULSe:UWIDth command).
- NGLess: indicates that the oscilloscope triggers when the negative pulse width of the input signal is greater than the lower limit of the specified pulse width (refer to the :TRIGger:PULSe:LWIDth command) and smaller than the upper limit of the specified pulse width (refer to the :TRIGger:PULSe:UWIDth command).

Return Format

The query returns PGR, PLES, NGR, NLES, PGL, or NGL.

:TRIGger:RUNT

Command List:

- :TRIGger:RUNT:ALEVel
- :TRIGger:RUNT:BLEVel
- :TRIGger:RUNT:POLarity
- :TRIGger:RUNT:SOURce
- :TRIGger:RUNT:WHEN
- :TRIGger:RUNT:WLOWer
- :TRIGger:RUNT:WUPPer

:TRIGger:RUNT:ALEVel

Syntax

```
:TRIGger:RUNT:ALEVel <level>
:TRIGger:RUNT:ALEVel?
```

Description

Sets or queries the upper limit of trigger level of Runt trigger (namely the high level). The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from $(-5.98 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	1

Remarks

The upper limit of the trigger level of Runt trigger must be greater than the lower limit of the current trigger level (refer to the :TRIGger:RUNT:BLEVel command).

Return Format

The query returns the upper limit of the trigger level in scientific notation.

:TRIGger:RUNT:BLEVel

Syntax

```
:TRIGger:RUNT:BLEVel <level>
:TRIGger:RUNT:BLEVel?
```

Description

Sets or queries the lower limit of trigger level of Runt trigger (namely the low level). The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (5.98 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Remarks

The lower limit of the trigger level of Runt trigger must be smaller than the upper limit of the current trigger level (refer to the :TRIGger:RUNT:ALEVEL command).

Return Format

The query returns the lower limit of the trigger level in scientific notation.

:TRIGger:RUNT:POLarity**Syntax**

```
:TRIGger:RUNT:POLarity <polarity>
:TRIGger:RUNT:POLarity?
```

Description

Sets or queries the polarity of Runt trigger.

Parameter

Name	Type	Range	Default
<polarity>	Discrete	{POSitive NEGative}	POSitive

Remarks

- POSitive: indicates the positive polarity. The oscilloscope triggers on the positive polarity of Runt trigger.
- NEGative: indicates the negative polarity. The oscilloscope triggers on the negative polarity of Runt trigger.

Return Format

The query returns POS or NEG.

:TRIGger:RUNT:SOURce**Syntax**

```
:TRIGger:RUNT:SOURce <source>
:TRIGger:RUNT:SOURce?
```

Description

Sets or queries the source channel of Runt trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:RUNT:WHEN**Syntax**

```
:TRIGger:RUNT:WHEN <cond>
:TRIGger:RUNT:WHEN?
```

Description

Sets or queries the trigger conditions of Runt trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{NONE GREater LESS GLESS}	NONE

Remarks

- NONE: indicates that no trigger conditions of Runt trigger are set.
- GREater: triggers when the width of the runt is greater than the current minimum width of the runt (i.g. lower limit of the pulse width, refer to the :TRIGger:RUNT:WLOWer command).
- LESS: triggers when the width of the runt is smaller than the current maximum width of the runt (i.g. upper limit of the pulse width, refer to the :TRIGger:RUNT:WUPPer command).
- GLESS: triggers when the width of the runt is greater than the current minimum width of the runt (i.g. lower limit of the pulse width, refer to the :TRIGger:RUNT:WLOWer command) and smaller than the current maximum width of the runt (i.g. upper limit of the pulse width, refer to the :TRIGger:RUNT:WUPPer command).

Return Format

The query returns NONE, GRE, LESS, or GLEs.

:TRIGger:RUNT:WLOWer**Syntax**

```
:TRIGger:RUNT:WLOWer <width>
:TRIGger:RUNT:WLOWer?
```

Description

Sets or queries the minimum pulse width (i.g. lower limit of the pulse width) of Runt trigger when the trigger condition is "GREater" or "GLESS" (refer to the :TRIGger:RUNT:WHEN command).

Parameter

Name	Type	Range	Default
<width>	Discrete	The range of <width> is from 4 ns to 4 s when the trigger condition is "GREater". The range of <width> is from 4 ns to 3.99 s when the trigger condition is "GLESS".	1 us

Remarks

If the trigger condition is "GLESS" (refer to the :TRIGger:RUNT:WHEN command, the minimum pulse width must be smaller than the current maximum pulse width (refer to the :TRIGger:RUNT:WUPPer command).

Return Format

The query returns the minimum pulse width in scientific notation.

:TRIGger:RUNT:WUPPer**Syntax**

:TRIGger:RUNT:WUPPer <width>

:TRIGger:RUNT:WUPPer?

Description

Sets or queries the maximum pulse width (i.g. upper limit of the pulse width) of Runt trigger when the trigger condition is "LESS" or "GLESS" (refer to the :TRIGger:RUNT:WHEN command).

Parameter

Name	Type	Range	Default
<width>	Discrete	The range of <width> is from 4 ns to 4 s when the trigger condition is "LESS". The range of <width> is from 12 ns to 4 s when the trigger condition is "GLESS".	2 us

Remarks

If the trigger condition is "GLESS" (refer to the :TRIGger:RUNT:WHEN command), the maximum pulse width must be greater than the current minimum pulse width (refer to the :TRIGger:RUNT:WLOWer command).

Return Format

The query returns the maximum pulse width in scientific notation.

:TRIGger:NEDGe

Command List:

- :TRIGger:NEDGe:EDGE
- :TRIGger:NEDGe:IDLE
- :TRIGger:NEDGe:LEVel
- :TRIGger:NEDGe:SLOPe
- :TRIGger:NEDGe:SOURce

:TRIGger:NEDGe:EDGE

Syntax

```
:TRIGger:NEDGe:EDGE <edge>
:TRIGger:NEDGe:EDGE?
```

Description

Sets or queries the number of edges for the Nth edge trigger.

Parameter

Name	Type	Range	Default
<edge>	Integer	1 to 65535	2

Return Format

The query returns an integer between 1 and 65535.

:TRIGger:NEDGe:IDLE

Syntax

```
:TRIGger:NEDGe:IDLE <idle>
:TRIGger:NEDGe:IDLE?
```

Description

Sets or queries the idle time for the Nth edge trigger. The default unit is s.

Parameter

Name	Type	Range	Default
<idle>	Real	40 ns to 1 s	100 ns

Return Format

The query returns the idle time in scientific notation.

:TRIGger:NEDGe:LEVel

Syntax

```
:TRIGger:NEDGe:LEVel <level>
:TRIGger:NEDGe:LEVel?
```

Description

Sets or queries the trigger level of the Nth edge trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:NEDGE:SLOPe**Syntax**

```
:TRIGger:NEDGE:SLOPe <slope>
:TRIGger:NEDGE:SLOPe?
```

Description

Sets or queries the edge type of the Nth Edge trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive NEGative}	POSitive

Remarks

- POSitive: indicates that the oscilloscope triggers at the crosspoint between the rising edge of the input signal and the preset trigger level.
- NEGative: indicates that the oscilloscope triggers at the crosspoint between the falling edge of the input signal and the preset trigger level.

Return Format

The query returns POS or NEG.

:TRIGger:NEDGE:SOURce**Syntax**

```
:TRIGger:NEDGE:SOURce <source>
:TRIGger:NEDGE:SOURce?
```

Description

Sets or queries the source channel of the Nth Edge trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:RS232

Command List:

- :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>
:TRIGger:RS232:BAUD?
```

Description

Sets or queries the baud rate of RS232 trigger. The default unit is bps.

Parameter

Name	Type	Range	Default
<baud>	Discrete	{2400 4800 9600 19200 38400 57600 115200 230400 460800 921600 1000000 USER}	9600

Remarks

When <baud> is set to "USER", you can use the :TRIGger:RS232:BUSeR command to self-define the baud rate of RS232 trigger.

Return Format

The query returns 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 1000000, or USER.

:TRIGger:RS232:BUSeR

Syntax

```
:TRIGger:RS232:BUSeR <baud>
:TRIGger:RS232:BUSeR?
```

Description

Sets or queries the user-defined baud rate of RS232 trigger. The default unit is bps.

Parameter

Name	Type	Range	Default
<baud>	Integer	110 to 20000000	9600

Return Format

The query returns an integer between 110 and 20000000.

:TRIGger:RS232:DATA**Syntax**

:TRIGger:RS232:DATA <data>

:TRIGger:RS232:DATA?

Description

Sets or queries the data value of RS232 trigger when the trigger condition is "DATA" (refer to the :TRIGger:RS232:WHEN command).

Parameter

Name	Type	Range	Default
<data>	Integer	Refer to Remarks	70

Remarks

The value of <data> is related to the current data width (set to n, refer to the :TRIGger:RS232:WIDTH command). Its range is from 0 to $(2^n - 1)$.

Return Format

The query returns an integer.

:TRIGger:RS232:LEVel**Syntax**

:TRIGger:RS232:LEVel <level>

:TRIGger:RS232:LEVel?

Description

Sets or queries the trigger level of RS232 trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from $(-6 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:RS232:PARity**Syntax**

:TRIGger:RS232:PARity <parity>

:TRIGger:RS232:PARity?

Description

Sets or queries the even-odd check mode of RS232 trigger when the trigger condition is "ERRor", "PARity", or "DATA" (refer to the :TRIGger:RS232:WHEN command).

Parameter

Name	Type	Range	Default
<parity>	Discrete	{EVEN ODD NONE}	NONE

Remarks

The even-odd check mode cannot be set to NONE when the trigger condition is "PARity" (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

Sets or queries the source channel of RS232 trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:RS232:STOP**Syntax**

```
:TRIGger:RS232:STOP <bit>
:TRIGger:RS232:STOP?
```

Description

Sets or queries the stop bit of RS232 trigger when the trigger condition is "ERRor", "PARity" or "DATA" (refer to the :TRIGger:RS232:WHEN command).

Parameter

Name	Type	Range	Default
<bit>	Discrete	{1 2}	1

Return Format

The query returns 1 or 2.

:TRIGger:RS232:WHEN**Syntax**

:TRIGger:RS232:WHEN <cond>

:TRIGger:RS232:WHEN?

Description

Sets or queries the trigger condition of RS232 trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{START ERRor PARity DATA}	STARt

Remarks

- START: indicates start of frame. The oscilloscope triggers at the start of a frame.
ERRor: indicates error frame. The oscilloscope triggers when an error frame is found.
PARity: indicates check error. The oscilloscope triggers when a check error is found.
DATA: indicates that the oscilloscope triggers on the last bit of the preset data bits.
- When <cond> is "ERRor", you can use the :TRIGger:RS232:PARity command to set the even-odd check mode of RS232 trigger, and use the :TRIGger:RS232:STOP command to set the stop bit of RS232 trigger.
- When <cond> is "PARity", you can use the :TRIGger:RS232:PARity command to set the even-odd check mode of RS232 trigger.
- When <cond> is "DATA", you can use the :TRIGger:RS232:WIDTh command to set the data width of RS232 trigger, use the :TRIGger:RS232:DATA command to set the data value of RS232 trigger, use the :TRIGger:RS232:PARity command to set the even-odd check mode, and use the :TRIGger:RS232:STOP command to set the stop bit of RS232 trigger.

Return Format

The query returns STAR, ERR, PAR, or DATA.

:TRIGger:RS232:WIDTh**Syntax**

:TRIGger:RS232:WIDTh <width>

:TRIGger:RS232:WIDTh?

Description

Sets or queries the data width of RS232 trigger when the trigger condition is "DATA" (refer to the :TRIGger:RS232:WHEN command).

Parameter

Name	Type	Range	Default
<width>	Discrete	{5 6 7 8}	8

Return Format

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

:TRIGger:SLOPe

Command List:

- :TRIGger:SLOPe:ALEVel
- :TRIGger:SLOPe:BLEVel
- :TRIGger:SLOPe:SOURce
- :TRIGger:SLOPe:TLOWer
- :TRIGger:SLOPe:TUPPer
- :TRIGger:SLOPe:WHEN
- :TRIGger:SLOPe:WINDow

:TRIGger:SLOPe:ALEVel

Syntax

```
:TRIGger:SLOPe:ALEVel <level>
:TRIGger:SLOPe:ALEVel?
```

Description

Sets or queries the upper limit of trigger level of Slope trigger (namely the high level). The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from $(-5.98 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	1

Remarks

The upper limit of the trigger level of Slope trigger must be greater than the lower limit of the current trigger level (refer to the :TRIGger:SLOPe:BLEVel command).

Return Format

The query returns the upper limit of the trigger level in scientific notation.

:TRIGger:SLOPe:BLEVel

Syntax

```
:TRIGger:SLOPe:BLEVel <level>
:TRIGger:SLOPe:BLEVel?
```

Description

Sets or queries the lower limit of trigger level of Slope trigger (namely the low level). The unit is the same as the current amplitude unit of the source channel of Slope trigger.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (5.98 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel of Slope trigger, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel of Slope trigger, refer to the :CHANnel<n>:OFFSet command.	0

Remarks

The lower limit of the trigger level of Slope trigger must be smaller than the upper limit of the current trigger level (refer to the :TRIGger:SLOPe:ALEVel command).

Return Format

The query returns the lower limit of the trigger level in scientific notation.

:TRIGger:SLOPe:SOURce**Syntax**

```
:TRIGger:SLOPe:SOURce <source>
:TRIGger:SLOPe:SOURce?
```

Description

Sets or queries the source channel of Slope trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:SLOPe:TLOWer**Syntax**

```
:TRIGger:SLOPe:TLOWer <time>
:TRIGger:SLOPe:TLOWer?
```

Description

Sets or queries the time lower limit of Slope trigger when the trigger condition is "PGReater", "NGReater", "PGLess", or "NGLess" (refer to the :TRIGger:SLOPe:WHEN command). The default unit is s.

Parameter

Name	Type	Range	Default
<time>	Real	When the trigger condition is "PGReater" or "NGReater": 10 ns to 1 s When the trigger condition is "PGLess" or "NGLess": 10 ns to 999 ms	1 us

Remarks

When the trigger condition is "PGLess" or "NGLess" (refer to the :TRIGger:SLOPe:WHEN command), the time lower limit must be smaller than the current time upper limit (refer to the :TRIGger:SLOPe:TUPPer command).

Return Format

The query returns the time lower limit in scientific notation.

:TRIGger:SLOPe:TUPPer**Syntax**

```
:TRIGger:SLOPe:TUPPer <time>
:TRIGger:SLOPe:TUPPer?
```

Description

Sets or queries the time upper limit of Slope trigger when the trigger condition is "PLESs", "NLESs", "PGLess", or "NGLess" (refer to the :TRIGger:SLOPe:WHEN command). The default unit is s.

Parameter

Name	Type	Range	Default
<time>	Real	When the trigger condition is "PLESs" or "NLESs": 10 ns to 1 s When the trigger condition is "PGLess" or "NGLess": 20 ns to 1 s	2 us

Remarks

When the trigger condition is "PGLess" or "NGLess" (refer to the :TRIGger:SLOPe:WHEN command), the time upper limit must be greater than the current time lower limit (refer to the :TRIGger:SLOPe:TLOWer command).

Return Format

The query returns the timer upper limit in scientific notation.

:TRIGger:SLOPe:WHEN**Syntax**

```
:TRIGger:SLOPe:WHEN <cond>
:TRIGger:SLOPe:WHEN?
```

Description

Sets or queries the trigger condition of Slope trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{PGReater PLESs NGReater NLESs PGLess NGLess}	PGReater

Remarks

- PGReater: indicates that the oscilloscope triggers when the positive slope time of the input signal is greater than the specified time (refer to the :TRIGger:SLOPe:TLOWer command).
- PLESs: indicates that the oscilloscope triggers when the positive slope time of the input signal is smaller than the specified time (refer to the :TRIGger:SLOPe:TUPPer command).
- NGReater: indicates that the oscilloscope triggers when the negative slope time of the input signal is greater than the specified time (refer to the :TRIGger:SLOPe:TLOWer command).
- NLESs: indicates that the oscilloscope triggers when the negative slope time of the input signal is smaller than the specified time (refer to the :TRIGger:SLOPe:TUPPer command).

- PGLess: indicates that the oscilloscope triggers when the positive slope time of the input signal is greater than the lower limit of the specified time (refer to the :TRIGger:SLOPe:TLOWer command) and smaller than the upper limit of the specified time (refer to the :TRIGger:SLOPe:TUPPer command).
- NGLess: indicates that the oscilloscope triggers when the negative slope time of the input signal is greater than the lower limit of the specified time (refer to the :TRIGger:SLOPe:TLOWer command) and smaller than the upper limit of the specified time (refer to the :TRIGger:SLOPe:TUPPer command).

Return Format

The query returns PGR, PLES, NGR, NLES, PGL, or NGL.

:TRIGger:SLOPe:WINDow

Syntax

:TRIGger:SLOPe:WINDow <window>

:TRIGger:SLOPe:WINDow?

Description

Sets or queries the vertical window type of Slope trigger.

Parameter

Name	Type	Range	Default
<window>	Discrete	{TA TB TAB}	TA

Remarks

Different vertical windows correspond to different adjustment modes of the trigger level (use **TRIGGER LEVEL**).

- TA: only adjusts the upper limit of the trigger level; the lower limit of the trigger level remains unchanged.
- TB: only adjusts the lower limit of the trigger level; the upper limit of the trigger level remains unchanged.
- TAB: adjusts the upper and lower limits of the trigger level at the same time; the trigger level deviation (the difference between the upper limit and lower limit) remains unchanged.

Return Format

The query returns TA, TB, or TAB.

:TRIGger:SPI

Command List:

- :TRIGger:SPI:CLEVel
- :TRIGger:SPI:CS
- :TRIGger:SPI:DATA
- :TRIGger:SPI:DLEVel
- :TRIGger:SPI:MODE
- :TRIGger:SPI:SCL
- :TRIGger:SPI:SDA
- :TRIGger:SPI:SLEVel
- :TRIGger:SPI:SLOPe
- :TRIGger:SPI:TIMEout
- :TRIGger:SPI:WHEN
- :TRIGger:SPI:WIDTh

:TRIGger:SPI:CLEVel

Syntax

```
:TRIGger:SPI:CLEVel <level>
:TRIGger:SPI:CLEVel?
```

Description

Sets or queries the trigger level of the clock signal of SPI trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the clock line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the clock line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:SPI:CS

Syntax

```
:TRIGger:SPI:CS <source>
:TRIGger:SPI:CS?
```

Description

Sets or queries the source channel of the CS line of SPI trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel3

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:SPI:DATA**Syntax**

:TRIGger:SPI:DATA <data>

:TRIGger:SPI:DATA?

Description

Sets or queries the data value of SPI trigger.

Parameter

Name	Type	Range	Default
<data>	Integer	Refer to Remarks	0

Remarks

The value of <data> is related to the current data width (set to n, refer to the :TRIGger:SPI:WIDTH command). Its range is from 0 to $(2^n - 1)$.

Return Format

The query returns an integer.

:TRIGger:SPI:DLEVel**Syntax**

:TRIGger:SPI:DLEVel <level>

:TRIGger:SPI:DLEVel?

Description

Sets or queries the trigger level of the data signal of SPI trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from $(-6 \times \text{VerticalScale} - \text{Offset})$ to $(6 \times \text{VerticalScale} - \text{Offset})$ (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the data line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:SPI:MODE**Syntax**

:TRIGger:SPI:MODE <mode>

:TRIGger:SPI:MODE?

Description

Sets or queries the CS mode of SPI trigger when the trigger condition is "CS" (refer to the :TRIGger:SPI:WHEN command).

Parameter

Name	Type	Range	Default
<mode>	Discrete	{HIGH LOW}	HIGH

Return Format

The query returns HIGH or LOW.

:TRIGger:SPI:SCL**Syntax**

:TRIGger:SPI:SCL <source>

:TRIGger:SPI:SCL?

Description

Sets or queries the source channel of the clock line of SPI trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:SPI:SDA**Syntax**

:TRIGger:SPI:SDA <source>

:TRIGger:SPI:SDA?

Description

Sets or queries the source channel of the data line of SPI trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:SPI:SLEVel**Syntax**

:TRIGger:SPI:SLEVel <level>

:TRIGger:SPI:SLEVel?

Description

Sets or queries the trigger level of the CS signal of SPI trigger when the trigger condition is "CS" (refer to the :TRIGger:SPI:WHEN command). The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the CS line source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the CS line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:SPI:SLOPe**Syntax**

:TRIGger:SPI:SLOPe <slope>

:TRIGger:SPI:SLOPe?

Description

Sets or queries the edge type of the clock signal of SPI trigger.

Parameter

Name	Type	Range	Default
<slope>	Discrete	{POSitive NEGative}	POSitive

Remarks

- POSitive: samples the data signal (refer to the :TRIGger:SPI:SDA command) on the rising edge of the clock signal.
- NEGative: samples the data signal (refer to the :TRIGger:SPI:SDA command) on the falling edge of the clock signal.

Return Format

The query returns POS or NEG.

:TRIGger:SPI:TIMEout**Syntax**

:TRIGger:SPI:TIMEout <time>

:TRIGger:SPI:TIMEout?

Description

Sets or queries the timeout value of SPI trigger when the trigger condition is "TIMEout" (refer to the :TRIGger:SPI:WHEN command). The default unit is s.

Parameter

Name	Type	Range	Default
<time>	Real	100 ns to 1 s	1 us

Return Format

The query returns the timeout value in scientific notation.

:TRIGger:SPI:WHEN**Syntax**

:TRIGger:SPI:WHEN <cond>

:TRIGger:SPI:WHEN?

Description

Sets or queries the trigger condition of SPI trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{CS TIMEout}	TIMEout

Remarks

- CS: The oscilloscope starts to search for the data to be triggered on it when the CS signal is valid.
- TIMEout: The oscilloscope starts to search for the data to be triggered on it after the clock signal stays in the idle state for a specified period of time.

Return Format

The query returns CS or TIM.

:TRIGger:SPI:WIDTH**Syntax**

:TRIGger:SPI:WIDTH <width>

:TRIGger:SPI:WIDTH?

Description

Sets or queries the data width of SPI trigger.

Parameter

Name	Type	Range	Default
<width>	Integer	4 to 32	8

Return Format

The query returns an integer between 4 and 32.

:TRIGger:USB

Command List:

- :TRIGger:USB:DMINus
- :TRIGger:USB:DPLus
- :TRIGger:USB:MLEVel
- :TRIGger:USB:PLEVel
- :TRIGger:USB:SPEed
- :TRIGger:USB:WHEN

:TRIGger:USB:DMINus

Syntax

```
:TRIGger:USB:DMINus <source>
:TRIGger:USB:DMINus?
```

Description

Sets or queries the source channel of D- data line of USB trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel2

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:USB:DPLus

Syntax

```
:TRIGger:USB:DPLus <source>
:TRIGger:USB:DPLus?
```

Description

Sets or queries the source channel of D+ data line of USB trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:USB:MLeVel**Syntax**

:TRIGger:USB:MLeVel <level>

:TRIGger:USB:MLeVel?

Description

Sets or queries the trigger level of D- data signal of USB trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the D- data line source channel, refer to the :CHANnel<n>:SCALe command; Offset is the vertical position of the D- data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:USB:PLeVel**Syntax**

:TRIGger:USB:PLeVel <level>

:TRIGger:USB:PLeVel?

Description

Sets or queries the trigger level of D+ data signal of USB trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the D+ data line source channel, refer to the :CHANnel<n>:SCALe command; Offset is the vertical position of the D+ data line source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:USB:SPEed**Syntax**

:TRIGger:USB:SPEed <value>

:TRIGger:USB:SPEed?

Description

Sets or queries the signal rate of 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 <cond>

:TRIGger:USB:WHEN?

Description

Sets or queries the trigger condition of USB trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{SOP EOP RC SUSPend EXITsuspend}	SOP

Remarks

- SOP: indicates Start of Packet. The oscilloscope triggers at the sync bit of SOP.
- EOP: indicates End of Packet. The oscilloscope triggers at the end of the SEO portion of EOP.
- RC: indicates Reset Complete. The oscilloscope triggers when SEO is greater than 10 ms.
- SUSPend: indicates Enter Suspend. The oscilloscope triggers when the idle time of the bus is greater than 3 ms.
- EXITsuspend: indicates Exit Suspend. The oscilloscope triggers when the bus exits from the idle state for more than 10 ms.

Return Format

The query returns SOP, EOP, RC, SUSP, or EXIT.

:TRIGger:VIDeo

Command List:

- :TRIGger:VIDeo:LEVel
- :TRIGger:VIDeo:LINE
- :TRIGger:VIDeo:MODE
- :TRIGger:VIDeo:POLarity
- :TRIGger:VIDeo:SOURce
- :TRIGger:VIDeo:STANdard

:TRIGger:VIDeo:LEVel

Syntax

```
:TRIGger:VIDeo:LEVel <level>
:TRIGger:VIDeo:LEVel?
```

Description

Sets or queries the trigger level of Video trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:VIDeo:LINE

Syntax

```
:TRIGger:VIDeo:LINE <line>
:TRIGger:VIDeo:LINE?
```

Description

Sets or queries the line number of Video trigger when the sync trigger mode is "LINE" (refer to the :TRIGger:VIDeo:MODE command).

Parameter

Name	Type	Range	Default
<line>	Integer	Related to the video standard currently selected (refer to the :TRIGger:VIDeo:STANdard command): NTSC: 1 to 525 PALSecam: 1 to 625 480P: 1 to 525 576P: 1 to 625 720P: 1 to 750 1080P: 1 to 1125 1080I: 1 to 1125	1

Return Format

The query returns an integer.

:TRIGger:VIDeo:MODE**Syntax**

:TRIGger:VIDeo:MODE <mode>

:TRIGger:VIDeo:MODE?

Description

Sets or queries the sync trigger mode of Video trigger.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{ALINes LINE ODDField EVENfield}	ALINes

Remarks

- ALINes: indicates all lines. The oscilloscope triggers on the first line found.
- LINE: indicates the specified line. The oscilloscope triggers on the specified line. For NTSC and PAL/SECAM video standards, the oscilloscope triggers on the specified line in the odd or even field. For HDTV video standard, the oscilloscope triggers on the specified line. You can use the :TRIGger:VIDeo:LINE command to specify the line number.
- ODDfield: indicates the odd field. The oscilloscope triggers on the rising edge of the first ramp waveform pulse in the odd field. It is only available when the video standard is "NTSC" or "PALSecam" (refer to the :TRIGger:VIDeo:STANdard command).
- EVENfield: indicates the even field. The oscilloscope triggers on the rising edge of the first ramp waveform pulse in the even field. It is only available when the video standard is "NTSC" or "PALSecam" (refer to the :TRIGger:VIDeo:STANdard command).

Return Format

The query returns ALIN, LINE, ODDF, or EVEN.

:TRIGger:VIDeo:POLarity**Syntax**

:TRIGger:VIDeo:POLarity <polarity>

:TRIGger:VIDeo:POLarity?

Description

Sets or queries the video polarity of Video trigger.

Parameter

Name	Type	Range	Default
<polarity>	Discrete	{POSitive NEGative}	POSitive

Return Format

The query returns POS or NEG.

:TRIGger:VIDeo:SOURce**Syntax**

:TRIGger:VIDeo:SOURce <source>

:TRIGger:VIDeo:SOURce?

Description

Sets or queries the source channel of Video trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:VIDeo:STANdard**Syntax**

:TRIGger:VIDeo:STANdard <std>

:TRIGger:VIDeo:STANdard?

Description

Sets or queries the video standard of Video trigger.

Parameter

Name	Type	Range	Default
<std>	Discrete	{NTSC PALSecam 480P 576P 720P 1080P 1080I}	NTSC

Return Format

The query returns NTSC, PALS, 480P, 576P, 720P, 1080P, or 1080I.

:TRIGger:FLEXray

Command List:

- :TRIGger:FLEXray:BAUD
- :TRIGger:FLEXray:LEVel
- :TRIGger:FLEXray:SOURce
- :TRIGger:FLEXray:WHEN

:TRIGger:FLEXray:BAUD

Syntax

```
:TRIGger:FLEXray:BAUD <baud>
:TRIGger:FLEXray:BAUD?
```

Description

Sets or queries the signal rate of FlexRay trigger. The default unit is b/s.

Parameter

Name	Type	Range	Default
<baud>	Discrete	{2500000 5000000 10000000}	2500000

Return Format

The query returns 2500000, 5000000, or 10000000.

:TRIGger:FLEXray:LEVel

Syntax

```
:TRIGger:FLEXray:LEVel <level>
:TRIGger:FLEXray:LEVel?
```

Description

Sets or queries the trigger level of FlexRay trigger. The unit is the same as the current amplitude unit of the source channel.

Parameter

Name	Type	Range	Default
<level>	Real	The range of <level> is from (-6 x VerticalScale - Offset) to (6 x VerticalScale - Offset) (relative to the vertical center of the screen). Wherein, VerticalScale is the vertical scale of the source channel, refer to the :CHANnel<n>:SCALE command; Offset is the vertical position of the source channel, refer to the :CHANnel<n>:OFFSet command.	0

Return Format

The query returns the trigger level in scientific notation.

:TRIGger:FLEXray:SOURce**Syntax**

```
:TRIGger:FLEXray:SOURce <source>
```

```
:TRIGger:FLEXray:SOURce?
```

Description

Sets or queries the source channel of FlexRay trigger.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4}	CHANnel1

Remarks

Channels that are not currently turned on can also be selected as the trigger source.

Return Format

The query returns CHAN1, CHAN2, CHAN3, or CHAN4.

:TRIGger:FLEXray:WHEN**Syntax**

```
:TRIGger:FLEXray:WHEN <cond>
```

```
:TRIGger:FLEXray:WHEN?
```

Description

Sets or queries the trigger condition of FlexRay trigger.

Parameter

Name	Type	Range	Default
<cond>	Discrete	{FRAMe SYMBol ERRor TSS}	TSS

Remarks

- FRAME: triggers on the frame of the FlexRay bus.
- SYMBol: triggers on the Channel Idle Delimiter (CID), Collision Avoidance Symbol (CAS), Media Access Test Symbol (MTS), and Wakeup Pattern (WUP) of the FlexRay bus.
- ERRor: triggers when an error occurs to the FlexRay bus, including header CRC error and frame CRC error.
- TSS: triggers on the transmission start sequence of the FlexRay bus.

Return Format

The query returns FRAM, SYMB, ERR, or TSS.

:WAVEform Commands

The :WAVEform commands are used to set the parameters concerning waveform data reading and to read the waveform data. In different waveform data reading mode (refer to the :WAVEform:MODE command), the definition of each parameter is different. The definitions of the parameters in NORMAL and RAW modes are as shown in Figure 2-1 and Figure 2-2.

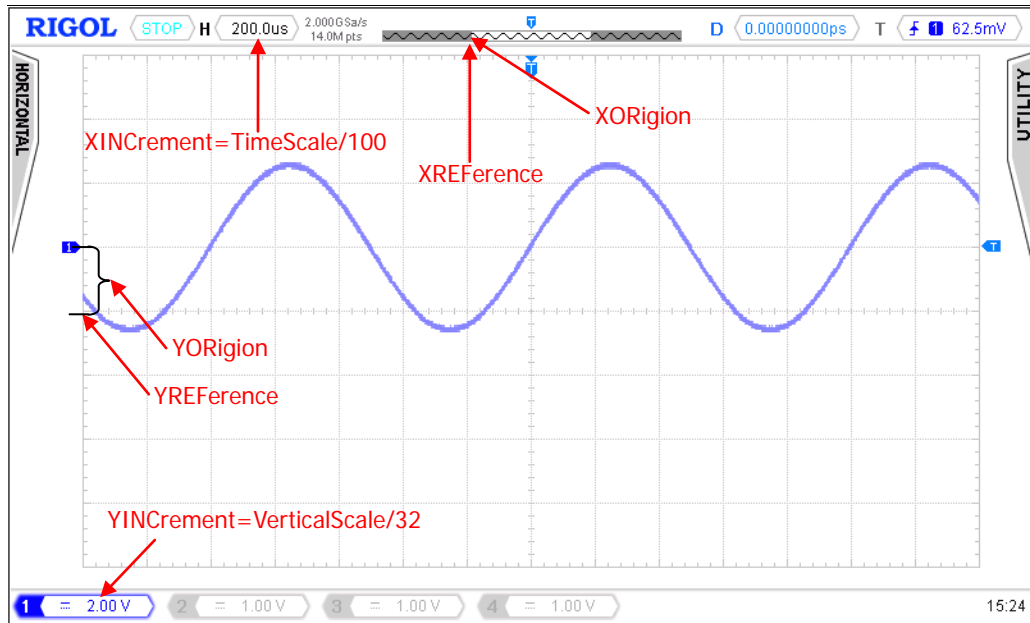


Figure 2-1 Parameter Definitions in NORMAL Mode

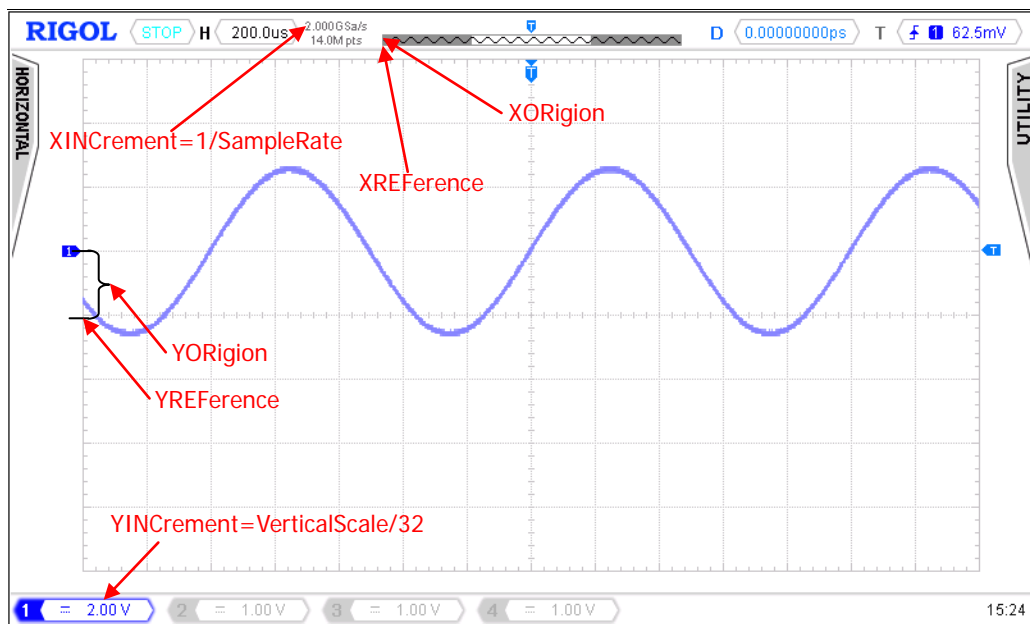


Figure 2-2 Parameter Definitions in RAW Mode

Command List:

- :WAVeform:BEgin
- :WAVeform:DATA?
- :WAVeform:END
- :WAVeform:FORMat
- :WAVeform:MODE
- :WAVeform:POINts
- :WAVeform:PREamble?
- :WAVeform:RESet
- :WAVeform:SOURce
- :WAVeform:STARt
- :WAVeform:STATus?
- :WAVeform:STOP
- :WAVeform:XINCrement?
- :WAVeform:XORigin?
- :WAVeform:XREFerence?
- :WAVeform:YINCrement?
- :WAVeform:YORigin?
- :WAVeform:YREFerence?

:WAVeform:BEgin**Syntax**

:WAVeform:BEgin

Description

Starts the waveform data reading.

Remarks

This command is only applicable to reading waveform data in the internal memory (refer to the :WAVeform:MODE command).

:WAVeform:DATA?**Syntax**

:WAVeform:DATA?

Description

Queries the waveform data in the buffer.

Remarks

You can use the :WAVeform:FORMat, :WAVeform:MODE, :WAVeform:POINts, and :WAVeform:SOURce commands to set various parameters for the waveform data reading.

Note: Turn on the display of the source channel (refer to the :WAVeform:SOURce command) before querying the waveform data.

Procedures of reading the waveform data on the screen:

- | | |
|---------------------|---|
| S1. :WAV:SOUR CHAN1 | Sets the source channel of waveform data reading to CH1 |
| S2. :WAV:MODE NORM | Sets the waveform data reading mode to NORMAL |
| S3. :WAV:DATA? | Obtains data from the buffer |

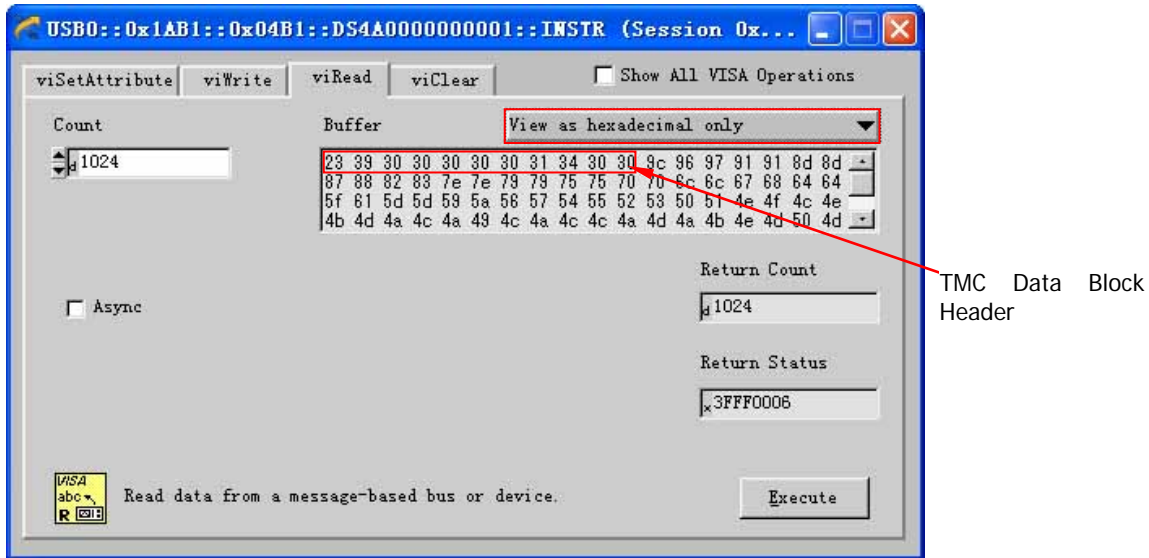
Procedures of reading the waveform data in the internal memory:

S1. :STOP	Sets the oscilloscope to the Stop state (You can only read the waveform data in the internal memory when the oscilloscope is in the Stop state.)
S2. :WAV:SOUR CHAN1	Sets the source channel of waveform data reading to CH1
S3. :WAV:MODE RAW	Sets the waveform data reading mode to RAW Note: When the source channel of waveform data reading is set to MATH or FFT, only the waveform data displayed on the screen can be read, and the waveform data in the internal memory cannot be read in this mode.
S4. :WAV:POIN 100	Sets the number of the waveform points to be read to 100
S5. :WAV:RES	Resets the waveform reading
S6. :WAV:BEG	Starts the waveform reading
S7. :WAV:STAT?	Obtains status
1) IDLE	Finishes the waveform reading thread
:WAV:DATA?	Obtains data from the buffer
:WAV:END	Stops the waveform reading
2) READ	the waveform reading thread is running
:WAV:DATA?	Obtains data from the buffer
Repeat S7	Continues reading the waveform data

Return Format

The query returns the waveform data in strings.

- The return value is related to the current return format of the waveform data (refer to the :WAVEform:FORMat command).
"WORD" or "BYTE" format: The strings of the waveform data consists of TMC data block header and the waveform data. The format of the TMC data block header is #9XXXXXXXXXX, and the 9-digit data (XXXXXXXXXX) following it denotes the length of the data stream (in bytes). The TMC data block header is followed by the waveform data.
"AScii" format: The query directly returns the actual voltage value of each waveform point in scientific notation; and the voltage values are separated by commas.
- When the waveform data in the internal memory are read, the waveform data returned each time might be the data in one area of the internal memory. Waveform data in two adjacent data blocks are consecutive. In "WORD" or "BYTE" return format, each returned data in a block contains the TMC data block header (#9XXXXXXXXXX).
- You can follow the methods below to convert the waveform data that have been read to the voltage value of each point of the waveform on the screen.
The figure below shows the waveform data that have been read. First, select "View as hexadecimal only" from the drop-down list at the right of Buffer. Then, the waveform data that have been read are displayed in hexadecimal format. The first 11 bytes denote the "TMC data block header", and beginning from the 12th byte (9c) are the waveform data. Then use the formula "(Data Read-YREFerence-YORigin) x YINCrement" to convert the waveform data that have been read to the voltage value of the specified point of the waveform on the screen. Wherein, Data Read represents the specified waveform data. For YREFerence, refer to the :WAVEform:YREFerence? command; for YINCrement, refer to the :WAVEform:YINCrement? command; and for YORigin, refer to the :WAVEform:YORigin? command.



:WAVEform:END

Syntax

:WAVEform:END

Description

Stops the waveform data reading.

Remarks

This command is only applicable to reading waveform data in the internal memory (refer to the :WAVEform:MODE command).

:WAVEform:FORMat

Syntax

:WAVEform:FORMat <format>
:WAVEform:FORMat?

Description

Sets or queries the return format of the waveform data.

Parameter

Name	Type	Range	Default
<format>	Discrete	{WORD BYTE ASCii}	BYTE

Remarks

- WORD: Each waveform point corresponds to 2-byte (16-bit) waveform data. The lower 8 bits are valid and the higher 8 bits are 0.
- BYTE: Each waveform point corresponds to 1-byte (8-bit) waveform data.
- ASCii: The query directly returns the actual voltage value of each waveform point in scientific notation; and the voltage values are separated by commas.

Return Format

The query returns WORD, BYTE, or ASC.

:WAVeform:MODE

Syntax

```
:WAVeform:MODE <mode>
:WAVeform:MODE?
```

Description

Sets or queries the reading mode of the waveform data.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{NORMal RAW MAXimum}	NORMal

Remarks

- NORMal: reads the waveform data displayed on the screen.
RAW: reads the waveform data in the internal memory.
MAXimum: reads the waveform data displayed on the screen when the oscilloscope is in the Run state; reads the waveform data in the internal memory when the oscilloscope is in the Stop state.
Note: The waveform data in the internal memory can only be read when the oscilloscope is in the Stop state; besides, you cannot operate the oscilloscope during the reading process.
- When the source channel of waveform data reading is set to MATH or FFT (refer to the :WAVeform:SOURce command), only the waveform data displayed on the screen can be read, and the waveform data in the internal memory cannot be read at this time.

Return Format

The query returns NORM, RAW, or MAX.

:WAVeform:POINts

Syntax

```
:WAVeform:POINts <point>
:WAVeform:POINts?
```

Description

Sets or queries the number of the waveform points to be read.

Parameter

Name	Type	Range	Default
<point>	Integer	Refer to Remarks	1400

Remarks

The range of <point> is related to the current waveform data reading mode (refer to the :WAVeform:MODE command).

- NORMal mode: 1 to 1400
- RAW mode: 1 to the current maximum memory depth
- MAXimum mode: 1 to the number of effective points currently on the screen

Return Format

The query returns an integer.

:WAVeform:PREamble?

Syntax

:WAVeform:PREamble?

Description

Queries the waveform parameter settings related to the waveform data reading.

Return Format

The query returns the parameter settings in strings in the following sequence, and the parameters are separated by commas.

<format>, <mode>, <points>, <count>, <xincrement>, <xorigin>, <xreference>, <yincrement>, <yorigin>, <yreference>

<format>: indicates 0 (BYTE), 1 (WORD), or 2 (AScii). Refer to the :WAVeform:FORMat command.

<mode>: indicates 0 (NORMal), 1 (MAXimum), or 2 (RAW). Refer to the :WAVeform:MODE command.

<points>: indicates the number of waveform points to be read (in integer). Refer to the :WAVeform:POINts command.

<count>: indicates the number of averages (refer to the :ACQuire:AVERages command) in "Average" acquisition mode (refer to the :ACQuire:TYPE command). The <count> parameter is 1 in other modes.

<xincrement>: indicates the time difference (in scientific notation) between two neighboring points in the X direction. Refer to the :WAVeform:XINCrement? command.

<xorigin>: indicates the start time (in scientific notation) of the waveform data in the X direction. Refer to the :WAVeform:XORigin? command.

<xreference>: indicates the reference time (in integer) of the waveform data in the X direction. Refer to the :WAVeform:XREFerence? command.

<yincrement>: indicates the unit voltage value (in scientific notation) in the Y direction. Refer to the :WAVeform:YINCrement? command.

<yorigin>: indicates the vertical position (in integer) relative to the vertical reference position in the Y direction. Refer to the :WAVeform:YORigin? command.

<yreference>: indicates the vertical reference position (in integer) in the Y direction. Refer to the :WAVeform:YREFerence? command.

:WAVeform:RESet

Syntax

:WAVeform:RESet

Description

Resets the waveform data reading.

Remarks

This command is only applicable to reading waveform data in the internal memory (refer to the :WAVeform:MODE command).

:WAVeform:SOURce

Syntax

```
:WAVeform:SOURce <source>
:WAVeform:SOURce?
```

Description

Sets or queries the source channel of waveform data reading.

Parameter

Name	Type	Range	Default
<source>	Discrete	{CHANnel1 CHANnel2 CHANnel3 CHANnel4 MATH FFT}	CHANnel1

Remarks

When the source channel is set to MATH or FFT, only the waveform data displayed on the screen can be read, and the waveform data in the internal memory cannot be read in this mode.

Return Format

The query returns CHAN1, CHAN2, CHAN3, CHAN4, MATH, or FFT.

:WAVeform:START

Syntax

```
:WAVeform:START <start>
:WAVeform:START?
```

Description

Sets or queries the start position of waveform data reading.

Parameter

Name	Type	Range	Default
<start>	Integer	Refer to Remarks	1

Remarks

- The range of <start> is related to the current waveform data reading mode (refer to the :WAVeform:MODE command).
 NORMAL mode: 1 to 1400
 RAW mode: 1 to the current maximum memory depth
 MAXimum mode: 1 to the number of effective points currently on the screen
- For the memory depth, refer to the :ACQUIRE:MDEPTH command.

Return Format

The query returns an integer.

:WAVeform:STATUs?

Syntax

:WAVeform:STATUs?

Description

Queries the current status of waveform data reading.

Return Format

The query returns IDLE,<n> or READ,<n>.

IDLE,<n>: indicates that the waveform data reading thread finishes; <n> is the number of waveform points that have been read.

READ,<n>: indicates that the waveform data reading thread is running; <n> is the number of waveform points that have currently been read.

:WAVeform:STOP

Syntax

:WAVeform:STOP <stop>

:WAVeform:STOP?

Description

Sets or queries the stop position of waveform data reading.

Parameter

Name	Type	Range	Default
<stop>	Integer	Refer to Remarks	1400

Remarks

- The range of <stop> is related to the current waveform data reading mode (refer to the :WAVeform:MODE command).
 NORMAl mode: 1 to 1400
 RAW mode: 1 to the current maximum memory depth
 MAXimum mode: 1 to the number of effective points currently on the screen
- For the memory depth, refer to the :ACQuire:MDEPth command.

Return Format

The query returns an integer.

:WAVeform:XINCrement?

Syntax

:WAVeform:XINCrement?

Description

Queries the time difference (the default unit is s) between two neighboring points of the current source channel in the X direction when the current source channel is (CHANnel1-CHANnel4) or MATH (and the MATH operation type is not FFT) (refer to the :WAVeform:SOURce command).

Remarks

The time difference (XINCrement) between two neighboring points in the X direction is related to the current waveform data reading mode (refer to the :WAVeform:MODE command).

- NORMAl mode: XINCrement = TimeScale/100.
- RAW mode: XINCrement = 1/SampleRate.

- MAXimum mode: $XINCrement = TimeScale/100$ when the oscilloscope is in the Run state; $XINCrement = 1/SampleRate$ when the oscilloscope is in the Stop state. Wherein, TimeScale is the current horizontal time base, refer to the :TIMEbase[:MAIN]:SCALE command; SampleRate is the current sample rate, refer to the :ACQUIRE:SRATE? command.

Return Format

The query returns the time difference in scientific notation.

:WAVEform:XORigin?

Syntax

:WAVEform:XORigin?

Description

Queries the start time (the default unit is s) of the waveform data of the current source channel in the X direction when the current source channel is (CHANnel1-CHANnel4) or MATH (and the MATH operation type is not FFT) (refer to the :WAVEform:SOURce command).

Remarks

The start time of the waveform data in the X direction is related to the current waveform data reading mode (refer to the :WAVEform:MODE command).

- NORMal mode: the start time of the waveform currently displayed on the screen.
- RAW mode: the start time of the waveform in the internal memory.
- MAX mode: the start time of the waveform currently displayed on the screen when the oscilloscope is in the Run state; the start time of the waveform in the internal memory when the oscilloscope is in the Stop state.

Return Format

The query returns the time value in scientific notation.

:WAVEform:XREFerence?

Syntax

:WAVEform:XREFerence?

Description

Queries the reference time of the waveform data of the current source channel (refer to the :WAVEform:SOURce command) in the X direction. The default 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

Queries the unit voltage value of the current source channel (refer to the :WAVEform:SOURce command) in the Y direction. The unit is the same as the current amplitude unit of the source channel.

Remarks

YINCrement=Vertical Scale/32

Return Format

The query returns the unit voltage value in scientific notation.

:WAVeform:YORigin?**Syntax**

:WAVeform:YORigin?

Description

Queries the vertical position relative to the vertical reference position (refer to the :WAVeform:YREFerence? command) of the current source channel (refer to the :WAVeform:SOURce command) in the Y direction.

Remarks

The following formula presents the relations among three parameters: $YORigin = VerticalOffset / VerticalScale \times 32$. Wherein, YORigin is the vertical position relative to the vertical reference position in the Y direction; VerticalOffset is the vertical position of the channel; and VerticalScale is the vertical scale of the channel.

Return Format

The query returns an integer.

:WAVeform:YREFerence?**Syntax**

:WAVeform:YREFerence?

Description

Queries the vertical reference position of the current source channel (refer to the :WAVeform:SOURce command) in the Y direction.

Remarks

YREFerence is always 127 (the screen bottom is 0 and the screen top is 255).

Return Format

The query returns 127.

Chapter 3 Programming Examples

This chapter illustrates how to program the DS4000E series digital oscilloscope with SCPI commands based on NI-VISA in Excel, LabVIEW, MATLAB, Visual Basic 6.0, and Visual C++ 6.0.

NI-VISA (National Instrument-Virtual Instrument Software Architecture), developed by NI (National Instrument), provides an advanced programming interface to communicate with various instruments through their bus lines. NI-VISA enables you to communicate with the instrument in the same way, without considering the interface type of the instrument (such as GPIB, USB, LAN/Ethernet, or RS232). The instruments that communicate with NI-VISA through various interfaces are called "Resources". The VISA descriptor (i.g. resource name) describes the accurate name and location of the VISA resource. For example, when you use the LAN interface to communicate with the instrument, the VISA descriptor is displayed as "TCPIP::172.16.3.4::INSTR". Before programming, please obtain the correct VISA descriptor.

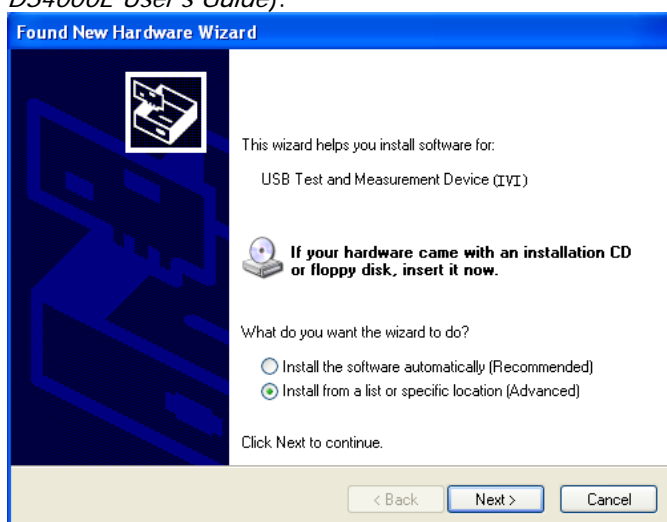
Contents in this chapter:

- Programming Preparations
- Excel Programming Example
- LabVIEW Programming Example
- MATLAB Programming Example
- Visual Basic 6.0 Programming Example
- Visual C++ 6.0 Programming Example

Programming Preparations

Before programming, you need to prepare the following tasks:

1. Install Ultra Sigma (PC) software. You can log in to the **RIGOL** official website (www.rigol.com) to download the software. Then install the software according to the installation wizard. After Ultra Sigma is installed successfully, NI-VISA library will be completely installed automatically. In this manual, the default installation path is C:\Program Files\IVI Foundation\VISA.
2. Use the USB cable to connect the computer with the USB DEVICE interface on the rear panel of the digital oscilloscope. DS4000E can communicate with a PC through the USB, LAN, or GPIB (works with the specified USB-GPIB interface module provided by **RIGOL**). This chapter takes the USB interface as an example.
3. After the oscilloscope is correctly connected to the PC, power it on to start the oscilloscope.
4. In this case, "Found New Hardware Wizard" dialog box appears on the PC. Please install "USB Test and Measurement Device (IVI)" according to the instructions (For detailed installation procedures, refer to *DS4000E User's Guide*).



5. Obtain the USB VISA descriptor of the oscilloscope. Open Ultra Sigma and the searched instrument

resource (connected to PC via the USB interface) will be under the directory of "RIGOL Online Resource" in the Ultra Sigma interface, with the model of the instrument and the USB information displayed. In this instance, the USB VISA descriptor is **USB0::0x1AB1::0x04B1::DS4A000000001::INSTR**

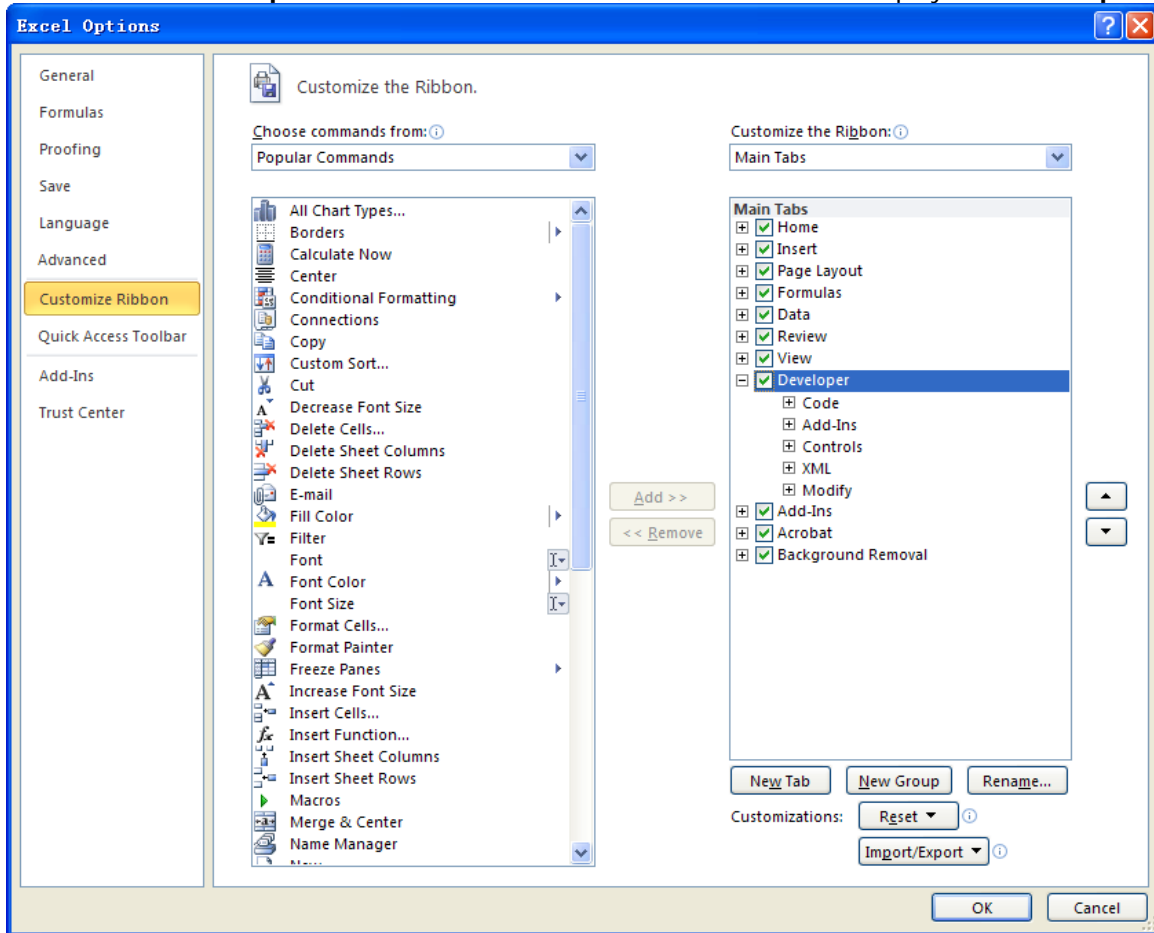
By now, the programming preparations are complete. The following parts will make a detailed introduction about the programming examples in Excel, LabVIEW, MATLAB, Visual Basic 6.0, and Visual C++ 6.0.

Excel Programming Example

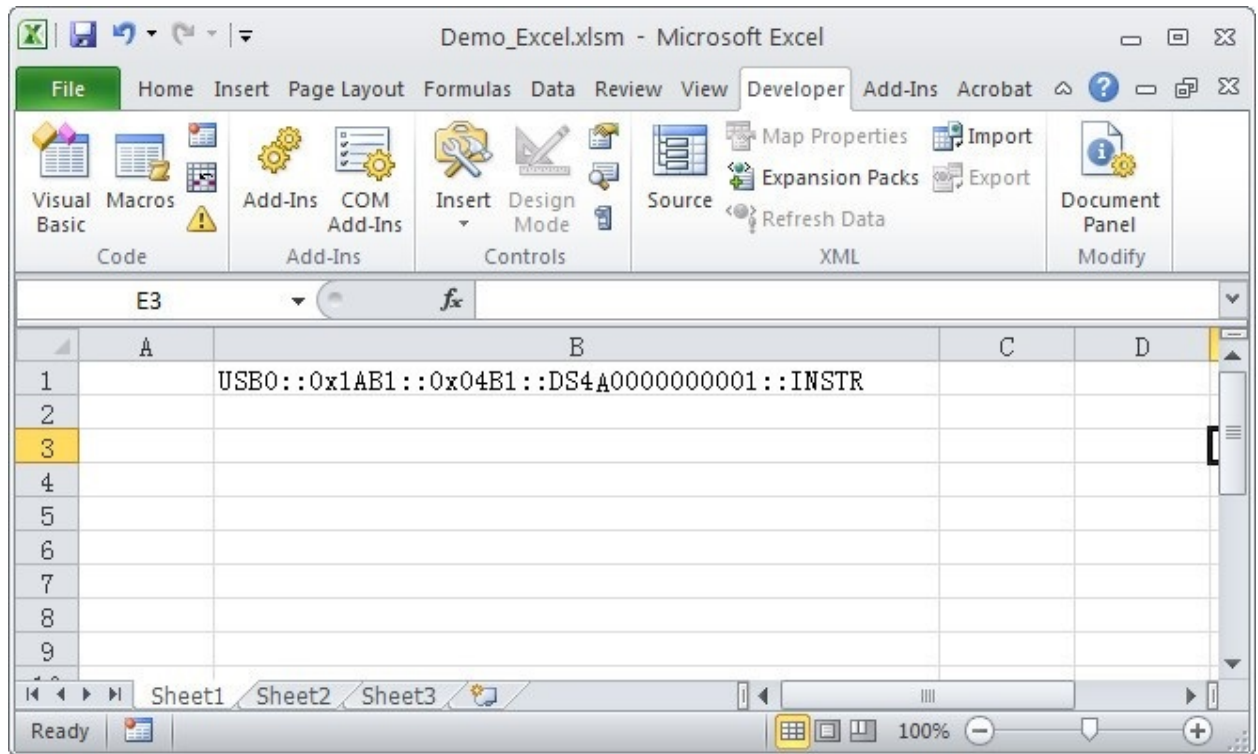
Software used in this example: Microsoft Excel 2010

Function realized in this example: sending the *IDN? command and reading the instrument information.

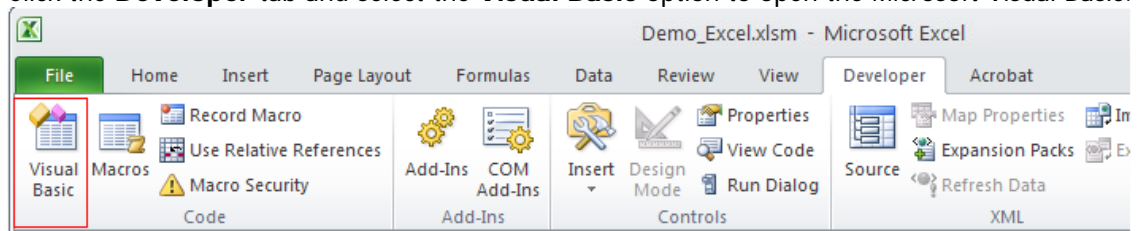
1. Open a new Macro-enabled Excel file and name it "Demo_Excel.xlsm" in this example.
2. Displays the Developer tab. Run the Demo_Excel.xlsm file. Click **File→Options** at the upper-left corner of the Excel file to open the interface as shown in the figure below. Click **Customize Ribbon** at the left, check **Developer** and click **OK**. At this time, the Excel menu bar displays the **Developer** tab.



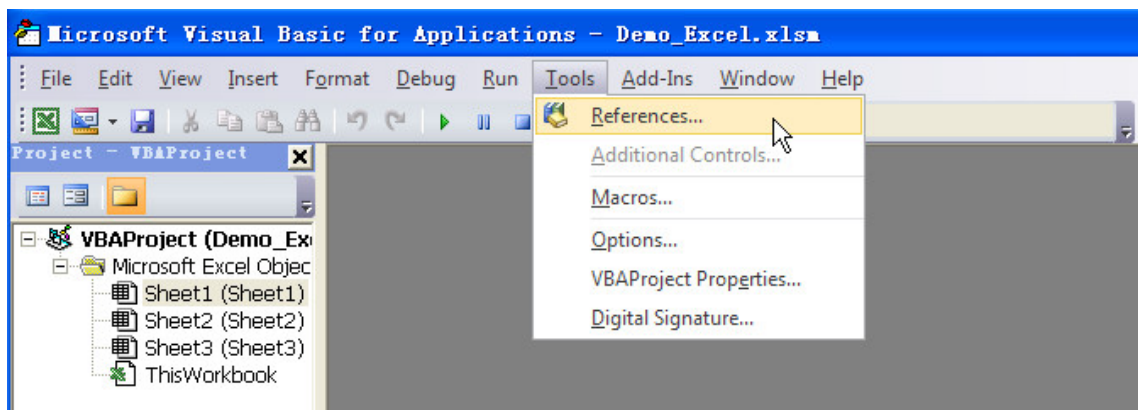
3. Enter the VISA descriptor into a cell of the file. In this example, input the VISA descriptor into SHEET1.CELLS(1,2) (namely the B1 cell in Sheet 1) as shown in the figure below.



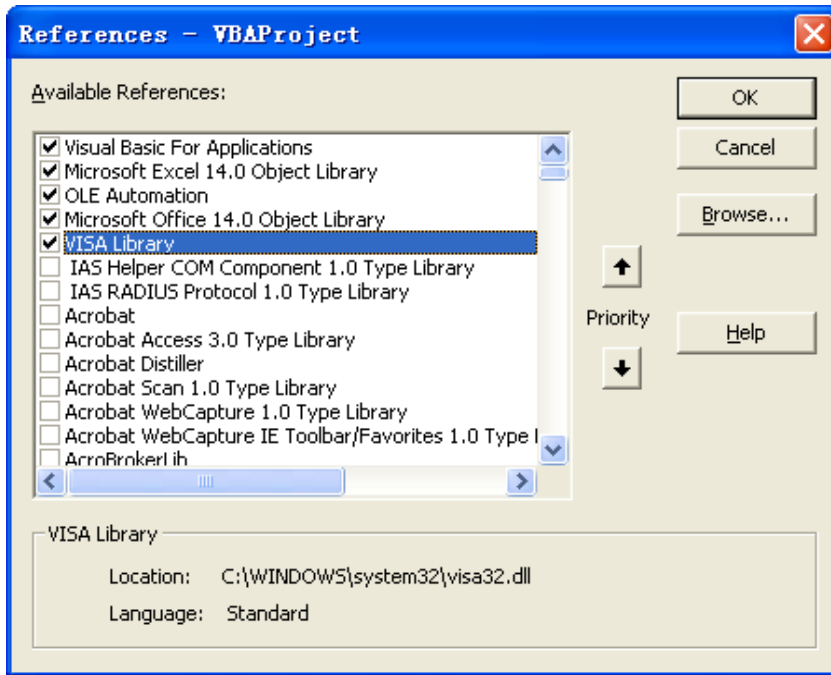
Click the **Developer** tab and select the **Visual Basic** option to open the Microsoft Visual Basic.



- Click **Tools** in the Microsoft Visual Basic menu bar and select **References...**



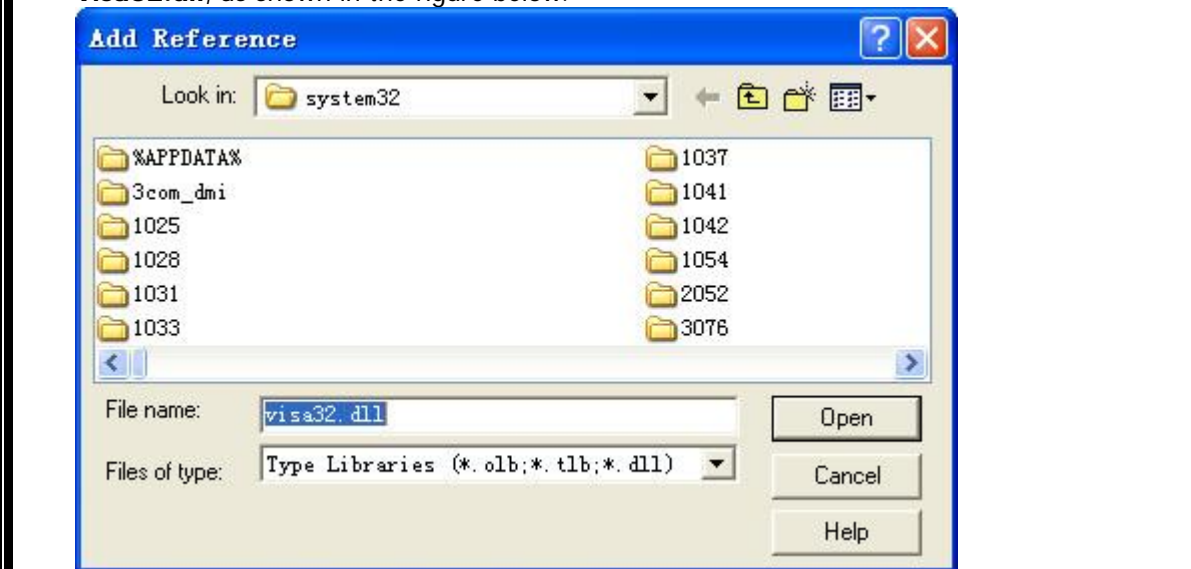
Select **VISA Library** in the pop-up dialog box and click **OK** to take VISA Library as a reference.



Remarks:

If you cannot find **VISA Library** in the left section of the above dialog box, please follow the method below to find it.

- (1) Make sure that your PC has installed the NI-VISA library.
- (2) Click **Browse...**, then select the path **C:\WINDOWS\system32** and search the filename **visa32.dll**, as shown in the figure below.



5. Click **View** in the Microsoft Visual Basic menu bar and select **Code** to enter the code window. Add the following codes and save the file.

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, and 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, and 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
```

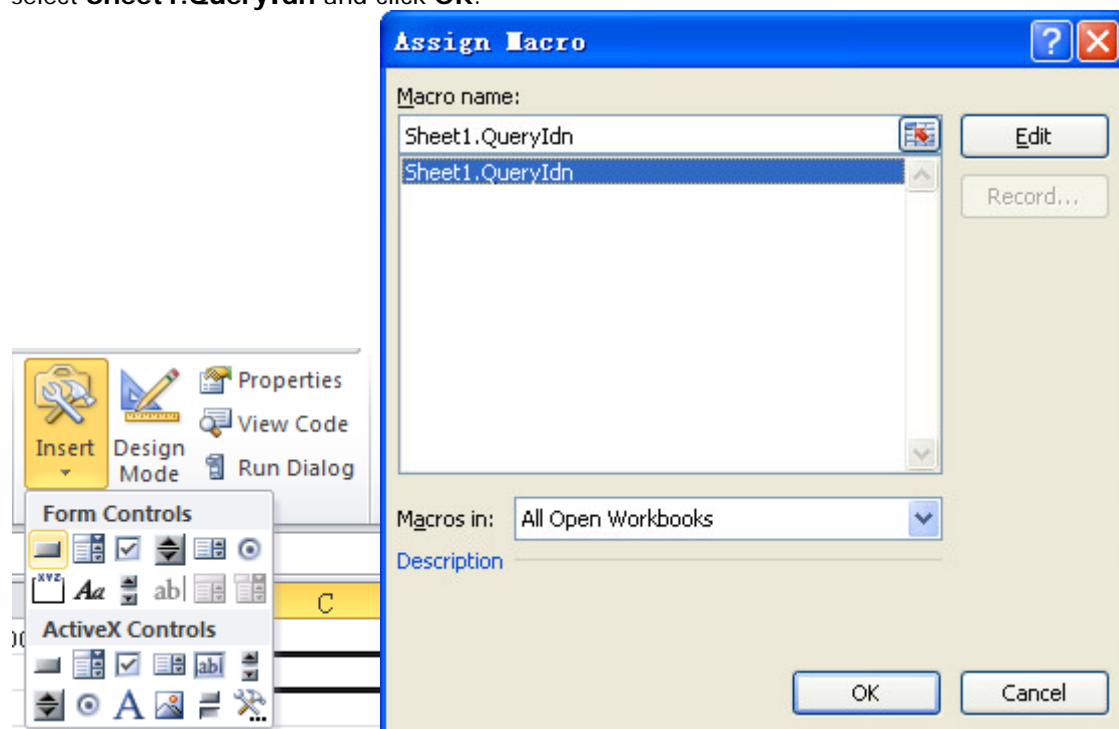
```
'Turn off the device'
visa.viClose (viDevice)
visa.viClose (viDefRm)
```

End Sub

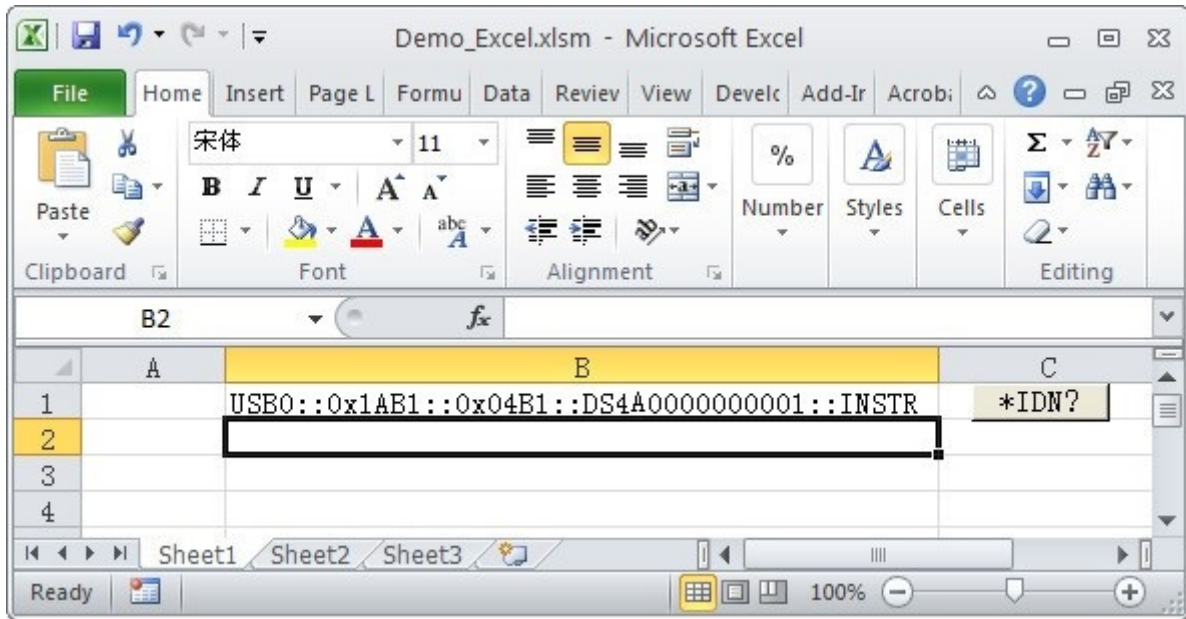
Note: If the Excel file created in Step 1 does not enable the Macros, a prompt message "The following features cannot be saved in macro-free workbooks" will be displayed. In this case, please save the file as a macro-enabled file type (filename with a suffix of ".xlsm").

Besides, when you need to view or modify the codes, you can select **View Code** in the **Developer** tab in the Excel window to open the code window.

- Click **Insert** in the **Developer** tab in the Excel window, and then select the desired button in **Form Controls** and put it into the cell of the Excel. At this time, the **Assign Macro** interface is displayed, select **Sheet1.QueryIdn** and click **OK**.



- The default button name is "Button 1". Right-click the button and select **Edit Text** in the pop-up menu to change the button name to "*IDN?" as shown in the figure below. Click the *IDN? button to read the device information. The result is displayed in SHEET1.CELLS(2,2) (namely the B2 cell in Sheet1).

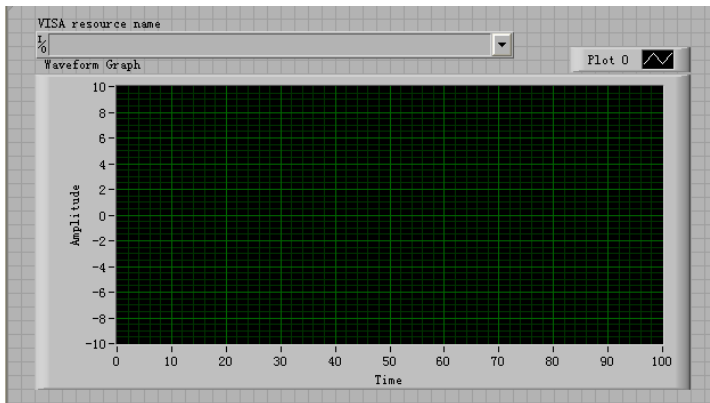
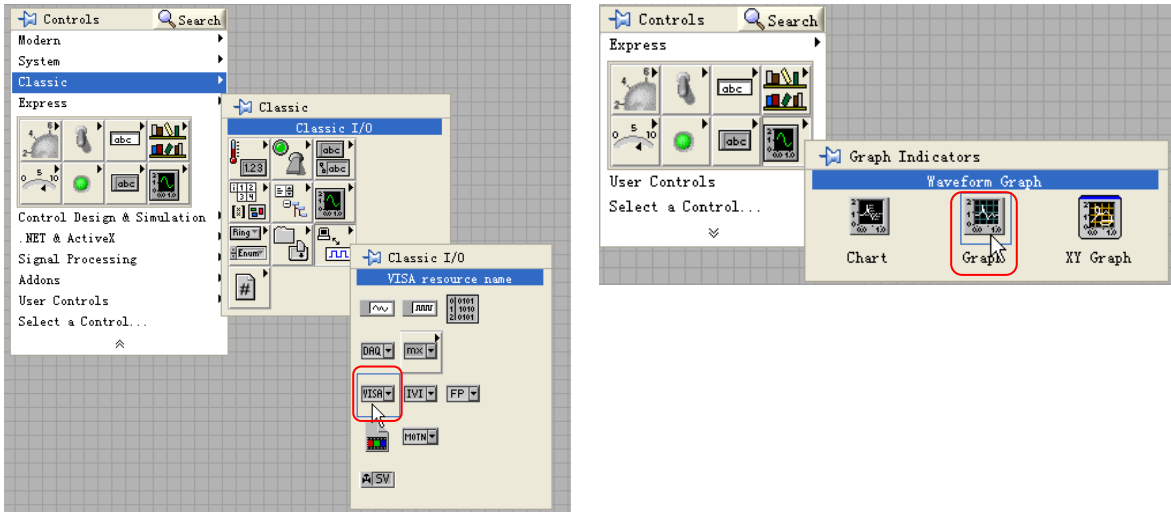


LabVIEW Programming Example

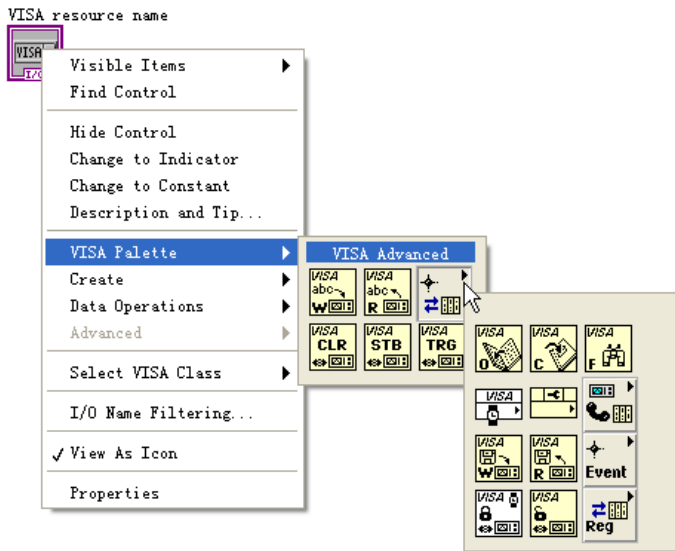
Program used in this example: LabVIEW 8.2

Function realized in this instance: reading the waveform data of CH1 on the screen.

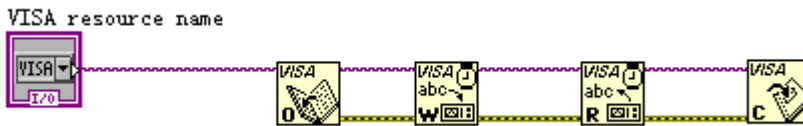
1. Run LabVIEW 8.2, and then create a VI file named Demo_LabVIEW.
2. Add the **VISA resource name** and **Waveform Graph** controls, as shown in the figure below:.



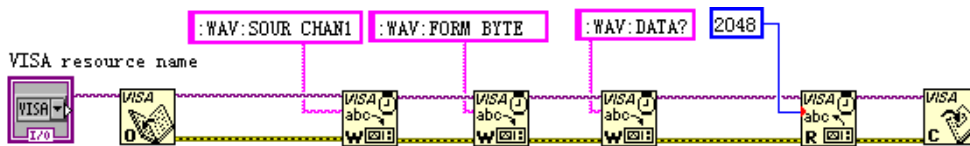
3. Open the **Block Diagram** interface. Right-click on the **VISA resource name** and you can select and add the following functions from **VISA Palette** in the pop-up menu: **VISA Write**, **VISA Read**, **VISA Open** and **VISA Close**.



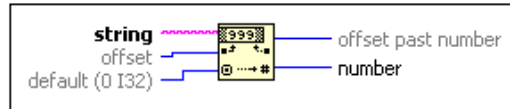
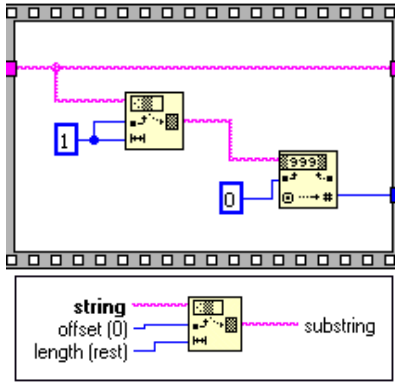
4. Connect the **VISA resource name** with the **VISA Open**. Then, connect the VISA resource name outputs of all the functions with the VISA resource name and connect the error output with the error input as shown in the figure below.



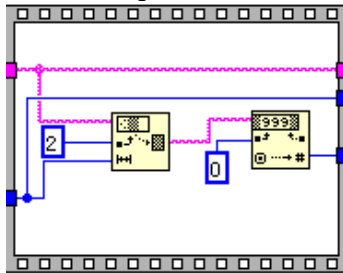
5. Add text boxes in the write buffer areas of the **VISA Write** controls and input `":WAV:SOUR CHAN1"`, `":WAV:FORM BYTE"` and `":WAV:DATA?"` respectively. The first sets the source channel of waveform data reading to CH1, the second sets the return format of the waveform data to BYTE, and the last reads the waveform data on the screen. 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.



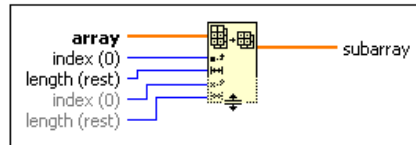
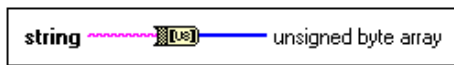
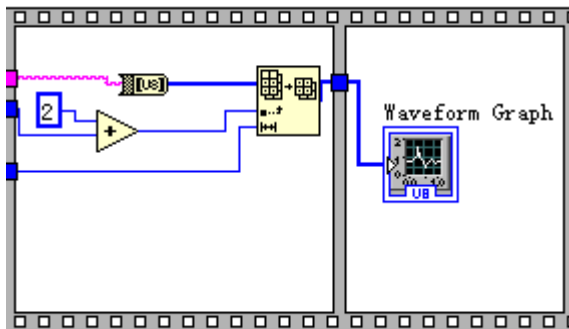
6. The data format is TMC data block header + waveform data + terminator. The TMC header is in `#NX...X` format; wherein, `#` is the TMC header identifier; `N` following `#` represents the the length of the waveform data; and the terminator represents the ending of communication. For example, for `#900001400XXX...`, `"00001400"` following `"9"` indicates that the length of the waveform data byte is 1400. Use the **String Subset** and **Decimal String To Number** functions to get the value of N.



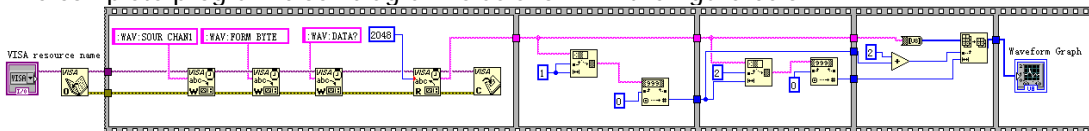
Get the length of the effective waveform data.



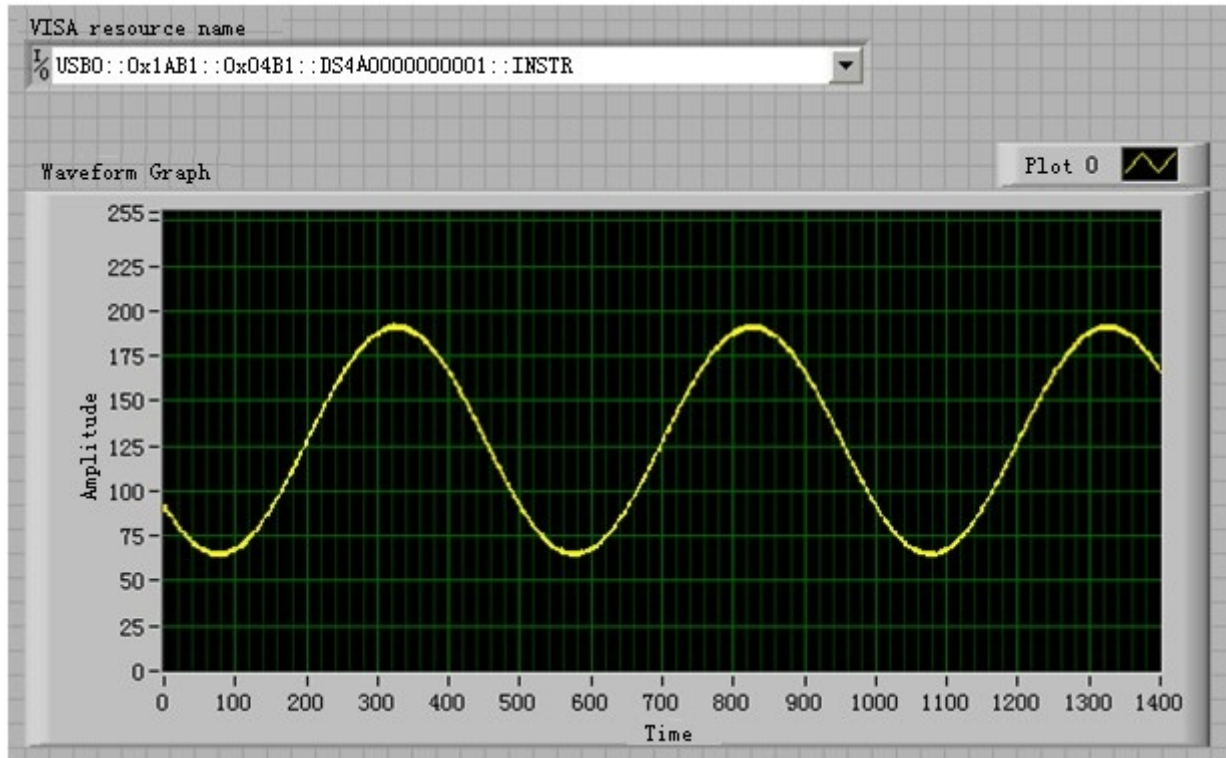
- Convert the character data into array format using the **String To Byte Array** to display the waveform data on the **Waveform Graph** control and then remove the TMC data header using the **Array Subset** function.



- The complete program block diagram is as shown in the figure below:



- Select the device resource from the **VISA Resource Name** drop-down list and run the program.

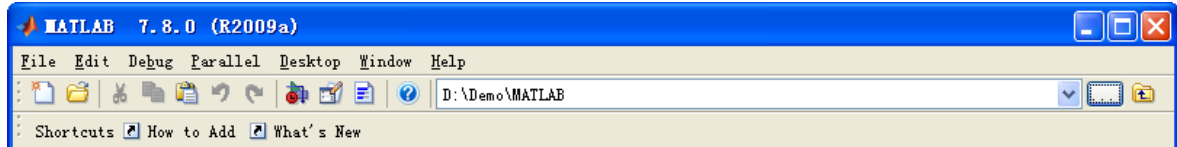


MATLAB Programming Example

Program used in this example: MATLAB R2009a

Function realized in this instance: making FFT operation on the waveform data and plotting the waveform.

1. Run the MATLAB software and modify the current path. In this example, the current path is modified to be D:\Demo\MATLAB.



2. Click **File** → **New** → **Blank M-File** in the Matlab interface to create an empty M file. Add the following codes to the M file:

```
% Create the VISA object.
%'ni' is the seller parameter, and it can be agilent, NI, or tek,
%'USB0::0x1AB1::0x04B1::DS4A000000001::INSTR' is the instrument resource descriptor.
% Create the instrument property. In this example, set the length of the input buffer to 2048
DS4000E = visa( 'ni','USB0::0x1AB1::0x04B1::DS4A000000001::INSTR' );
DS4000E.InputBufferSize = 2048;

% Open the created VISA object
fopen(DS4000E);

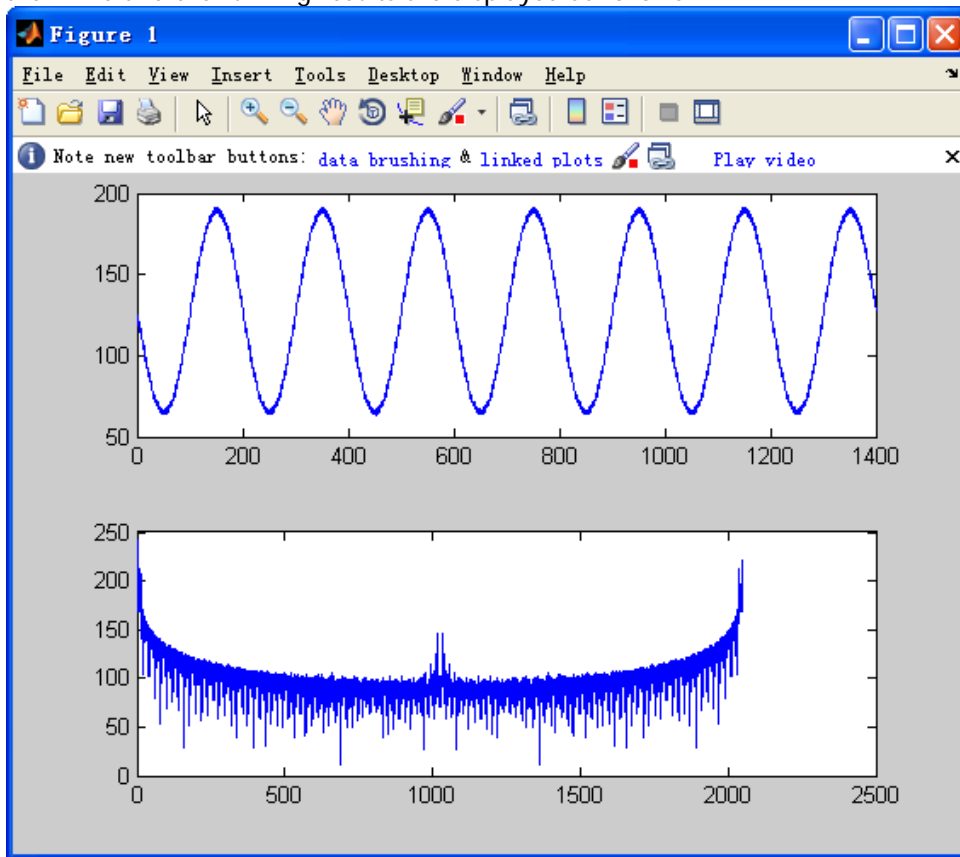
% Read the waveform
fprintf(DS4000E, ':wav:data?' );

% Request data
[data,len]= fread(DS4000E,2048);

% Turn off the instrument
fclose(DS4000E);
delete(DS4000E);
clear DS4000E;

% Data processing. The waveform data read contains the TMC block header. The length of the header
is 11 bytes. The first two bytes are the TMC data block header identifier (#) and the width descriptor
(9) respectively. The 9 bytes following the identifier are the data length. Then, comes with the
waveform data. The last byte is the terminator (0x0A). Therefore, the effective waveform data read is
from the 12nd byte to the next-to-last byte.
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 to the current path. In this example, the M file is named as "Demo_MATLAB.m". Run the M file and the running results are displayed as follows:

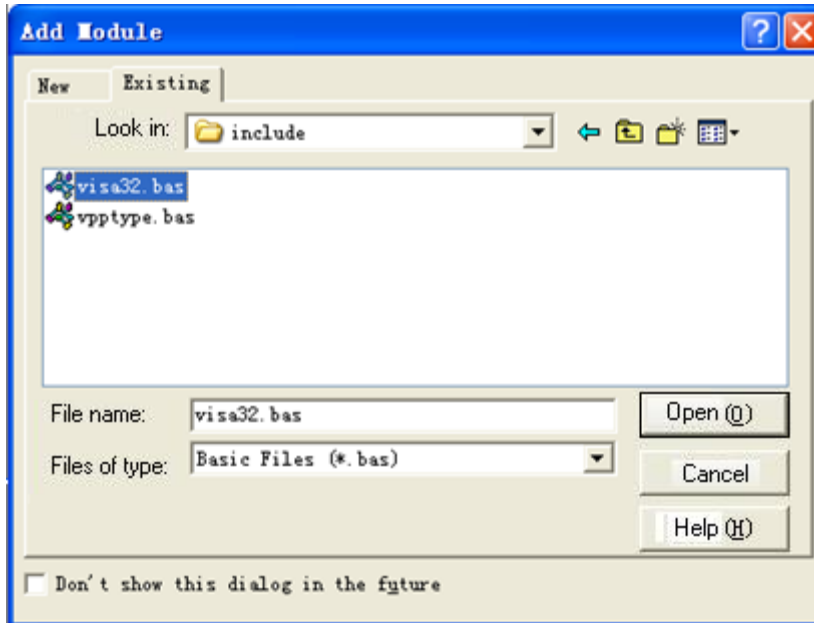


Visual Basic 6.0 Programming Example

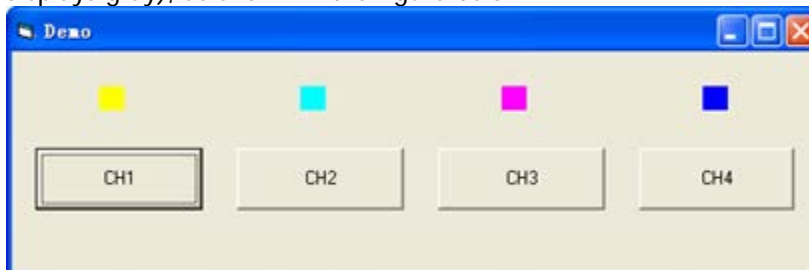
Program used in this example: Visual Basic 6.0

Function realized in this example: controlling the on/off status of any channel.

1. Build a standard application program project (Standard EXE), and name it "Demo_VB".
2. Click **Project** → **Add Module** to open the **Add Module** dialog box. In the dialog box, click the **Existing** tab to search for the **visa32.bas** file in the "include" folder in the NI-VISA installation path and add the file.



3. In the **Demo** dialog box, add four buttons to represent CH1 to CH4 respectively. Add four Labels (Label1(0), Label1(1), Label1(2) and Label1(3)) to represent the statuses of CH1 to CH4 respectively (when the channel is enabled, it displays the color of the channel; when the channel is disabled, it displays gray), as shown in the figure below.



4. Click **Project** → **Project1 Properties** to open the **Project1 – Project Properties** dialog box. Select **Form1** in the **Startup Object** drop-down list box in the **General** tab.
5. Double-click **CH1** to enter the programming environment. Add the following codes to control CH1. The codes of CH1 are as shown below; the codes of the other channels are similar. Please use the same method to control the other channels.

```
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

' Obtain the USB resource of VISA
Call viOpenDefaultRM(defrm)
Call viFindRsrc(defrm, "USB?*\"", list, nmatches, matches)

' Turn on the instrument
Call viOpen(defrm, matches, 0, 0, vi)

' Send a 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 resource
Call viClose(vi)
Call viClose(defrm)
```

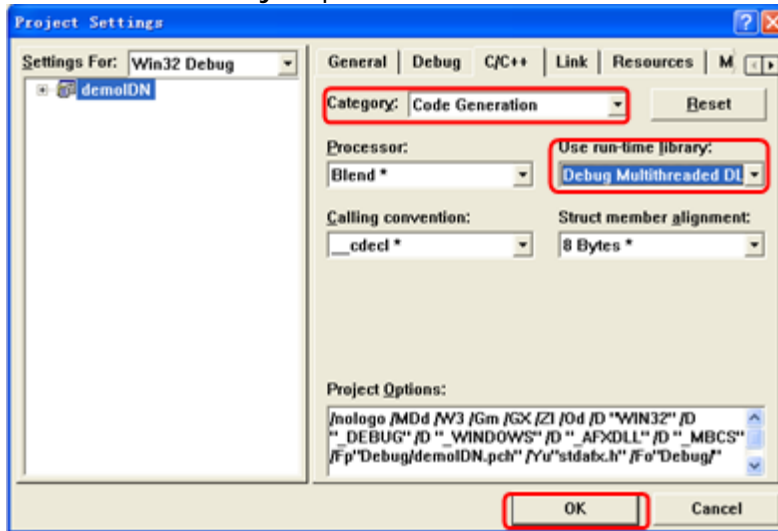
6. Save and run the project to obtain a single exe. program for demo. When the oscilloscope is correctly connected to the PC, the ON/OFF control of any channel can be realized.

Visual C++ 6.0 Programming Example

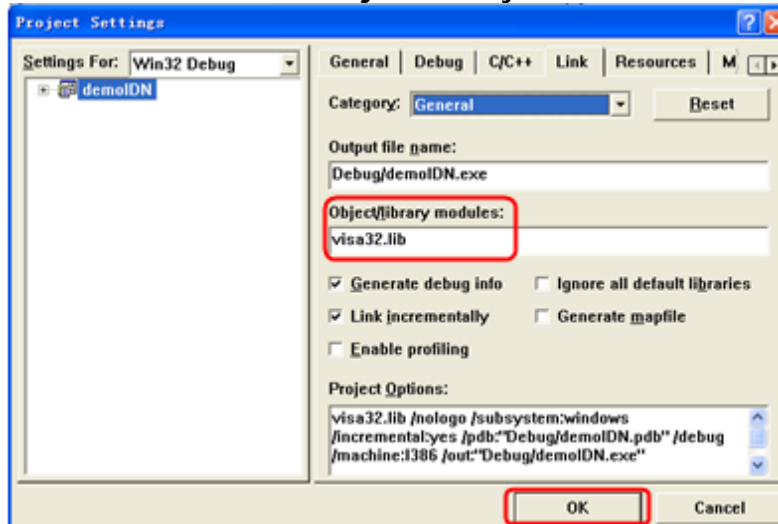
Program used in this instance: Microsoft Visual C++ 6.0

Function realized in this instance: searching for the instrument address, connecting to the instrument, sending commands, and reading return values.

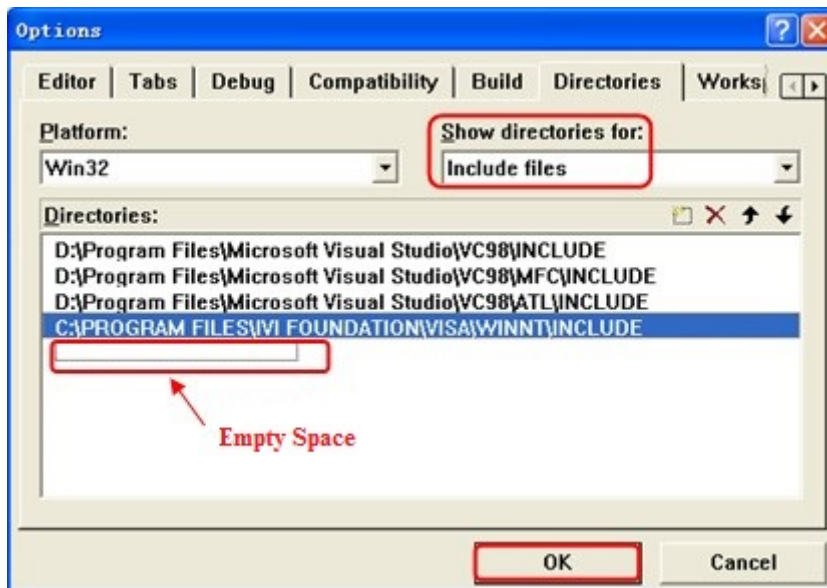
1. Run Microsoft Visual C++ 6.0. Create a MFC project based on a dialog box and name it as demoIDN in this instance.
2. Click **Project** → **Settings** to open the **Project Settings** dialog box. Select **Code Generation** from the **Category** drop-down list box in the **C/C++** tab; select **Debug Multithreaded DLL** from the **Use run-time library** drop-down list box. Click **OK** to close the dialog box.



3. Click **Project** → **Settings** to open the **Project Settings** dialog box. In the dialog box, click the **Link** tab, add "visa32.lib" under **Object/library modules**, then click **OK** to close the dialog box.



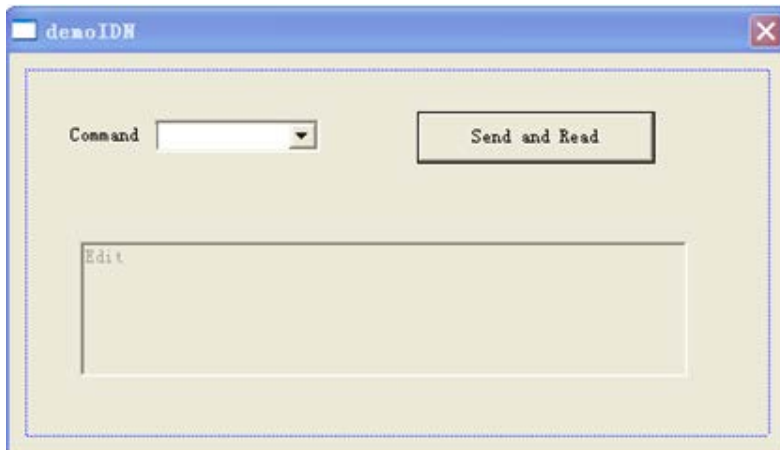
4. Click **Tools** → **Options** to open the **Options** dialog box.
 - 1) Select **Include files** from the drop-down list box under **Show directories for**. Double click the empty space under **Directories** to enter the specified path of Include files: C:\Program Files\IVI Foundation\VISA\WinNT\include. Click **OK** to close the dialog box.



- 2) Select **Library files** from the drop-down list box under **Show directories for**. Double click the empty space under **Directories** to enter the specified path of Library files: C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc. Click **OK** to close the dialog box.

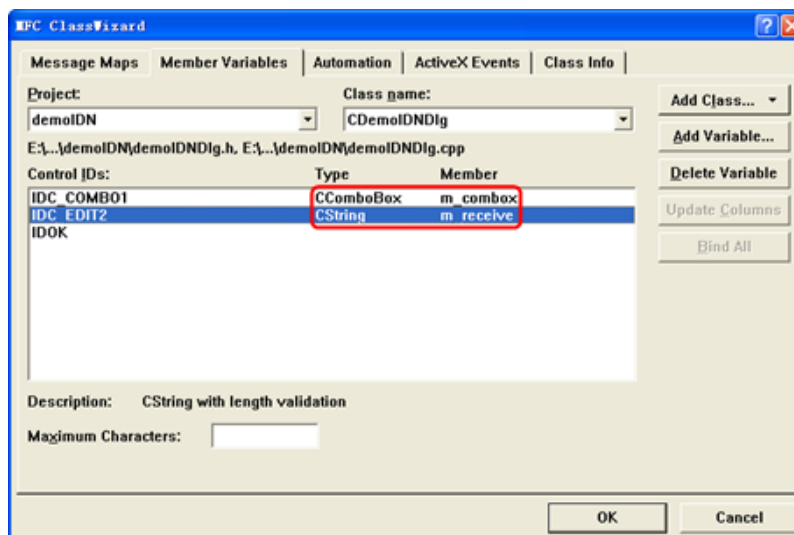
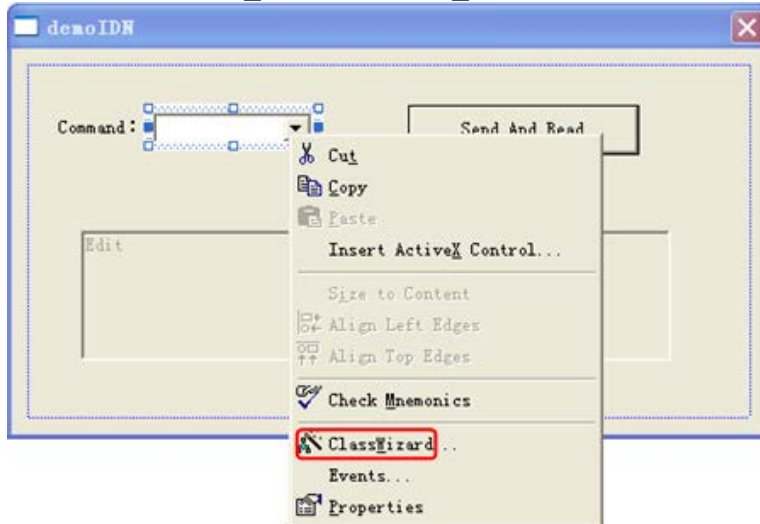
By now, VISA library has been added.

5. Add **Static Text**, **Combo Box**, **Button**, and **Edit Box** controls. The layout interface for adding controls is as follows:



6. Modify the control attributes.
 - 1) Name **Static Text** as "Command".
 - 2) Open the **Data** item in the **Com Box** attribute and input the following three commands manually.
 - *IDN?
 - :CHAN1:DISP 1
 - :CHAN1:DISP 0
 - 3) Open the **General** item in the **Edit Box** attribute and select **Disable**.
 - 4) Name **Button** as **Send and Read**.

7. Add the variables **m_combox** and **m_receive** to the **Com Box** and **Edit Box** 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_BUFLLEN];
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 results  
viScanf (vi, "%t\n", &buf);
```

```
//Display the results  
UpdateData (TRUE);  
m_receive = buf;  
UpdateData (FALSE);  
viClose (vi);  
viClose (defaultRM);
```

9. Save, compile, and run the project to obtain a single exe file. When the oscilloscope is correctly connected to the PC, select a command and click **Send and Read** to execute the command.

