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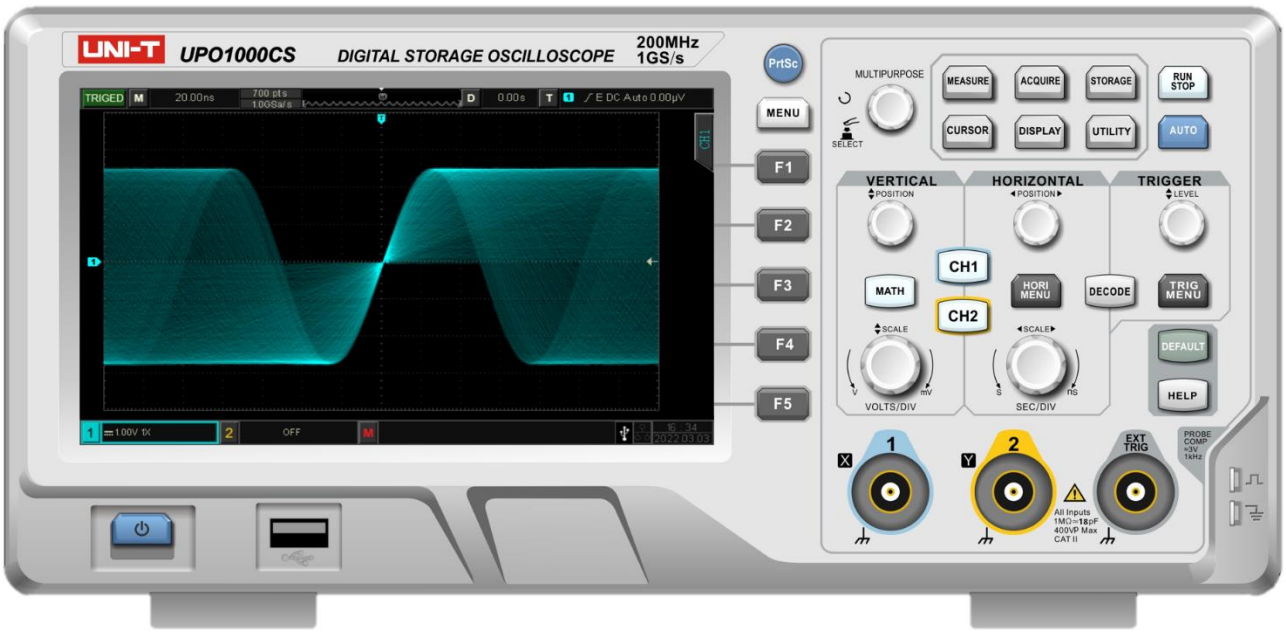

Programming Manual

UPO1000CS Series Digital Phosphor Oscilloscope

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Software Version

00.00.01

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SCPI

SCPI was defined as an additional layer on top of the IEEE 488.2-1987 specification "Standard Codes, Formats, Protocols, and Common Commands". The standard specifies a common syntax, command structure, and data formats, to be used with all instruments. It introduced generic commands (such as CONFigure and MEASure) that could be used with any instrument. These commands are grouped into subsystems. SCPI also defines several classes of instruments. For example, any controllable power supply would implement the same DCPSUPPLY base functionality class. Instrument classes specify which subsystems they implement, as well as any instrument-specific features.

The physical hardware communications link is not defined by SCPI. While it was originally created for the IEEE-488.1 (GPIB) bus, SCPI can also be used with RS-232, RS-422, Ethernet, USB, VXIbus, HiSLIP, etc.

SCPI commands are ASCII textual strings, which are send to the instrument over the physical layer (e.g., IEEE-488.1). Commands are a series of one or more keywords, many of which take parameters. In the specification, keywords are written CONFigure: The entire keyword can be used, or it can be abbreviated to just the uppercase portion. Responses to query commands are typically ASCII strings. However, for bulk data, binary formats can be used.

This section introduces the format, symbols, parameters, and abbreviations of the SCPI command.

Instruction Format

The SCPI command is a tree-like hierarchy consisting of multiple subsystems, each consisting of a root keyword and one or more hierarchical key words. The command line usually begins with a colon ":"; Keywords are separated by the colon ":", followed by optional parameter settings. The command keyword is separated by spaces from the first parameter. The command string must end with a newline <NL> character. Add the question mark "? " after the command line. It is usually indicated that this feature is being queried.

Symbol Description

The following four symbols are not part of SCPI command, it cannot send with the command. It usually used as supplementary description of command parameter.

- Brace { } usually contains multiple optional parameters, it should select one parameter when send command.

  Such as DISPlay:GRID:MODE { FULL | GRID | CROSS | NONE} command

- Vertical Bar | used to separated multiple parameters, it should select one parameter when send command.

  Such as DISPlay:GRID:MODE { FULL | GRID | CROSS | NONE} command

- Square Brackets [ ] the contents in square brackets (command keywords) can omissible. If the parameter is ignored, the instrument will set the parameter as the default value.

  Such as MEASure:NDUTy? [<source>] command, it represents current channel

- Triangular Brackets < > The parameter in the brackets must be replaced with a valid value.

  Such as use DISPlay:GRID:BRIGhtness 30 form to send DISPlay:GRID:BRIGhtness <count> command

Parameter Description

The parameter in this manual can divide into five types: Boolean, Integer, Real, Discrete, ASCII string

- Boolean

  Parameter value can set "ON" (1) or "OFF" (0)

  Such as SYSTem:LOCK {{1 | ON} | {0 | OFF}}

- Integer

  Parameter can take any valid integer value unless there have some other descriptions.

  Such as command: DISPlay:GRID:BRIGhtness <count> , parameter of <count> can take integer from 0~100

  Note: Do not set decimal as parameter, otherwise it may occur error.

- Real

  Parameter can take any valid integer value unless there have some other descriptions.

  Such as for command CH1, CHANnell: OFFSet <offset>, parameter of <offset> can take integer value.

- Discrete

  Parameter can only take some specified numbers or characters.

  Such as command DISPlay:GRID:MODE { FULL | GRID | CROSS | NONE} parameter can only take FULL, GRID, CROSS, NONE

- ASCII Character String

  String parameter contain all ASCII string sets. Strings must begin and end with paired quotes; it can use single or double quotation marks. The quotation and delimiter can also be part of a string by typing it twice and not adding any characters.

  Such as set IP SYST:COMM:LAN:IPAD "192.168.1.10"

Shorthand Rule

All command can er capital and small letter, if command need enter shorthand, it should be all capital letter.

Data Return

Data return is divided into single data and batch data. The single data return is the corresponding parameter type, in which the real return type is express in scientific notation. The part before e retains three figure behind the decimal point, and the e part retains three figure; the batch return must be obey IEEE

488.2# string data format, '#'+ the length of character bits [fixed to one character] + ASCII valid value+ valid data+ end string['\n']

Such as #3123xxxxxxxxxxxxxxxxxxx\n represents 123 strings batch data return format, '3' represents "123" occupies three character bits.

Note: If return data is invalid data, use * to represent it.

SCPI Command Explanation

IEEE488.2 Common Command

*IDN?

- **Command format:**
  *IDN?
- **Functional description:**
  For querying manufacture name, model, product serial number and software version.
- **Return format:**
  Manufacture name, model, product serial number, software version separated by dot mark.
- **For example:**
  UNI-T Technologies, UPO1000CS, UPO1000, 00.00.01

*RST

- **Command format:**
  *RST
- **Functional description:**
  Restore factory settings and clear the entire error message, send and receive queue buffers.

*OPC

- **Command format:**
  *OPC
  *OPC?
- **Functional description:**
  This command is used to force the current instruction to complete and marked as the mark position 1.
- **Return format:**
  Query returns whether the current send instruction is executed, 1 represents it's completed, 0 represents it's not complete.
- **For example:**
  *OPC Mark the executed instruction at mark position 1.
  *OPC? Query returns 1, it represents the command is executed. Otherwise, it's not.

SYSTem Command

The command is used for the basic operation of oscilloscope, including operating control, full keyboard lock, error queue and system data setting.

:RUN

- **Command format:**
  :RUN

- **Functional description:**
  This command is used to start the sampling operating of the oscilloscope, if it need to stop, executing: STOP command.

:STOP

- **Command format:**
  :STOP
- **Functional description:**
  This command is used to stop the sampling operating of the oscilloscope, if it need to restart, executing: RUN command.

:AUTO

- **Command format:**
  :AUTO
- **Functional description:**
  This command is used to automatically set the control parameter of the instrument, the automatic setting can make the best display effect for the input waveform.

:SYSTem:LOCK

- **Command format:**
  :SYSTem:LOCK {{1|ON}|{0|OFF}}
  :SYSTem:LOCK?
- **Functional description:**
  This command is used to lock/unlock full keyboard.
- **Return format:**
  Query returns full keyboard locked status, 0 represents locked, 1 represents unlock.
- **For example:**

:SYSTem:LOCK ON/:SYST:LOCK 1	Full keyboard locked.
:SYSTem:LOCK OFF/:SYST:LOCK 0	Unlock full keyboard.
:SYSTem:LOCK?	Query returns 1, it represents locked.

:SYSTem:ERRor

- **Command format:**
  :SYSTem:ERRor
  :SYSTem:ERRor?
- **Functional description:**
  This command is used to empty error message queue.
- **Return format:**
  Query returns the last error message, Query returns error message in the format of "<Message number>, <Message content>. <Message number> is an integer; <Message content> is an ASCII character string with double quotation marks.

Such as-113,"Undefined header; command cannot be found".

- **For example:**

:SYSTem:ERR	Empty error message queue.
:SYSTem:ERR?	Query returns -113,"Undefined header; command cannot be found".

:SYSTem:SETup

- **Command format:**

  :SYSTem:SETup <setup_data>

  :SYSTem:SETup?

- **Functional description:**

  This command is used to configure the system setting data. <setup_data> is conform to the Appendix 2: IEEE 488.2 binary data format

- **Return format:**

  Query returns the system setting data.

:SYSTem:LANGuage

- **Command format:**

  :SYSTem:LANGuage { ENGLish | SIMPlifiedchinese }

  :SYSTem:LANGuage?

- **Functional description:**

  This command is used to set the system lanauage.

- **Return format:**

  Query returns { ENGLish | SIMPlifiedchinese}.

- **For example:**

:SYSTem:LANGuage ENGL	Set the system language to English.
:SYSTem:LANGuage?	Query returns ENGLish.

:SYSTem:RTC

- **Command format:**

  :SYSTem:RTC <year>,<month>,<day>,<hour>,<minute>,<second>

  :SYSTem:RTC?

- **Functional description:**

  This command is used to set the system time.

- **Return format:**

  Query returns year, month, date, hour, minute and second.

- **For example:**

:SYSTem:RTC 2017,7,7,20,8,8	Set the system time to 20:08:08, 7th, July, 2017.
:SYSTem:RTC?	Query returns 2017,7,7,20,8,8.

:SYSTem:CAL

- **Command format:**
  :SYSTem:CAL
- **Functional description:**
  This command is used to set the self-calibration of the system, it cannot be normal communicated during self-calibration.

:SYSTem:CLEAr

- **Command format:**
  :SYSTem:CLEAr
- **Functional description:**
  Empty all the saved waveforms and data settings.

:SYSTem:CYMOmeter

- **Command format:**
  :SYSTem:CYMOmeter {1|ON}|{0|OFF}
  :SYSTem:CYMOmeter?
- **Functional description:**
  This command is used to turn on/off the frequency meter.
- **Return format:**
  Query returns the status of frequency meter, 1 represets ON, 0 represents OFF.
- **For example:**
  :SYSTem:CYMOmeter ON Turn on frequency meter.
  :SYSTem:CYMOmeter? Query returns 1.

:SYSTem:CYMOmeter:FREQuency?

- **Command format:**
  :SYSTem:CYMOmeter:FREQuency?
- **Functional description:**
  This command is used to acquire the frequency value of the frequency meter measurement.
- **Return format:**
  Query returns the frequency value of the frequency meter measurement, and invalid value returns *.
- **For example:**
  :SYSTem:CYMOmeter:FREQuency? Query returns 1.20000E+3.

:SYSTem:SQUare:SELect

- **Command format:**
  :SYSTem:SQUare:SELect {10 Hz|100 Hz|1 kHz|10 kHz}
  :SYSTem:SQUare:SELect?
- **Functional description:**
  This command is used to select square wave output.

- **Return format：**

  Query returns { 10 Hz | 100 Hz | 1 kHz | 10 kHz }.

- **For example：**

  :SYSTem:SQUare:SELect 10 Hz Select 10 Hz square wave output.

  :SYSTem:SQUare:SELect? Query returns 10 Hz.

:SYSTem:OUTPut:SELect

- **Command format：**

  :SYSTem:OUTPut:SELect { TRIGger | PASS_FAIL }

  :SYSTem:OUTPut:SELect?

- **Functional description：**

  This command is used to set output selection TRIGger or PASS_FAIL（pass&fail）.

- **Return format：**

  Query returns {TRIGger | PASS_FAIL}.

- **For example：**

  :SYSTem:OUTPut:SELect TRIG Output selection sets to trigger.

  :SYSTem:OUTPut:SELect? Query returns TRIG.

:SYSTem:MNUDisplay

- **Command format：**

  :SYSTem:MNUDisplay {5S | 10S | 20S | INFinite}

  :SYSTem:MNUDisplay?

- **Functional description：**

  This command is used to set the menu display time, INFinite represents the menu is always displayed.

- **Return format：**

  Query returns {5S | 10S | 20S | INFinite}.

- **For example：**

  :SYSTem:MNUDisplay 5S

  Set the menu display time to 5s, the menu will automatically withdraw after 5 s.

  :SYSTem:MNUDisplay? Query returns 5 s.

:SYSTem:BRIGhtness

- **Command format：**

  :SYSTem:BRIGhtness <count>

  :SYSTem:BRIGhtness?

- **Functional description：**

  This command is used to set the screen brightness, <count> take value from 1~100, the bigger the number, the brighter the screen.

- **Return format：**

  Query returns the current screen brightness.

- **For example：**

  :SYSTem:BRIGhtness 50 Set screen brightness to 50.

:SYSTem:BRIGhtness? Query returns 50.

:SYSTem:VERSion?

- **Command format:**
  :SYSTem:VERSion?
- **Return format:**
  Query returns version information, which are 128 bytes character string.
  HW is hardware version number, SW is software version number, PD is created date, ICV is protocol version number.
- **For example:**
  :SYST:VERS? Query returns HW:1.0;SW:1.0;PD:2014-11-20;ICV:1.4.0.

:SYSTem:COMMunicate:LAN:APPLy

- **Command format:**
  :SYSTem:COMMunicate:LAN:APPLy
- **Functional description:**
  This command is used to take effect the current network parameter immediately.

:SYSTem:COMMunicate:LAN:GATEway

- **Command format:**
  :SYSTem:COMMunicate:LAN:GATEway <gateway>
  :SYSTem:COMMunicate:LAN:GATEway?
- **Functional description:**
  This command is used to set the default gateway. <gateway> is belong to the parameter of ASCII character string, the format is xxx.xxx.xxx.xxx.
- **Return format:**
  Query returns the default gateway.
- **For example:**
  :SYST:COMM:LAN:GATE "192.168.1.1" Set the default gateway to 192.168.1.1.
  :SYST:COMM:LAN:GATE? Query returns192.168.1.1.

:SYSTem:COMMunicate:LAN:SMASK

- **Command format:**
  :SYSTem:COMMunicate:LAN:SMASK <submask>
  :SYSTem:COMMunicate:LAN:SMASK?
- **Functional description:**
  This command is used to set subnet mask. <submask> is belong to the parameter of ASCII character string, the format is xxx.xxx.xxx.xxx.
- **Return format:**
  Query returns subnet mask.
- **For example:**
  :SYST:COMM:LAN:SMASK "255.255.255.0" Set subnet mask to 255.255.255.0.

:SYST:COMM:LAN:SMASK? Query returns 255.255.255.0.

:SYSTem:COMMunicate:LAN:IPADdress

- **Command format:**
  :SYSTem:COMMunicate:LAN:IPADdress <ip>
  :SYSTem:COMMunicate:LAN:IPADdress?
- **Functional description:**
  This command is used to set IP address. <ip> is belong to the parameter of ASCII character string, the format is xxx.xxx.xxx.xxx.
- **Return format:**
  Query returns IP address.
- **For example:**
  :SYST:COMM:LAN:IPAD "192.168.1.10" Set IP address to 192.168.1.10

  :SYST:COMM:LAN:IPAD? Query returns 192.168.1.10.

:SYSTem:COMMunicate:LAN:DHCP

- **Command format:**
  :SYSTem:COMMunicate:LAN:DHCP {{1|ON}|{0|OFF}}
  :SYSTem:COMMunicate:LAN:DHCP?
- **Functional description:**
  This command is used to switch the configuration mode to automatic IP or manual IP.
- **Return format:**
  Query returns dynamic allocation mode, 0 represents manual IP, 1 represents automatic IP.
- **For example:**
  :SYST:COMM:LAN:DHCP ON Turn on IP dynamic allocation.
  :SYST:COMM:LAN:DHCP? Query returns 1.

:SYSTem:COMMunicate:LAN:MAC?

- **Command format:**
  :SYSTem:COMMunicate:LAN:MAC?
- **Return format:**
  Query returns MAC physical address.
- **For example:**
  :SYST:COMM:LAN:MAC? Query returns 00-2A-A0-AA-E0-56.

KEY Command

This command is used to control the key and rotary knob on the operating panel of the oscilloscope.

:KEY:<key>

- **Command format：**

  :KEY:<key>

  :KEY:<key>:LOCK {{1|ON}|{0|OFF}}

  :KEY:<key>:LOCK?

  :KEY:<key>:LED?

- **Functional description：**

  This command is used to set key function and lock/unlock function. <key> definition and description refer to Appendix 1：Key List

- **Return format：**

  Query returns key status or LED indicator status;

  Lock status: 0 represents the key is unlock, 1 represents the key is locked;

  LED status：0 represents LED indicator is lightless, 1 represents LED indicator is lit up.

- **For example：**

  :KEY:AUTO

  Automatically set the control parameter of the oscilloscope.

  :KEY:AUTO:LOCK ON/OFF Lock/unlock key.

  :KEY:AUTO:LOCK? Query returns key status, 1 represents the key is locked.

  :KEY:AUTO:LED?

  Query returns LED status, 0 represents LED indicator is lightless.

CHANnel Command

This command is used to set each channel independently.

:CHANnel<n>:BWLimit

- **Command format：**

  :CHANnel<n>:BWLimit {{1|ON}|{0|OFF}}

  :CHANnel<n>:BWLimit?

- **Functional description：**

  This command is used to set the bandwidth limit to ON or OFF.

  ON: turn on bandwidth limit to 20 MHz, to reduce display noise.

  OFF: turn off bandwidth limit to achieve full babdwidth display.

  <n>：{1|2|3|4}，it represents {CH1|CH2} separately.

- **Return format：**

  Query returns 1 or 0, it represents ON or OFF separately.

- **For example：**

  :CHAN1:BWL ON Turn on the bandwidth limit of channel 1.

  :CHAN1:BWL?

  Query returns 1，it represents the bandwidth limit of channel 1 is turned on.

:CHANnel<n>:COUPling

- **Command format：**
  :CHANnel<n>:COUPling {DC|AC|GND}
  :CHANnel<n>:COUPling?
- **Functional description：**
  This command is used to set the channel coupling mode. DC represents the AC and DC component that can be through the input signal; AC represents the DC component that blocks the input signal;
  GND represents cut-off the input signal.
  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.
- **Return format：**
  Query AC, DC or GND.
- **For example：**
  :CHAN1:COUP DC Set the coupling mode of channel 1 to DC.
  :CHAN1:COUP? Query returns DC.

:CHANnel<n>:DISPlay

- **Command format：**
  :CHANnel<n>:DISPlay { {1|ON} | {0|OFF} }
  :CHANnel<n>:DISPlay?
- **Functional description：**
  This command is used to turn on/off the specified channel.
  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.
- **Return format：**
  Query returns 1 or 0， it represents ON or OFF separately.
- **For example：**
  :CHAN1:DISP ON Turn on Channel 1.
  :CHAN1:DISP?
  Query returns 1, it represents the channel 1 is turned on.

:CHANnel<n>:INVert

- **Command format：**
  :CHANnel<n>:INVert { {1|ON} | {0|OFF} }
  :CHANnel<n>:INVert?
- **Functional description：**
  This command is used to turn on/off the waveform phase reverse.
  ON: turn on the waveform phase reverse.
  OFF: restore the waveform to normal display.
  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.
- **Return format：**
  Query returns 1 or 0, it represents ON or OFF.
- **For example：**
  :CHAN1:INV OFF Turn off the phase reverse of channel 1.

:CHAN1:INV?

Query returns 0, it represents the phase reverse of channel 1 is turned off.

:CHANnel<n>:PROBe

- **Command format:**

  :CHANnel<n>:PROBe {<probe>| 0.001X | 0.01X | 0.1X | 1X | 10X | 100X | 1000X }

  :CHANnel<n>:PROBe?

- **Functional description:**

  This command is used to set the probe attenuation factor which corresponding to probe.

  <probe>: Self-defined probe attenuation factor.

  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.

- **Return format:**

  Query returns if the probe attenuation factor of the oscilloscope is self-defind, it returns the current probe attenuation value in scientific notation, unit is X; if the probe attenuation factor of the oscilloscope is not self-defind, then it returns {0.001X | 0.01X | 0.1X | 1X | 10X | 100X | 1000X}.

- **For example:**

  :CHAN1:PROB 10X Set the probe attenuation factor of channel 1 to 10.

  :CHAN1:PROB? Query returns 10X.

:CHANnel<n>:OFFSet

- **Command format:**

  :CHANnel<n>:OFFSet <offset>

  :CHANnel<n>:OFFSet?

- **Functional description:**

  This command is used to set the waveform displacement on vertical direction.

  <n>: {1|2|3|4|5|6|7|8|9}, it represents {CH1|CH2|CH3|CH4|MATH|REFA|REFB|REFC|REFD} separately.

- **Return format:**

  Query returns the setting value of offset in scientific notation, unit is V.

- **For example:**

  :CHAN1:OFFS 20V Set the vertical displacement of channel 1 to 20 V.

  :CHAN1:OFFS? Query returns 2.000e001.

:CHANnel<n>:SCALe

- **Command format:**

  :CHANnel<n>:SCALe {<scale> | UP | DOWN}

  :CHANnel<n>:SCALe?

- **Functional description:**

  This command is used to set volts/div scale on vertical direction.

  <scale>: Volts/div scale value;

  UP: Increase one scale based on the current scale of the oscilloscope;

  DOWN: Decrease one scale based on the current scale of the oscilloscope.

  <n>: {1|2|3|4|5|6|7|8|9}, it represents {CH1|CH2|MATH|REFA|REFB|} separately.

- **Return format:**

Query returns the current volts/div scale vaule in scientific notation, unit is V.

- **For example:**

:CHAN1:SCAL 20 V	Set the volts/div scale of channel 1 to 20 V.
:CHAN1:SCAL?	Query returns 2.000e001.
:CHAN1:SCAL UP	Increase one scale based on 20 V volts/div scale.

:CHANnel<n>:UNITs

- **Command format:**

  :CHANnel<n>:UNITs {VOLTs|AMPeres|WATTs|UNKNown}

  :CHANnel<n>:UNITs?

- **Functional description:**

  This command is used to set the channel unit to VOLTs, AMPeres, WATTs or UNKNown.

  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.

- **Return format:**

  Query returns VOLTs, AMPeres, WATTs or UNKNown.

- **For example:**

:CHAN1:UNIT VOLT	Set the unit of channel 1 to VOLTs.
:CHAN1:UNIT?	Query returns VOLTs.

:CHANnel<n>:VERNier

- **Command format:**

  :CHANnel<n>:VERNier { {1|ON} | {0|OFF} }

  :CHANnel<n>:VERNier?

- **Functional description:**

  This command is used to set scale adjusting mode. If scale adjusting mode sets to ON, which is fine tuning. Fine tuning can further subdivided within coarse tuning range for improving vertical resolution; if scale adjusting mode sets to OFF, which is coarse tuning. It can adjust vertical sensitivity by system 1-2-5.

  <n>: {1|2|3|4}, it represents {CH1|CH2} separately.

- **Return format:**

  Query returns 1 or 0, it represents ON or OFF.

- **For example:**

:CHAN1:VERN ON	Turn on fine tuning of channel 1.
:CHAN1:VERN?	Query returns 1.

:CHANnel<n>:SELect

- **Command format:**

  :CHANnel<n>:SELect

:CHANnel<n>:SELect?

- **Functional description:**

  This command is used to select channel.

  <n>：{1|2|3|4|5|6|7|8|9}, it represents {CH1|CH2|MATH|REFA|REFB} separately.

- **Return format:**

  Query returns 1 or 0.

- **For example:**

:CHAN1:SELect	Select channel 1.
:CHAN1:SELect?	Query returns 1, it present the channel is selected.

TIMebase Command

This command is to change the horizontal scale (timebase) of the current channel and horizontal position of the trigger in memory (trigger displacement). Changing the horizontal scale may casue the waveform extended or compressed relative to the center of the screen; changing the horizontal position may casue waveform position away from the center of screen.

:TIMebase:MODE

- **Command format:**

  :TIMebase:MODE {MAIN | WINDow}

  :TIMebase:MODE?

- **Functional description:**

  This command is used to set timebase mode, MAIN（main timebase）or WINDow（<Zoomed> timebase）.

- **Return format:**

  Query returns MAIN or WINDow.

- **For example:**

:TIM:MODE MAIN	Set timebase mode to MAIN.
:TIM:MODE?	Query returns MAIN.

:TIMebase:OFFSet

- **Command format:**

  :TIMebase:OFFSet <offset>

  :TIMebase:OFFSet?

- **Functional description:**

  This command is used to adjust the offset of MAIN (main timebase), which is displacement of the waveform position from the center of the screen.

- **Return format:**

  Query returns <offset> value in scientific notation, unit is s.

- **For example:**

:TIM:OFFS 1s	Set the offset of MAIN to 1s.
:TIM:OFFS?	Query returns 1.000e000.

:TIMebase:WINDow:OFFSet

- **Command format:**
  :TIMebase:WINDow:OFFSet <offset>
  :TIMebase:WINDow:OFFSet?
- **Functional description:**
  This command is used to adjust the offset of WINDow （<Zoomed> timebase）, which is displacement of the waveform position from the center of the screen.
- **Return format:**
  Query returns <offset> value in scientific notation, unit is s.
- **For example:**

:TIM:WIND:OFFS 1	Set the offset of WINDow to 1s.
:TIM:WIND:OFFS?	Query returns 1.000e000.

:TIMebase:SCALe

- **Command format:**
  :TIMebase:SCALe {<scale> | UP | DOWN}
  :TIMebase:SCALe?
- **Functional description:**
  This command is used to set timebase scale of MAIN（main timebase）, which is s/div.
  <scale>: Timebase scale value;
  UP: Increase one scale based on the current scale of the oscilloscope;
  DOWN: Decrease one scale based on the current scale of the oscilloscope.
- **Return format:**
  Query returns < scale> value in scientific notation, unit is s/div.
- **For example:**

:TIM:SCAL 2	Set the offset of MAIN to 2 s/div.
:TIM:SCAL?	Query returns 2.000e000.

:TIMebase:WINDow:SCALe

- **Command format:**
  :TIMebase:WINDow:SCALe < scale >
  :TIMebase:WINDow:SCALe?
- **Functional description:**
  This command is used to set timebase scale of WINDow（<Zoomed> timebase）, which is s/div.
- **Return format:**
  Query returns < scale> value in scientific notation, unit is s/div.
- **For example:**

:TIM:WIND:SCAL 2	Set the offset of WINDow to 2 s/div.
:TIM:WIND:SCAL?	Query returns 2.000e000.

:TIMebase:INDPendent

- **Command format:**

:TIMebase:INDPendent {{1|ON}|{0|OFF}}

:TIMebase:INDPendent?

- **Functional description:**

  This command is used to turn on/off timebase independent mode.

- **Return format:**

  Query returns 1 or 0, it represents ON or OFF.

- **For example:**

  :TIMebase:INDPendent ON Turn on timebase independent mode.

  :TIMebase:INDPendent? Query returns 1.

:TIMebase:HOLDoff

- **Command format:**

  :TIMebase:HOLDoff <time>

  :TIMebase:HOLDoff?

- **Functional description:**

  This command is used to set trigger holdoff time, which can set the range to 100ns~10s.

- **Return format:**

  Query returns the value of trigger holdoff time in scientific notation, unit is s.

- **For example:**

  :TIM:HOLD 1s Set trigger holdoff time to 1s.

  :TIM:HOLD? Query returns 1.000e000.

:TIMebase:SPLit:SCReen

- **Command format:**

  :TIMebase:SPLit:SCReen {{1|ON}|{0|OFF}}

  :TIMebase:SPLit:SCReen?

- **Functional description:**

  This command is used to set the split screen display status in independent mode, set to ON or OFF.

- **Return format:**

  Query returns 1 or 0, it present ON or OFF.

- **For example:**

  :TIMebase:SPLit:SCReen ON Turn on channel's split screen display.

  :TIMebase:SPLit:SCReen? Query returns 1.

FUNCtion Command

This command is used to display the operation result of the waveform of CH1, CH2. The operation is add, subtract, multiply, divide, and, or, not, XOR and FFT. Set filter to use the expression to operating.

:FUNCtion:MATH:MODE

- **Command format:**
  FUNCtion:MATH:MODE {MATH|FFT|LOGic|FILTer|ADVance}
  FUNCtion:MATH:MODE?
- **Functional description:**
  This command is used to select MATH mode.
- **Return format:**
  Query returns {MATH|FFT|LOGic|FILTer|ADVance}.
- **For example:**

FUNC:MATH:MODE FFT	Set MATH mode to FFT mode.
FUNC:MATH:MODE?	Query returns FFT.

:FUNCtion:OPERation

- **Command format:**
  :FUNCtion:OPERation {ADD | SUBTract | MULTiply | DIVide }
  :FUNCtion:OPERation?
- **Functional description:**
  This command is used to set functional operator, which includes the basic and logical operation. That is add, subtract, multiply and divide.
- **Return format:**
  Query returns {ADD | SUBTract | MULTiply | DIVide}.
- **For example:**

:FUNCtion:OPERation ADD	Use add operator: src1+src2.
:FUNCtion:OPERation?	Query returns ADD.

:FUNCtion:DIGital<n>:THReshold

- **Command format:**
  :FUNCtion:DIGital<n>:THReshold <value>
  :FUNCtion:DIGital<n>:THReshold?
- **Functional description:**
  This command is used to set the logical threshold value of the specified channel, if it greater than the threshold value, then take value as 1, if it less than the threshold value, then take value as 0. n take value from1,2.
- **Return format:**
  Query returns 1.000e000, unit is V.
- **For example:**

:FUNC:DIG1:THR 1 V	Set the lpgical threshold value of channel 1 to 1 V
:FUNC:DIG1:THR?	Query returns 1.000e000

:FUNCtion:SOURce<m>

- **Command format:**
  :FUNCtion:SOURce<m> {CHANnel1| CHANnel2 }
  :FUNCtion:SOURce<m>?
- **Functional description:**
  SOURce<m> represents source 1 or source 2, <m> take value from 1, 2.
  SOURce1 is used to select the first source of operator mathematical functions. And which can be a signle source of Filter, FFT.
  SOURce2 is used to select the second source of operator mathematical functions. Single source of Filter, FFT are not suitable.
  <value> represents CHANnel<n>, <n>take value from 1/2{CH1/ CH2 }.
- **Return format:**
  Query returns CHANnel1, CHANnel2.
- **For example:**

:FUNCtion:SOUR1 CHAN1	Set channel 1 as the first source.
:FUNCtion:SOUR1?	Query returns CHANnel1.
:FUNCtion:SOUR2 CHAN2	Set channel 2 as the second source.
:FUNCtion:SOUR2?	Query returns CHANnel2.
:FUNCtion:OPERation ADD	Add channel of source 1 and channel of source 2.

:FUNCtion:FFT:WINDow

- **Command format:**
  :FUNCtion:FFT:WINDow {RECTangular|HANNing|HAMMing|BMAN}
  :FUNCtion:FFT:WINDow?
- **Functional description:**
  FFT add window to intercept signal. RECT, HANN, HAMM, BMAN is respectively rectangular window, Hanning window, Hamming window and Blacman window.
- **Return format:**
  Query returns {RECTangular|HANNing|HAMMing|BMAN}.
- **For example:**

:FUNCtion:SOUR1 CHAN1	Set channel 1 as the source.
:FUNC:FFT:WIND HAMM	Add Hamming window.
:FUNC:FFT:WIND?	Query returns HAMMing.

:FUNCtion:FFT:DISPlay

- **Command format:**
  :FUNCtion:FFT:DISPlay {FULL| SPLIt| WATerfall1| WATerfall2}
  :FUNCtion:FFT:DISPlay?
- **Functional description:**
  This command is used to set FFT display mode.
- **Return format:**
  Query returns {FULL| SPLIt| WATerfall1| WATerfall2}. FULL is full display, SPLIt is split screen display.

WATerfall1 is waterfall curve 1, WATerfall2 is waterfall curve 2.

- **For example:**

:FUNCtion:FFT:DISPlay FULL Set FFT to full display.

:FUNCtion:FFT:DISPlay? Return FULL.

:FUNCtion:FFT:WATerfall:SLICe

- **Command format:**

:FUNCtion:FFT:WATerfall:SLICe <value>

:FUNCtion:FFT:WATerfall:SLICe ?

- **Functional description:**

This command is used to select the segment of FFT waterfall curve, which can select the range to 1~200.

- **Return format:**

Query returns which frame segment is currently selected.

- **For example:**

:FUNCtion:FFT:WATerfall:SLICe 100

Set FFT waterfall curve to select 100 frame segment.

:FUNCtion:FFT:WATerfall:SLICe ? Query returns 100.

:FUNCtion:FFT:POINts

- **Command format:**

:FUNCtion:FFT:POINts {8 K| 16 K| 32 K| 64 K}

:FUNCtion:FFT:POINts?

- **Functional description:**

This command is used to set FFT's point.

- **Return format:**

Query returns {8 K| 16 K| 32 K| 64 K}.

- **For example:**

:FUNCtion:FFT:POINts 8 K Set FFT's point to 8 K.

:FUNCtion:FFT:POINts? Return 8 K.

:FUNCtion:FFT:VTYPe

- **Command format:**

:FUNCtion:FFT:VTYPe {VRMS|DBRMS}

:FUNCtion:FFT:VTYPe?

- **Functional description:**

This command is used to select the unit of FFT vertical direction to dBRMS or VRMS. dBRMS represents power root mean square, VRMS represents voltage root mean square.

- **Return format:**

Query returns {VRMS|DBRMS}.

- **For example:**

:FUNCtion:SOUR1 CHAN1 Set channel 1 as the source.

:FUNC:FFT:VTYP VRMS Set the unit of FFT vertical direction to VRMS.

:FUNC:FFT:VTYP? Query returns VRMS.

:FUNCtion:FFT:FREQuency

- **Command format:**
  :FUNCtion:FFT:FREQuency?
- **Functional description:**
  This command is used to acquire the center freuquency of spectrum waveform after FFT.
- **Return format:**
  Query returns the center frequency of spectrum waveform, unit is Hz.
- **For example:**
  :FUNCtion:FFT:FREQuency? Query returns 1.000e003.

:FUNCtion:FFT:FREQuency:STARt

- **Command format:**
  :FUNCtion:FFT:FREQuency:STARt <freq>
  :FUNCtion:FFT:FREQuency:STARt?
- **Functional description:**
  This command is used to set the start frequency of FFT.
- **Return format:**
  Query returns 1.000e003, unit is Hz.
- **For example:**
  :FUNCtion:FFT:FREQuency:STARt 1 kHz Set the start frequency to 1 kHz.
  :FUNC:FFT:FREQ:STARt? Query returns 1.000e003.

:FUNCtion:FFT:FREQuency:END

- **Command format:**
  :FUNCtion:FFT:FREQuency:END <freq>
  :FUNCtion:FFT:FREQuency:END?
- **Functional description:**
  This command is used to set the end frequency of FFT.
- **Return format:**
  Query returns 1.000e003, unit is Hz.
- **For example:**
  :FUNCtion:FFT:FREQuency:END 1 kHz Set the end frequency of FFT 1 kHz.
  :FUNC:FFT:FREQ:END? Query returns 1.000e003.

:FUNCtion:FFT:FREQuency:CENTer

- **Command format:**
  :FUNCtion:FFT:FREQuency:CENTer <freq>
  :FUNCtion:FFT:FREQuency:CENTer?
- **Functional description:**
  This command is used to set the center frequency of FFT.
- **Return format:**
  Query returns 1.000e003, unit is Hz.

- **For example:**

  :FUNCtion:FFT:FREQuency:CENTer 1 kHz Set the center frequency to 1 kHz.

  :FUNC:FFT:FREQ:CENTer? Query returns 1.000e003.

:FUNCtion:FFT:FREQuency:BW

- **Command format:**

  :FUNCtion:FFT:FREQuency:BW <freq>

  :FUNCtion:FFT:FREQuency:BW?
- **Functional description:**

  This command is used to set the frequency bandwidth of FFT.
- **Return format:**

  Query returns 1.000e003, unit is Hz.
- **For example:**

  :FUNCtion:FFT:FREQuency:BW 1 kHz Set the frequency bandwidth to 1 kHz.

  :FUNC:FFT:FREQ:BW? Query returns 1.000e003.

:FUNCtion:FFT:FREQuency:TRACk

- **Command format:**

  :FUNCtion:FFT:FREQuency:TRACk {{1|ON}|{0|OFF}}

  :FUNCtion:FFT:FREQuency:TRACk?
- **Functional description:**

  This command is used to set the frequency track switch of FFT.
- **Return format:**

  Query returns the status of the frequency track switch. 0 represents track is enabled, 1 represents is track is disabled.
- **For example:**

  :FUNCtion:FFT:FREQuency:TRACk ON Turn on the frequency track switch.

  :FUNCtion:FFT:FREQuency:TRACk? Query returns 1.

:FUNCtion:FFT:DETEction:REALTime

- **Command format:**

  :FUNCtion:FFT:DETEction:REALTime {PPEAK|NPEAK| AVERage| SAMPle}

  :FUNCtion:FFT:DETEction:REALTime?
- **Functional description:**

  This command is used to set the detection mode of real-time spectrum.

  PPEAK: Take the maximum value within the range of each sampling point.

  NPEAK: Take the minimum value within the range of each sampling point.

  AVERage: Take the average value within the range of each sampling point.

  SAMPle: Take the value of first point within the range of each sampling point.
- **Return format:**

  Query returns the detection mode of real-time spectrum.
- **For example:**

  :FUNCtion:FFT:DETEction:REALTime PPEAK

Set the detection mode of real-time spectrum to +peak detection.

:FUNCtion:FFT:DETEction:REALTime? Query returns PPEAK.

:FUNCtion:FFT:DETEction:AVERage

- **Command format:**

  :FUNCtion:FFT:DETEction:AVERage {OFF|PPEAK|NPEAK| AVERage|SAMPle}

  :FUNCtion:FFT:DETEction:AVERage?

- **Functional description:**

  This command is used to set the detection mode of the average spectrum.

  OFF: turn off the average spectrum

  PPEAK: Take the maximum value within the range of each sampling point.

  NPEAK: Take the minimum value within the range of each sampling point..

  AVERage: Take the average value within the range of each sampling point.

  SAMPle: Take the value of first point within the range of each sampling point.

- **Return format:**

  Query returns the detection mode of the average spectrum.

- **For example:**

  :FUNCtion:FFT:DETEction:AVERage PPEAK

  Set the detection mode of the average spectrum to +peak detection.

  :FUNCtion:FFT:DETEction:AVERage? Query returns PPEAK.

:FUNCtion:FFT:DETEction:AVERage:COUNt

- **Command format:**

  :FUNCtion:FFT:DETEction:AVERage:COUNt <value>

  :FUNCtion:FFT:DETEction:AVERage:COUNt?

- **Functional description:**

  This command is used to set the average number of times of average spectrum, the range can set to 2~512.

- **Return format:**

  Query the average number of times of average spectrum.

- **For example:**

  :FUNCtion:FFT:DETEction:AVERage:COUNt 56

  Set the average number of times of average spectrum to 56.

  :FUNCtion:FFT:DETEction:AVERage:COUNt? Query returns 56.

:FUNCtion:FFT:DETEction:MAXHold

- **Command format:**

  :FUNCtion:FFT:DETEction:MAXHold {OFF|PPEAK|NPEAK|AVERage|SAMPle}

  :FUNCtion:FFT:DETEction:MAXHold?

- **Functional description:**

  This command is used to set the detection mode of the maximum hold spectrum.

  OFF: turn off the average spectrum

  PPEAK: Take the maximum value within the range of each sampling point.

  NPEAK: Take the minimum value within the range of each sampling point.

AVERage：Take the average value within the range of each sampling point.

SAMPle：Take the value of first point within the range of each sampling point.

- **Return format：**

Query returns the detection mode of the maximum hold spectrum.

- **For example：**

:FUNCtion:FFT:DETEction:MAXHold PPEAK

Set the detection mode of the maximum hold spectrum to +peak detection.

:FUNCtion:FFT:DETEction:MAXHold?

Query returns PPEAK.

:FUNCtion:FFT:DETEction:MINHold

- **Command format：**

:FUNCtion:FFT:DETEction:MINHold {OFF|PPEAK|NPEAK| AVERage|SAMPle}

:FUNCtion:FFT:DETEction:MINHold?

- **Functional description：**

This command is used to set the detection mode of the minimum hold spectrum.

OFF: Turn off the average spectrum

PPEAK：Take the minimum value within the range of each sampling point.

NPEAK：Take the minimum value within the range of each sampling point.

AVERage：Take the average value within the range of each sampling point.

SAMPle：Take the value of first point within the range of each sampling point.

- **Return format：**

Query returns the detection mode of the minimum hold spectrum.

- **For example：**

:FUNCtion:FFT:DETEction:MINHold PPEAK

Set the detection mode of spectrum to +peak detection.

:FUNCtion:FFT:DETEction:MINHold? Query returns PPEAK.

:FUNCtion:FFT:DETEction:RESet

- **Command format：**

:FUNCtion:FFT:DETEction:RESet

- **Functional description：**

This command is used to reset the average value, the maiximum and minimum hold spectrum.

- **For example：**

:FUNCtion:FFT:DETEction:RESet Reset each spectrum.

:FUNCtion:FFT:MARK:TYPE

- **Command format：**

:FUNCtion:FFT:MARK:TYPE {OFF|AUTO|THReshold| MANUal}

:FUNCtion:FFT:MARK:TYPE?

- **Functional description：**

This command is used to set mark type of the spectrum.

OFF：Turn off the spectrum marker.

AUTO: Auto spectrum marker.

THReshold： Threshold spectrum marker.

MANUal： Manual spectrum marker.

- **Return format：**

Query returns the current selected marker type of spectrum.

- **For example：**

:FUNCtion:FFT:MARK:TYPE AUTO Set marker type of the spectrum to AUTO.

:FUNCtion:FFT:MARK:TYPE? Query returns AUTO.

:FUNCtion:FFT:MARK:SOURce

- **Command format：**

:FUNCtion:FFT:MARK:SOURce {REALtime|AVERage|MAXHold|MINHold}

:FUNCtion:FFT:MARK:SOURce?

- **Functional description：**

This command is used to set mark source of the spectrum marker, this instruction is the common instruction.

REALtime： Mark the real-time spectrum.

AVERage： Mark the average spectrum.

MAXHold： Mark the maximum hold spectrum.

MINHold： Mark the minimum hold spectrum.

- **Return format：**

Query returns the current selected mark source.

- **For example：**

:FUNCtion:FFT:MARK:SOURce AVERage

Set mark source of the spectrum marker to average spectrum.

:FUNCtion:FFT:MARK:SOURce? Query returns AVERage.

:FUNCtion:FFT:MARK:POINts

- **Command format：**

:FUNCtion:FFT:MARK:POINts <value>

:FUNCtion:FFT:MARK:POINts ?

- **Functional description：**

Set mark point of of the spectrum marker.

<value>: the value of mark point, which can set the range to 1~50.

- **Return format：**

Query returns mark point of the spectrum marker.

- **For example：**

:FUNCtion:FFT:MARK:POINts 20 Set mark point of of the spectrum marker to 20.

:FUNCtion:FFT:MARK:POINts ? Query returns 20.

:FUNCtion:FFT:MARK:EVENt

- **Command format：**

:FUNCtion:FFT:MARK:EVENt {1|ON}|{0|OFF}
:FUNCtion:FFT:MARK:EVENt?

- **Functional description：**
  This command is used to turn on/off mark list of the spectrum marker.
- **Return format：**
  Query the status of mark list, 1 represents ON, 0 represents OFF.
- **For example：**
  :FUNCtion:FFT:MARK:EVENt ON Turn on mark list.
  :FUNCtion:FFT:MARK:EVENt? Query returns 1.

:FUNCtion:FFT:MARK:DATA?

OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO

- **Command format：**
  :FUNCtion:FFT:MARK:DATA?
- **Functional description：**
  This command is used to read the mark event list data in FFT of the oscilloscope.
- **Return format：**
  Query returns the mark event list data in FFT. Returned data is conform with Appendix 2：IEEE 488.2 binary data format.
- **For example：**
  :FUNCtion:FFT:MARK:DATA? Query returns
  #9000000089FFT,
  ID,Freq,Amp,
  1,1.000E+003,7.800E-001,
  2,2.000E+003,7.900E-001,
  3,3.000E+003,7.700E-001,
  4,4.000E+003,7.300E-001,
  5,5.000E+003,7.400E-001,
  FFT represents FFT mode, the event table data in CSV format followed behind. The specified format of the event table data is automatically adapted by different devices. The data are separated by commas and will automatically line wrap according to the decoding list.

:FUNCtion:FFT:MARK:THReshold:LEVel

- **Command format：**
  :FUNCtion:FFT:MARK:THReshold:LEVel <value>
  :FUNCtion:FFT:MARK:THReshold:LEVel?
- **Functional description：**
  This command is used to set threshold voltage value of threshold spectrum mark.
  <value>：Threshold voltage value, unit is V if vertical direction is Vrms; unit is dB if vertical direction is dBVrms; if the unit is not matched with the vertical unit, the setting is invalid.

- **Return format:**
  Query returns the threshold value of spectrum mark in scientific notation, unit is related to :FUNCtion:FFT:VTYPe.
- **For example:**
  :FUNCtion:FFT:MARK:THReshold:LEVel -12.5dB
  Set the threshold of spectrum mark to -12.5dB.
  :FUNCtion:FFT:MARK:THReshold:LEVel? Query returns -1.250e-001.
  :FUNCtion:FFT:MARK:THReshold:LEVel 0.15V.
  Set the threshold of spectrum mark to 0.15V.
  :FUNCtion:FFT:MARK:THReshold:LEVel? Query returns 1.500e-001.

:FUNCtion:FFT:MARK:MANUal:PEAK

- **Command format:**
  :FUNCtion:FFT:MARK:MANUal:PEAK
- **Functional description:**
  This command is used to move the marker to the maximum peak.
- **For example:**
  :FUNCtion:FFT:MARK:MANUal:PEAK Move the marker to the maximum peak.

:FUNCtion:FILTer:TYPE

- **Command format:**
  :FUNCtion:FILTer:TYPE {LP|HP|BP|BS}
  :FUNCtion:FILTer:TYPE?
- **Functional description:**
  This command is used to set the filter type. LP, HP, BP, BS respectively represents low-pass filter, high-pass filter, band-pass filter and band-limit filter.
- **Return format:**
  Query returns LP, HP, BP and BS.
- **For example:**
  :FUNCtion:SOUR1 CHAN1 Set channel 1 as the source.
  :FUNC:FILT:TYPE BP Set the filter type to band-pass filter.
  :FUNC:FILT:TYPE? Query returns BP.

:FUNCtion:FILTer:FREQuency:HIGH

- **Command format:**
  :FUNCtion:FILTer:FREQuency:HIGH < freq>
  :FUNCtion:FILTer:FREQuency:HIGH?
- **Functional description:**
  This command is used to set the upper limit cut-off frequency value of filter. It is suitable for high-pass filter, band-pass filter and band-limit filter.
- **Return format:**
  Query returns 1.000e003, unit is Hz.
- **For example:**

:FUNCtion:SOUR1 CHAN1 Set channel 1 as the source.

:FUNC:FILT:FREQ:HIGH 1 kHz

Set the upper limit cut-off frequnecy value to 1 kHz.

:FUNC:FILT:FREQ:HIGH? Query returns 1.000e003.

:FUNCtion:FILTer:FREQuency:LOW

- **Command format:**

  :FUNCtion:FILTer:FREQuency:LOW <freq>

  :FUNCtion:FILTer:FREQuency:LOW?
- **Functional description:**

  This command is used to set the low limit cut-off frequency value of filter. It is suitable for high-pass filter, band-pass filter and band-limit filter.
- **Return format:**

  Query returns 6.000e001, unit is Hz.
- **For example:**

  :FUNC:SOUR1 CHAN1 Set channel 1 as the source.

  :FUNC:FILT:FREQ:LOW 60 Hz

  Set the low limit cut-off frequnecy value to 60 Hz.

  :FUNC:FILT:FREQ:LOW? Query returns 6.000e001.

:FUNCtion:LOGic:INVert

- **Command format:**

  :FUNCtion:LOGic:INVert {{1|ON}|{0|OFF}}

  :FUNCtion:LOGic:INVert?
- **Functional description:**

  This command is used to turn on/off logic cinvert function.
- **Return format:**

  Query returns 1 or 0, it represents ON or OFF seperatly.
- **For example:**

  :FUNCtion:LOGic:INVert OFF Turn off logic invert function.

  :FUNCtion:LOGic:INVert?

  Query returns 0, it represents logic invert function is tured off

:FUNCtion:EXPRession

- **Command format:**

  :FUNCtion:EXPRession <expression>
- **Functional description:**

  Use free combination expression to peform mathematical calculation.

  Expression format refer to Advance option in MATH menu of the oscilloscope, <expression> is belong to ASCII character string parameter.
- **For example:**

  :FUNCtion:EXPRession "CH1*CH2"

It represents multiply channel 1 with channel 2.

MEASure Command

The command is for the basic measurement operation; all parameter measurement can get the test value without open measurement function; by default, it will turn on measurement and acquire the test value autommaticaally. In general, test result is urned in scientific notation.

:MEASure:ALL

- **Command format:**
  :MEASure:ALL {{1|ON}|{0|OFF}}
  :MEASure:ALL?
- **Functional description:**
  This command is used to turn on/off all measurement functions.
- **Return format:**
  Query returns whether all measurement functions is enabled.
- **For example:**

:MEASure:ALL ON	Turn on all measurement functions.
:MEASure:ALL?	Query returns 1.

:MEASure:CLEar

- **Command format:**
  :MEASure:CLEar
- **Functional description:**
  This command is used to clear all the current measured parameter values.
- **For example:**

:MEAS:CLE	Clear all the current measured parameter values.

:MEASure:SOURce

- **Command format:**
  :MEASure:SOURce <source>
  :MEASure:SOURce?
- **Functional description:**
  This command is used to select measuring source. <source> is CHANnel<n>, n take value from 1,2.
- **Return format:**
  Query returns {CHANnel1|CHANnel2|MATH}.
- **For example:**

:MEAS:SOUR CHAN1	Select channel 1 as measuring source.
:MEAS:SOUR?	Return CHANnel1.

:MEASure:SLAVe:SOURce

- **Command format:**
  :MEASure:SLAVe:SOURce <source>
  :MEASure:SLAVe:SOURce?
- **Functional description:**
  This command is used to select slave source. <source> is CHANnel<n>, n take value from 1, 2.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2 | MATH}.
- **For example:**
  :MEAS:SLAV:SOUR CHAN1 Select channel 1 as measuring source.
  :MEAS:SLAV:SOUR? Return CHANnel1.

:MEASure:PDUTy?

- **Command format:**
  :MEASure:PDUTy? [<source>]
- **Functional description:**
  This command is used to measure positive duty cycle of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 5.000e001, unit is %.

:MEASure:NDUTy?

- **Command format:**
  :MEASure:NDUTy? [<source>]
- **Functional description:**
  This command is used to measure negative duty cycle of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 5.000e001, unit is %.

:MEASure:PDELay?

- **Command format:**
  :MEASure:PDELay? [<source1>, <source2>]
- **Functional description:**
  This command is used to measure time delay of <source1> and <source2> with respect to rising edge. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns -1.000e-004, unit is s.

- **For example:**
  Measuring time delay with repect to rising edge.
  :MEASure:PDEL? CHAN1,CHAN2

:MEASure:NDELay?

- **Command format:**
  :MEASure:NDELay? [<source1>, <source2>]
- **Functional description:**
  This command is used to measure time delay of <source1> and <source2> with respect to falling edge. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns -1.000e-004, unit is s.
- **For example:**
  Measuring time delay with repect to rising edge.
  :MEASure:NDEL? CHAN1,CHAN2

:MEASure:PHASe?

- **Command format:**
  :MEASure:PHASe? [<source1>, <source2>]
- **Functional description:**
  This command is used to timing measure the amount of time of <source1> which exceeds or lags with respect to <source2>, expressed in degrees, with 360° as a period. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns 1.000e001, unit is degree.
- **For example:**
  Measuring the amount of time of <source1> which exceeds or lags with respect to <source2>.
  :MEASure:PHAS? CHAN1,CHAN2

:MEASure:VPP?

- **Command format:**
  :MEASure:VPP? [<source>]
- **Functional description:**
  This command is used to measure peak-to-peak value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 3.120e000, unit is V.

:MEASure:VMAX?

- **Command format:**
  :MEASure:VMAX? [<source>]
- **Functional description:**
  This command is used to measure the maximum value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 2.120e000, unit is V.

:MEASure:VMIN?

- **Command format:**
  :MEASure:VMIN?[<source>]
- **Functional description:**
  This command is used to measure the minimum value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns -2.120e000, unit is V.

:MEASure:VAMPlitude?

- **Command format:**
  :MEASure:VAMPlitude?[<source>]
- **Functional description:**
  This command is used to measure amplitude value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 3.120e000, unit is V.

:MEASure:VTOP?

- **Command format:**
  :MEASure:VTOP?[<source>]
- **Functional description:**
  This command is used to measure the top value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 3.120e000, unit is V.

:MEASure:VBASe?

- **Command format:**
  :MEASure:VBASe?[<source>]
- **Functional description:**
  This command is used to measure the bottom value of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns -3.120e000, unit is V.

:MEASure:VMIDdle?

- **Command format:**
  :MEASure:VMIDdle?[<source>]
- **Functional description:**
  This command is used to measure the middle value of the specified channel waveform. <source> take value

from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 0.120e000, unit is V.

:MEASure:VAVerage?

- **Command format:**

  :MEASure:VAVerage? [<interval>],[<source>]

- **Functional description:**

  This command is used to measure the average value of the specified channel waveform. <source> is the specified channel and take value from CHANnel1, CHANnel2. If there is no assigned <source>, then the current channel as the default; <interval> specifies the measuring interval, take value from CYCLe, DISPlay. CYCLe represents integer cycle, DISPlay represents full screen. If there is no assigned <interval>, then DISPlay as the default.

- **Return format:**

  Query returns 1.120e000, unit is V.

:MEASure:VRMS?

- **Command format:**

  :MEASure:VRMS? [<interval>],[<source>]

- **Functional description:**

  This command is used to measure the root mean sqaure value of the specified channel waveform. <source> is the specified channel and take value from CHANnel1, CHANnel2. If there is no assigned <source>, then the current channel as the default; <interval> specifies the measuring interval, take value from CYCLe, DISPlay. CYCLe represents integer cycle, DISPlay represents

  full screen. If there is no assigned <interval>, then DISPlay as the default.

- **Return format:**

  Query returns 1.230e000, unit is V.

:MEASure:AREa?

- **Command format:**

  :MEASure:AREa? [<interval>],[<source>]

- **Functional description:**

  This command is used to measure the area of the specified channel waveform. <source> is the specified channel and take value from CHANnel1, CHANnel2. If there is no assigned <source>, then the current channel as the default; <interval> specifies the measuring interval, take value from CYCLe, DISPlay. CYCLe represents integer cycle, DISPlay represents full screen. If there is no assigned <interval>, then DISPlay as the default.

- **Return format:**

  Query returns 3.456e002, unit is V.

:MEASure:OVERshoot?

- **Command format:**
  :MEASure:OVERshoot?[<source>]
- **Functional description:**
  This command is used to measure overshoot of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 1.230e002, unit is V.

:MEASure:PREShoot?

- **Command format:**
  :MEASure:PREShoot?[<source>]
- **Functional description:**
  This command is used to measure preshoot of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 1.230e-002, unit is V.

:MEASure:FREQuency?

- **Command format:**
  :MEASure:FREQuency?[<source>]
- **Functional description:**

  This command is used to measure frequency of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 2.000e003, unit is V.

:MEASure:RISetime?

- **Command format:**
  :MEASure:RISetime?[<source>]
- **Functional description:**
  This command is used to measure rising time of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 5.000e-005, unit is s.

:MEASure:FALLtime?

- **Command format:**
  :MEASure:FALLtime?[<source>]
- **Functional description:**

This command is used to measure falling time of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 5.000e-005, unit is s.

:MEASure:PERiod?

- **Command format:**

  :MEASure:PERiod? [<source>]

- **Functional description:**

  This command is used to measure period of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 5.000e-003, unit is s.

:MEASure:PWIDth?

- **Command format:**

  :MEASure:PWIDth? [<source>]

- **Functional description:**

  This command is used to measure positive pulse width of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 5.000e-003, unit is s.

:MEASure:NWIDth?

- **Command format:**

  :MEASure:NWIDth? [<source>]

- **Functional description:**

  This command is used to measure negative pulse width of the specified channel waveform. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 5.000e-003, unit is s.

:MEASure:PULSes?

- **Command format:**

  :MEASure:PULSes? [<source>]

- **Functional description:**

  This command is used to measure the number of positive pulse of the specified channel. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.

- **Return format:**

  Query returns 2.000e+000, it represents 2 pulses.

:MEASure:FRR?

- **Command format:**
  :MEASure:FRR? <source1>, <source2>
- **Functional description:**
  This command is used to measure the time between <source1> and the first rising edge of <source2>. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns 5.000e-003, unit is s.

:MEASure:FRF?

- **Command format:**
  :MEASure:FRF? <source1>, <source2>
- **Functional description:**
  This command is used to measure the time between the first rising edge of <source1> and the first falling edge of <source2>. <source> take value from CHANnel1, CHANnel2. Omitting represents the current channel.
- **Return format:**
  Query returns 5.000e-003, unit is s.

:MEASure:FFR?

- **Command format:**
  :MEASure:FFR? <source1>, <source2>
- **Functional description:**
  This command is used to measure the time between the first falling edge of <source1> and the first rising edge of <source2>. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns 5.000e-003, unit is s.

:MEASure:FFF?

- **Command format:**
  :MEASure:FFF? <source1>, <source2>
- **Functional description:**
  This command is used to measure the time between <source1> and the first falling edge of <source2>. <source> take value from CHANnel1, CHANnel2.
- **Return format:**
  Query returns 5.000e-003, unit is s.

:MEASure:LRR?

- **Command format:**
  :MEASure:LRR? <source1>, <source2>
- **Functional description:**

This command is used to measure the time between the first rising edge of <source1> and the last rising edge of <source2>. <source> take value from CHANnel1, CHANnel2.

- **Return format：**

  Query returns 5.000e-003, unit is s.

:MEASure:LRF?

- **Command format：**

  :MEASure:LRF? <source1>, <source2>

- **Functional description：**

  This command is used to measure the time between the first rising edge of <source1> and the last falling edge of <source2>. <source> take value from CHANnel1, CHANnel2.

- **Return format：**

  Query returns 5.000e-003, unit is s.

:MEASure:LFR?

- **Command format：**

  :MEASure:LFR? <source1>, <source2>

- **Functional description：**

  This command is used to measure the time between the first falling edge of <source1> and the last rising edge of <source2>. <source> take value from CHANnel1, CHANnel2.

- **Return format：**

  Query returns 5.000e-003, unit is s.

:MEASure:LFF?

- **Command format：**

  :MEASure:LFF? <source1>, <source2>

- **Functional description：**

  This command is used to measure the time between the first falling edge of <source1> and the last falling edge of <source2>. <source> take value from CHANnel1, CHANnel2.

- **Return format：**

  Query returns 5.000e-003, unit is s.

TRIGger Command

This command is used to control trigger sweep mode and trigger specifiedation. Trigger determines when the oscilloscope to start sampling data and display waveform.

Trigger Control

:TRIGger:MODE

- **Command format:**
  :TRIGger:MODE <mode>
  :TRIGger:MODE?
- **Functional description:**
  This command is used to set trigger mode and it can automatically suitable for trigger mode of different model.
  <mode> contains EDGE (edge trigger), PULSe (pulse width trigger), VIDeo (video trigger), SLOPe (slope trigger), RUNT (runt trigger), WINDow (over-amplitude trigger), DELay (delay trigger), TIMeout (timeout trigger) DURation (duration time trigger),SHOLd (setup hold trigger), NE (Nth edge trigger) and PATTern (pattern trigger).
- **Return format:**
  Query returns the trigger mode.
- **For example:**

:TRIGger:MODE NE	Set trigger mode to Nth edge trigger.
:TRIGger:MODE?	Query returns NE.

:TRIGger:FORCe

- **Command format:**
  :TRIGger:FORCe
- **Functional description:**
  This command is sutiable for the oscilloscope if there is no properly trigger condition. Executing this command to force to produce a trigger signal to generate input waveform and display it.
- **For example:**

:TRIG:FORC	Force trigger

:TRIGger:SWEep

- **Command format:**
  :TRIGger:SWEep {AUTO|NORMal|SINGle}
  :TRIGger:SWEep?

- **Functional description:**

This command is used to select trigger sweep mode.

AUTO: In no trigger condition, the internal will generate a trigger signal to force trigger.

NORMal: It will be generated only when the trigger condition is met.

SINGle: Generating single trigger when the trigger condition is met and then stop.

- **Return format:**

  Query returns trigger sweep mode {AUTO|NORMal|SINGle}.

- **For example:**

:TRIGger:SWEep AUTO	Set channel 1 as AUTO trigger mode.
:TRIGger:SWEep?	Query returns AUTO.

:TRIGger:LEVel:ASETup

- **Command format:**

  :TRIGger:LEVel:ASETup

- **Functional description:**

  This command is used to set tigger level at the vertical midpoint of signal amplitude.

- **For example:**

:TRIG:LEVel:ASETup	Set tigger level at the center.

:TRIGger:STATus?

- **Command format:**

  :TRIGger:STATus?

- **Functional description:**

  Query the current trigger status of the oscilloscope.

- **Return format:**

  Query returns STOP/ARMED/READY/TRIGED/AUTO/SCAN/RESET/REPLAY/WAIT.

- **For example:**

:TRIGger:STATus?	Query returns AUTO.

:TRIGger:LEVel

- **Command format:**

  :TRIGger:LEVel <level>

  :TRIGger:LEVel?

- **Functional description:**

  This command is used to set trigger level value of normal trigger mode. Nuerical value of <level> must be set after the conversion according to the amplitude volts/div scale and screen information.

- **Return format:**

  Query returns the <level> setting value, unit is V.

- **For example:**

:TRIG:LEV 2	Set trigger level of the trigger to 2 V.
:TRIG:LEV?	Query returns 2.000e000.

:TRIGger:LEVel:LOW

- **Command format:**
  :TRIGger:LEVel:LOW <level>
  :TRIGger:LEVel:LOW?
- **Functional description:**
  This command is used to set low level value of slop trigger. Nuerical value of <level> must be set after the conversion according to the amplitude volts/div scale and screen information.
- **Return format:**
  Query returns the <level> setting value, unit is V.
- **For example:**

:TRIG:LEV:LOW 2	Set trigger level of the trigger to 2 V.
:TRIG:LEV:LOW?	Query returns 2.000e000.

:TRIGger:LEVel:HIGH

- **Command format:**
  :TRIGger:LEVel:HIGH <level>
  :TRIGger:LEVel:HIGH?
- **Functional description:**
  This command is used to set high level value of slop trigger. Nuerical value of <level> must be set after the conversion according to the amplitude volts/div scale and screen information.
- **Return format:**
  Query returns the <level> setting value, unit is V.
- **For example:**

:TRIG:LEV:HIGH 2	Set trigger level of the trigger to 2 V.
:TRIG:LEV:HIGH?	Query returns 2.000e000.

:TRIGger:SOURce

- **Command format:**
  :TRIGger:SOURce <source>
  :TRIGger:SOURce?
- **Functional description:**

  This command is used to set signle trigger source, input channel (CHANnel1, CHANnel 2), external trigger (EXT), AC Line (main electricity). EDGE/ PULSe only support AC Line and EXT source. VIDeo only support EXT source.
  <source> represents trigger source, take value from as follows,
  CHANnel<n>|EXT |ACLINE, <n> take value from 1, 2.
- **Return format:**
  Query returns trigger source { CHANnel1|CHANnel2|EXT|ACLINE}.
- **For example:**

:TRIGger:SOUR CHAN1	Set channel 1 as edge trigger.
:TRIGger:SOUR?	Query returns CHANnel1.

:TRIGger:COUPling

- **Command format:**
  :TRIGger:COUPling {DC|AC|LF|HF|NOISE}
  :TRIGger:COUPling?
- **Functional description:**
  This command is used to set coupling mode, DC (direct current), AC (alternating current), LF (low frequency reject), HF (high frequency reject), NOISE (noise reject). Only VIDeo is not support.
- **Return format:**
  Query returns coupling mode {DC|AC|LF|HF|NOISE}.
- **For example:**

:TRIGger:COUPling AC	Set edge trigger as AC.
:TRIGger:COUPling?	Query returns AC.

Edge Trigger

:TRIGger:EDGE:SLOPe

- **Command format:**
  :TRIGger:EDGE:SLOPe {POSitive|NEGative|ALTernation}
  :TRIGger:EDGE:SLOPe?
- **Functional description:**
  This command is used to set edge trigger type, which is POSitive (rising edge), NEGative (falling edge) and ALTernation (rising/falling edge).
- **Return format:**
  Query returns edge type of trigger source {POSitive | NEGative | ALTernation}.
- **For example:**

:TRIGger:EDGE:SLOP POS	Set trigger edge to rising edge.
:TRIGger:EDGE:SLOP?	Query returns POSitive.

Pulse Width Trigger

:TRIGger:PULSe:QUALifier

- **Command format:**
  :TRIGger:PULSe:QUALifier {GREaterthan | LESSthan | INRange}
  :TRIGger:PULSe:QUALifier?
- **Functional description:**

This command is used to set the setting condition of pulse time, which is GREaterthan (greater than), LESSthan (less than), EQUal (equal to) and INRange (between).

- **Return format:**

  Query returns {GREaterthan | LESSthan | EQUal| INRange}.

- **For example:**

:TRIGger:PULSe:QUALifier GRE	Set pulse condition to GREaterthan.
:TRIGger:PULSe:QUALifier?	Query returns GREaterthan.

:TRIGger:PULSe:POLarity

- **Command format:**

  :TRIGger:PULSe:POLarity {POSitive | NEGative}

  :TRIGger:PULSe:POLarity?

- **Functional description:**

  This command is used to set pulse polarity, which is POSitive and NEGative.

- **Return format:**

  Query returns { POSitive | NEGative }.

- **For example:**

:TRIGger:PULSe:POL POS	Set pulse polarity to POSitive.
:TRIGger:PULSe:POL?	Query returns POSitive.

:TRIGger:PULSe:TIME:UPPer

- **Command format:**

  :TRIGger:PULSe:TIME:UPPer <time>

  :TRIGger:PULSe:TIME:UPPer?

- **Functional description:**

  This command is used to set the upper time limit of pulse trigger.

- **Return format:**

  Query returns the current time interval, unit is s.

- **For example:**

:TRIGger:PULSe:TIME:UPPer 1	Set the upper time limit of pulse trigger to 1s.
:TRIGger:PULSe:TIME:UPPer?	Query returns 1.000e000.

:TRIGger:PULSe:TIME:LOWer

- **Command format:**

  :TRIGger:PULSe:TIME:LOWer <time>

  :TRIGger:PULSe:TIME:LOWer?

- **Functional description:**

  This command is used to set the low time limit of pulse trigger.

- **Return format:**

Query returns the current time interval, unit is s.

- **For example:**

:TRIGger:PULSe:TIME:LOWer 1 Set the low time limit of pulse trigger to 1s.

:TRIGger:PULSe:TIME:LOWer? Query returns 1.000e000.

Video Trigger

:TRIGger:VIDeo:MODE

- **Command format:**

:TRIGger:VIDeo:MODE { ODD | EVEN | LINE| ALINes}

:TRIGger:VIDeo:MODE?

- **Functional description:**

This command is used to set synchronization mode of video trigger, which includes ODD, EVEN, LINE (specified line), ALINes (all lines).

- **Return format:**

Query returns { ODD | EVEN | LINE| ALIN}.

- **For example:**

:TRIGger:VIDeo:MODE ODD Set synchronization mode of video trigger to ODD.

:TRIGger:VIDeo:MODE? Query returns ODD.

:TRIGger:VIDeo:STANdard

- **Command format:**

:TRIGger:VIDeo:STANdard { NTSC | PAL | SECAM }

:TRIGger:VIDeo:STANdard?

- **Functional description:**

This command is used to set video standard.

- **Return format:**

Query returns { NTSC | PAL | SECAM }.

- **For example:**

:TRIGger:VIDeo:STANdard NTSC Set video standard to NTSC.

:TRIGger:VIDeo:STANdard? Query returns NTSC.

:TRIGger:VIDEO:LINE

- **Command format:**

:TRIGger:VIDEO:LINE <value>

:TRIGger:VIDEO:LINE?

- **Functional description:**

This command is used to set the assigned line. <value> represents the assigned line, range is relative to video standard.

- **Return format:**

Query returns the current assigned line.

- **For example:**

  :TRIG:VIDEO:LINE 50 Set the assigned line of video synchronization to 50.

  :TRIG:VIDEO:LINE? Query returns 50.

Slope Trigger

:TRIGger:SLOPe:QUALifier

- **Command format:**

  :TRIGger:SLOPe:QUALifier {GREaterthan | LESSthan | INRange}

  :TRIGger:SLOPe:QUALifier?
- **Functional description:**

  This command is used to set the setting condition of slop time, which includes GREaterthan (greater than), LESSthan (less than) and INRange (between).
- **Return format:**

  Query returns {GREaterthan | LESSthan | INRange}.
- **For example:**

  :TRIGger:SLOPe:QUALifier GRE Set slop condition to GREaterthan.

  :TRIGger:SLOPe:QUALifier? Query returns GREaterthan.

:TRIGger:SLOPe:SLOPe

- **Command format:**

  :TRIGger:SLOPe:SLOPe {POSitive|NEGative}

  :TRIGger:SLOPe:SLOPe?
- **Functional description:**

  This command is used to set slop trigger type, which includes POSitive (rising) and NEGative (falling).
- **Return format:**

  Query returns {POSitive|NEGative}.
- **For example:**

  :TRIGger:SLOPe:SLOPe POS Set slop trigger as POSitive.

  :TRIGger:SLOPe:SLOPe? Query returns POSitive.

:TRIGger:SLOPe:TIME:UPPer

- **Command format:**

  :TRIGger:SLOPe:TIME:UPPer <time>

  :TRIGger:SLOPe:TIME:UPPer?
- **Functional description:**

  This command is used to set the upper time limit of slope trigger.
- **Return format:**

Query returns the current time interval, unit is s.

- **For example:**

:TRIGger:SLOPe:TIME:UPPer 1 Set the upper time limit of slope trigger to 1s.
:TRIGger:SLOPe:TIME:UPPer? Query returns 1.000e000.

:TRIGger:SLOPe:TIME:LOWer

- **Command format:**

:TRIGger:SLOPe:TIME:LOWer <time>
:TRIGger:SLOPe:TIME:LOWer?

- **Functional description:**

This command is used to set the low time limit of slope trigger.

- **Return format:**

Query returns the current time interval, unit is s.

- **For example:**

:TRIGger:SLOPe:TIME:LOWer 1 Set the low time limit of slope trigger to 1s.
:TRIGger:SLOPe:TIME:LOWer? Query returns 1.000e000.

:TRIGger:SLOPe:THReshold

- **Command format:**

:TRIGger:SLOPe:THReshold {LOW|HIGH|LH}
:TRIGger:SLOPe:THReshold?

- **Functional description:**

This command is used to set threshold mode of slop trigger.

- **Return format:**

Query returns {LOW|HIGH|LH}.

- **For example:**

:TRIGger:SLOPe:THR HIGH Set slope trigger threshold to HIGH.
:TRIGger:SLOPe:THR? Query returns HIGH.

:TRIGger:SLOPe:RATe:LOWer?

- **Command format:**

:TRIGger:SLOPe:RATe:LOWer?

- **Functional description:**

Set the lower limit of the current slop trigger.

- **Return format:**

Query returns the low limit of slope trigger in scientific notation.

- **For example:**

:TRIGger:SLOPe:RATe:LOWer? Query returns 3.210E+000.

:TRIGger:SLOPe:RATe:UPPer?

- **Command format:**
  :TRIGger:SLOPe:RATe:UPPer?
- **Functional description:**
  Query Set the uuper limit of the current slop trigger.
- **Return format:**
  Query returns the upper limit of slope trigger in scientific notation.
- **For example:**
  :TRIGger:SLOPe:RATe:UPPer? Query returns 3.210E+000.

Runt Trigger

:TRIGger:RUNT:QUALifier

- **Command format:**
  :TRIGger:RUNT:QUALifier {GREaterthan | LESSthan | INRange | NONE}
  :TRIGger:RUNT:QUALifier?
- **Functional description:**
  This command is used to set the setting condition of runt level time, which includes GREaterthan (greater than), LESSthan (less than), INRange (within the range) and NONE (random).
- **Return format:**
  Query returns {GREaterthan | LESSthan | EQUal | NONE}.
- **For example:**
  :TRIGger:RUNT:QUALifier GRE Set trigger condition to GREaterthan.
  :TRIGger:RUNT:QUALifier? Query returns GREaterthan.

:TRIGger:RUNT:POLarity

- **Command format:**
  :TRIGger:RUNT:POLarity {POSitive | NEGative}
  :TRIGger:RUNT:POLarity?
- **Functional description:**
  This command is used to set the pulse polarity of runt level, which includes POSitive (positive pulse width) and NEGative (negative pulse width).
- **Return format:**
  Query returns {POSitive | NEGative}.
- **For example:**
  :TRIGger:RUNT:POL POS Set the pulse polarity to POSitive.
  :TRIGger:RUNT:POL? Query returns POSitive.

:TRIGger:RUNT:LEVel

- **Command format:**
  :TRIGger:RUNT:LEVel {LOW | HIGH}
  :TRIGger:RUNT:LEVel?
- **Functional description:**
  This command is used to set trigger level mode of runt trigger.
- **Return format:**
  Query returns {LOW | HIGH}.

- **For example:**
  :TRIGger:RUNT:LEV HIGH Set runt level to HIGH.
  :TRIGger:RUNT:LEV? Query returns HIGH.

:TRIGger:RUNT:TIME:UPPer

- **Command format:**
  :TRIGger:RUNT:TIME:UPPer <time>
  :TRIGger:RUNT:TIME:UPPer?
- **Functional description:**
  This command is used to set the upper time limit of runt level trigger.
- **Return format:**
  Query returns the current upper time limit, unit is s.
- **For example:**
  :TRIGger:RUNT:TIME:UPPer 1
  Set the upper time limit of runt level trigger to 1s.
  :TRIGger:RUNT:TIME:UPPer? Query returns 1.000e000.

:TRIGger:RUNT:TIME:LOWer

- **Command format:**
  :TRIGger:RUNT:TIME:LOWer <time>
  :TRIGger:RUNT:TIME:LOWer?
- **Functional description:**
  This command is used to set the lower time limit of runt level trigger.
- **Return format:**
  Query returns the current low time limit, unit is s.
- **For example:**
  :TRIGger:RUNT:TIME:LOWer 1 Set the lower time limit of runt level trigger to 1s.
  :TRIGger:RUNT:TIME:LOWer? Query returns 1.000e000.

Over-amplitude Trigger

:TRIGger:WINDow:SLOPe

- **Command format:**
  :TRIGger:WINDow:SLOPe {POSitive|NEGative|ALTernation}
  :TRIGger:WINDow:SLOPe?
- **Functional description:**
  This command is used to set edge type of trigger source, which is POSitive (rising edge), NEGative (falling edge) and ALTernation (rising/falling edge).
- **Return format:**
  Query returns edge type of trigger souece {POSitive|NEGative|ALTernation}.
- **For example:**

:TRIGger:WINDow:SLOP POS	Set window trigger to rising edge.
:TRIGger:WINDow:SLOP?	Query returns POS.

:TRIGger:WINDow:LEVel

- **Command format:**
  :TRIGger:WINDow:LEVel {LOW | HIGH}
  :TRIGger:WINDow:LEVel?
- **Functional description:**
  This command is used to set level mode of window trigger.
- **Return format:**
  Query returns {LOW | HIGH}.
- **For example:**

:TRIGger:WINDow:LEV HIGH	Set window trigger to HIGH.
:TRIGger:WINDow:LEV?	Query returns HIGH.

:TRIGger:WINDow:TIME.

- **Command format:**
  :TRIGger:WINDow:TIME <time>
  :TRIGger:WINDow:TIME?
- **Functional description:**
  This command is used to set time interval of window trigger.
- **Return format:**
  Query returns the current time interval, unit is s.
- **For example:**

:TRIGger:WINDow:TIME 1	Set time interval of window trigger to 1s.
:TRIGger:WINDow:TIME?	Query returns 1.000e000.

:TRIGger:WINDow:POSition

- **Command format:**
  :TRIGger:WINDow:POSition {ENTER|EXIT|TIME}
  :TRIGger:WINDow:POSition?
- **Functional description:**
  This command is used to set window trigger position.
- **Return format:**
  Query returns {ENTER|EXIT|TIME}.
- **For example:**
  :TRIGger:WINDow:POS TIME Set window trigger position to TIME.
  :TRIGger:WINDow:POS? Query returns TIME.

Delay Trigger

:TRIGger:DELay:ARM:SOURce

- **Command format:**
  :TRIGger:DELay:ARM:SOURce {CHANnel1 | CHANnel2 }
  :TRIGger:DELay:ARM:SOURce?
- **Functional description:**
  This command is used to set focus source of delay trigger.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2 }.
- **For example:**
  :TRIGger:DELay:ARM:SOUR CHAN1 Set channel 1 as focus source.
  :TRIGger:DELay:ARM:SOUR? Query returns CHANnel1.

:TRIGger:DELay:ARM:SLOPe

- **Command format:**
  :TRIGger:DELay:ARM:SLOPe {NEGative | POSitive}
  :TRIGger:DELay:ARM:SLOPe?
- **Functional description:**
  This command is used to set edge type of trigger source, which includes POSitive (rising edge) and NEGative (falling edge).
- **Return format:**
  Query returns {NEGative | POSitive}.
- **For example:**
  :TRIGger:DELay:ARM:SLOPe NEG Set edge type of trigger source to NEGative.
  :TRIGger:DELay:ARM:SLOPe? Query returns NEGative.

:TRIGger:DELay:TRIGger:SOURce

- **Command format:**
  :TRIGger:DELay:TRIGger:SOURce {CHANnel1 | CHANnel2 }
  :TRIGger:DELay:TRIGger:SOURce?
- **Functional description:**
  This command is used to set trigger source of delay trigger.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2 }.
- **For example:**

  :TRIGger:DELay:TRIGger:SOUR CHAN1 Set channel 1 as trigger source.
  :TRIGger:DELay:TRIGger:SOUR? Query returns CHANnel1.

:TRIGger:DELay:TRIGger:SLOPe

- **Command format:**
  :TRIGger:DELay:TRIGger:SLOPe {NEGative | POSitive}
  :TRIGger:DELay:TRIGger:SLOPe?
- **Functional description:**
  This command is used to set edge type of trigger source, which includes POSitive (rising edge) and NEGative (falling edge).
- **Return format:**
  Query returns {NEGative | POSitive}.
- **For example:**
  :TRIGger:DELay:TRIGger:SLOPe NEG Set edge type of trigger source to NEGative.
  :TRIGger:DELay:TRIGger:SLOPe? Query returns NEGative.

:TRIGger:DELay:QUALifier

- **Command format:**
  :TRIGger:DELay:QUALifier { GREaterthan | LESSthan | INRange | OUTRange }
  :TRIGger:DELay:QUALifier?
- **Functional description:**
  This command is used to set time interval condition of delay trigger, which includes GREaterthan (greater than), LESSthan (less than), INRange (within in the range) and OUTRange (out of the range).
- **Return format:**
  Query returns { GREaterthan | LESSthan | INRange | OUTRange }.
- **For example:**
  :TRIGger:DELay:QUALifier GRE Set slope condition to GREaterthan.
  :TRIGger:DELay:QUALifier? Query returns GREaterthan.

:TRIGger:DELay:TIME:UPPer

- **Command format:**
  :TRIGger:DELay:TIME:UPPer <time>
  :TRIGger:DELay:TIME:UPPer?
- **Functional description:**
  This command is used to set the upper time limit of delay trigger.
- **Return format:**

  Query returns the current upper time limit, unit is s.
- **For example:**

:TRIGger:DELay:TIME:UPPer 1	Set the upper time limit of trigger delay to 1s.
:TRIGger:DELay:TIME:UPPer?	Query returns 1.000e000.

:TRIGger:DELay:TIME:LOWer

- **Command format:**
  :TRIGger:DELay:TIME:LOWer <time>
  :TRIGger:DELay:TIME:LOWer?
- **Functional description:**
  This command is used to set the lower time limit of delay trigger.
- **Return format:**
  Query returns the current lower time limit, unit is s.
- **For example:**

:TRIGger:DELay:TIME:LOWer 1	Set the lower time limit of delay trigger to 1s.
:TRIGger:DELay:TIME:LOWer?	Query returns 1.000e000.

:TRIGger:DELay:SELect

- **Command format:**
  :TRIGger:DELay:SELect <SOURce<n>>
  :TRIGger:DELay:SELect
- **Functional description:**
  This command is used to switch the selected source. SOURce<n> represents source, n take value from 1, 2. SOURce1 represents focus source; SOURce2 represents trigger source.
- **Return format:**
  Query returns { SOURce1 | SOURce2 }.
- **For example:**

:TRIGger:DELay:SELect SOURce1	Set to select the foucs trigger.
:TRIGger:DELay:SELect?	Query returns SOURce1.

Timeout Trigger

:TRIGger:TIMEOUT:TIME

- **Command format:**
  :TRIGger:TIMEOUT:TIME <time>
  :TRIGger:TIMEOUT:TIME?
- **Functional description:**
  This command is used to set time interval of timeout tigger.
- **Return format:**
  Query returns the current time interval, unit is s.
- **For example:**

:TRIGger:TIMEOUT:TIME 1	Set time interval of timeout tigger to 1s.
:TRIGger:TIMEOUT:TIME?	Query returns 1.000e000.

:TRIGger:TIMEOUT:SLOPe

- **Command format:**
  :TRIGger:TIMEOUT:SLOPe {POSitive|NEGative|ALTernation}
  :TRIGger:TIMEOUT:SLOPe?
- **Functional description:**
  This command is used to set edge type of trigger souece, which includes POSitive (rising edge), NEGative (falling edge) and ALTernation (rising/falling edge).
- **Return format:**
  Query returns edge type of trigger souece {POSitive|NEGative|ALTernation}.
- **For example:**

:TRIGger:TIMEOUT:SLOP POS	Set edge trigger to POSitive.
:TRIGger:TIMEOUT:SLOP?	Query returns POSitive.

Duration Trigger

:TRIGger:DURation:MODE

- **Command format:**
  :TRIGger:DURation:MODE { NORMAL | UPPER | LOW }
  :TRIGger:DURation:MODE?
- **Functional description:**
  This command is used to set time mode of duration trigger.
- **Return format:**
  Query returns { NORMAL | UPPER | LOW }.
- **For example:**

:TRIGger:DURation:MODE UPPER Set duration trigger mode to UPPER.
:TRIGger:DURation:MODE? Query returns UPPER.

:TRIGger:DURation:PATTern

- **Command format:**
  :TRIGger:DURation:PATTern { HIGH | LOW | X }
  :TRIGger:DURation:PATTern?
- **Functional description:**
  This command is used to set pattern of duration trigger, which is HIGH (pattern value is 1), LOW (pattern value is 0) and X (channel is invalid).
- **Return format:**
  Query returns { HIGH | LOW | X }.
- **For example:**
  :TRIGger:DURation:PATTern HIGH Set pattern of duration trigger to 1.
  :TRIGger:DURation:PATTern? Query returns HIGH.

:TRIGger:DURation:QUALifier

- **Command format:**
  :TRIGger:DURation:QUALifier { GREaterthan | LESSthan | INRange }
  :TRIGger:DURation:QUALifier?
- **Functional description:**
  This command is used to set time interval condition, which includes GREaterthan (greater than), LESSthan (less than) and INRange (within the range).
- **Return format:**
  Query returns { GREaterthan | LESSthan | INRange }.

- **For example:**
  :TRIGger:DURation:QUALifier GRE Set slope condition to GREaterthan.
  :TRIGger:DURation:QUALifier? Query returns GREaterthan.

:TRIGger:DURation:TIME:LOWer

- **Command format:**
  :TRIGger:DURation:TIME:LOWer <time>
  :TRIGger:DURation:TIME:LOWer?
- **Functional description:**
  This command is used to set the lower time limit of duration trigger. It can be set when time interval condition is GREaterthan.
- **Return format:**
  Query returns the current time limit, unit is s.
- **For example:**

:TRIGger:DURation:TIME:LOWer 1 Set the lower time limit of duration trigger to 1s.
:TRIGger:DURation:TIME:LOWer? Query returns 1.000e000.

:TRIGger:DURation:TIME:UPPer

- **Command format:**
  :TRIGger:DURation:TIME:UPPer <time>
  :TRIGger:DURation:TIME:UPPer?
- **Functional description:**
  This command is used to set the upper time limit of duration trigger. It can be set when time interval condition is LESSthan (less than).
- **Return format:**
  Query returns the current upper time limit, unit is s.
- **For example:**
  :TRIGger:DURation:TIME:UPPer 1 Set the upper time limit of duration trigger to 1s.
  :TRIGger:DURation:TIME:UPPer? Query returns 1.000e000.

Setup Hold Trigger

:TRIGger:SHOLd:DATA:SOURce

- **Command format:**
  :TRIGger:SHOLd:DATA:SOURce {CHANnel1 | CHANnel2 }
  :TRIGger:SHOLd:DATA:SOURce?
- **Functional description:**
  This command is used to set data source of setup hold trigger.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2 }.
- **For example:**
  :TRIGger:SHOLd:DATA:SOUR CHAN1 Set channel 1 as data source.
  :TRIGger:SHOLd:DATA:SOUR? Query returns CHANnel1.

:TRIGger:SHOLd:CLOCK:SOURce

- **Command format:**
  :TRIGger:SHOLd:CLOCK:SOURce {CHANnel1 | CHANnel2 }
  :TRIGger:SHOLd:CLOCK:SOURce?
- **Functional description:**
  This command is used to set clock source of setup hold trigger.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2 }.
- **For example:**

:TRIGger:SHOLd:CLOCK:SOUR CHAN1 Set channel 1 as clock source.
:TRIGger:SHOLd:CLOCK:SOUR? Query returns CHANnel1.

:TRIGger:SHOLd:SLOPe

- **Command format:**
  :TRIGger:SHOLd:SLOPe {POSitive|NEGative}
  :TRIGger:SHOLd:SLOPe?
- **Functional description:**
  This command is used to set edge type of setup hold trigger, which includes POSitive (rising edge) and NEGative (falling edge).
- **Return format:**
  Query returns {POSitive|NEGative}.
- **For example:**

:TRIGger:SHOLd:SLOPe POS Set setup hold trigger to POSitive.
:TRIGger:SHOLd:SLOPe? Query returns POSitive.

:TRIGger:SHOLd:PATTern

- **Command format:**
  :TRIGger:SHOLd:PATTern { HIGH | LOW }
  :TRIGger:SHOLd:PATTern?
- **Functional description:**
  This command is used to set pattern of setup hold trigger, which includes HIGH (pattern value is 1) and LOW (pattern value is 0).
- **Return format:**
  Query returns { HIGH | LOW }.
- **For example:**
  :TRIGger:SHOLd:PATTern HIGH Set pattern of setup hold trigger to 1.
  :TRIGger:SHOLd:PATTern? Query returns HIGH.

:TRIGger:SHOLd:MODE

- **Command format:**
  :TRIGger:SHOLd:MODE { SETup | HOLD }
  :TRIGger:SHOLd:MODE?
- **Functional description:**
  This command is used to set time mode of setup hold trigger, which includes SETup, HOLD.
- **Return format:**
  Query returns { SETup | HOLD }.
- **For example:**
  :TRIGger:SHOLd:MODE HOLD Set time mode to HOLD.

:TRIGger:SHOLd:MODE? Query returns HOLD.

:TRIGger:SHOLd:TIME

- **Command format:**
  :TRIGger:SHOLd:TIME <time>
  :TRIGger:SHOLd:TIME?
- **Functional description:**
  This command is used to set time interval of setup hold trigger.
- **Return format:**
  Query returns the current time interval, unit is s.
- **For example:**
  :TRIGger:SHOLd:TIME 1 Set time interval of setup hold trigger to 1s.
  :TRIGger:SHOLd:TIME? Query returns 1.000e000.

:TRIGger:SHOLd:SELect

- **Command format:**
  :TRIGger:SHOLd:SELect <SOURce<n>>
  :TRIGger:SHOLd:SELect
- **Functional description:**
  This command is used to switch the selected source. SOURce<n> represents source, n take value from 1, 2. SOURce1 represents data source; SOURce2 represents clock source.
- **Return format:**
  Query returns { SOURce1 | SOURce2 }.
- **For example:**
  :TRIGger:SHOLd:SELect SOURce1 Set the selected focus source.
  :TRIGger:SHOLd:SELect? Query returns SOURce1.

Nth edge Trigger

:TRIGger:NEDGE:SLOPe

- **Command format:**
  :TRIGger:NEDGE:SLOPe {POSitive|NEGative }
  :TRIGger:NEDGE:SLOPe?
- **Functional description:**
  This command is used to set edge type of the trigger, which includes POSitive (rising edge) and NEGative (falling edge).
- **Return format:**
  Query returns edge type of the trigger {POSitive|NEGative}.
- **For example:**
  :TRIGger:NEDGE:SLOP POS Set edge trigger to POSitive.

:TRIGger:NEDGE:SLOP? Query returns POSitive.

:TRIGger:NEDGE:TIME

- **Command format:**
  :TRIGger:NEDGE:TIME <time>
  :TRIGger:NEDGE:TIME?
- **Functional description:**
  This command is used to set time interval of Nth edge trigger.
- **Return format:**
  Query returns the current time interval, unit is s.
- **For example:**
  :TRIGger:NEDGE:TIME 1 Set time interval of Nth edge trigger to 1s.
  :TRIGger:NEDGE:TIME? Query returns 1.000e000.

:TRIGger:NEDGE:VALue

- **Command format:**
  :TRIGger:NEDGE:VALue <value>
  :TRIGger:NEDGE:VALue?
- **Functional description:**
  This command is used to set Nth edge value, <value> is integer value and the range can set to 0~65535.
- **Return format:**
  Query returns the current Nth edge value.
- **For example:**
  :TRIGger:NEDGE:VALue 100 Set Nth edge value to 100.
  :TRIGger:NEDGE:VALue? Query returns 100.

Pattern Trigger

:TRIGger:PATTern:PATTern

- **Command format:**
  :TRIGger:PATTern:PATTern { HIGH | LOW | X | POSitive | NEGative }
  :TRIGger:PATTern:PATTern?
- **Functional description:**
  This command is used to set pattern trigger, which includes HIGH (pattern value is 1), LOW (pattern value is 0) , X (channel is invalid), POSitive (rising edge), NEGative (falling edge).
- **Return format:**
  Query returns { HIGH | LOW | X | POSitive | NEGative }.
- **For example:**
  :TRIGger:PATTern:PATTern HIGH Set patter trigger to 1.
  :TRIGger:PATTern:PATTern? Query returns HIGH.

CURSor Command

This command is uset to set cursor parameter to measure the waveform data on the screen.

:CURSor:MODE

- **Command format:**
  :CURSor:MODE { TRACK | INDependent }
  :CURSor:MODE?
- **Functional description:**
  This command is used to set cursor mode, which includes TRACK, INDependent.
- **Return format:**
  Query returns { TRACK | INDependent }.
- **For example:**
  :CURSor:MODE TRACK Set cursor mode to TRACK.
  :CURSor:MODE? Query returns TRACK.

:CURSor:TYPE

- **Command format:**
  :CURSor:TYPE {AMPlitude | TIME | CLOSe }
  :CURSor:TYPE?
- **Functional description:**
  This command is used to set cursor type of cursor mode, which includes AMPlitude, TIME, CLOSe.
- **Return format:**
  Query returns {AMPlitude | TIME | CLOSe }.
- **For example:**
  :CURSor:TYPE AMP Set cursor type to AMPlitude.
  :CURSor:TYPE? Query returns AMPlitude.

:CURSor:SOURce

- **Command format:**
  :CURSor:SOURce <source>
  :CURSor:SOURce?
- **Functional description:**
  This command is used to set cursor source of manual cursor mode.
  <source> take value from {CHANnel<n>|MATH}，n take value from 1, 2.
- **Return format:**
  Query returns { CHANnel1 | CHANnel2 | MATH }.
- **For example:**
  :CURSor:SOURce CHAN1 Set channel 1 as cursor source.

:CURSor:SOURce?	Query returns CHANnel1.

:CURSor:CURA

- **Command format:**

  :CURSor:CURA <value>

  :CURSor:CURA?
- **Functional description:**

  This command is use to set horizontal or vertical position of cursor line A, it's related to instruction CURSor:TYPE. Amplitude represents vertical position, time represents horizontal position. Vertical line range form left to right [0,699], and horizontal line range from up to down [28,227].
- **Return format:**

  Query returns cursor line A position.
- **For example:**

:CURSor:CURA 50	Set manual cursor line A position to 50.
:CURSor:CURA?	Query returns 50.

:CURSor:CURB

- **Command format:**

  :CURSor:CURB <value>

  :CURSor:CURB?
- **Functional description:**

  This command is use to set horizontal or vertical position of cursor line B. Vertical line range form left to right [0,699], and horizontal line range from up to down [28,227]. It's related to instruction CURSor:TYPE.
- **Return format:**

  Query returns cursor line B position.
- **For example:**

:CURSor:CURB 50	Set manual cursor line B position to 50.
:CURSor:CURB?	Query returns 50.

:CURSor:AXValue?

- **Command format:**

  :CURSor:AXValue?
- **Functional description:**

  Query X value at cursor A, unit is determined by the amplitude unit of the current selected channel.
- **Return format:**

  Query returns X value at the current cursor A in scientific notation.
- **For example:**

:CURSor:AXV?	Query returns 2.000000E+02.

:CURSor:AYValue?

- **Command format:**
  :CURSor:AYValue?
- **Functional description:**
  Query Y value at cursor A, unit is determined by the amplitude unit of the current selected channel.
- **Return format:**
  Query returns Y value at the current cursor A in scientific notation.
- **For example:**
  :CURSor:AYV? Query returns 2.000000E+02.

:CURSor:BXValue?

- **Command format:**
  :CURSor:BXValue?
- **Functional description:**
  Query X value at cursor B, unit is determined by the amplitude unit of the current selected channel.
- **Return format:**
  Query returns X value at the current cursor B in scientific notation.
- **For example:**
  :CURSor:BXV? Query returns 2.000000E+02.

:CURSor:BYValue?

- **Command format:**
  :CURSor:BYValue?
- **Functional description:**
  Query Y value at cursor B, unit is determined by the amplitude unit of the current selected channel.
- **Return format:**
  Query returns Y value at the current cursor B in scientific notation.

- **For example:**
  :CURSor:BYV? Query returns 2.000000E+02.

FILE Command

This command is used to set reference waveform and storage function.

:FILE:LOAD

- **Command format：**

  :FILE:LOAD <filename>, [<source>], [<disk>]

- **Functional description：**

  This command is used to load waveform to the reference channel or set the data.

  <filename> represents the filename and it must be character string data with double quotation mark, for example "test.bsv".

  - The file name of *.bsv or *.csv represents load waveform data of a file into the reference channel, it matched with the oscilloscope's suffix name.
  - The file name of *.set or *.dat represents load waveform data of a file into the reference channel, it matched with the oscilloscope's suffix name.

  <source > represents reference channel {REFA | REFB | REFC | REFD}，**optional parameter，only valid when loading waveform data.**

  - REFA represents reference channel A
  - REFB represents reference channel B
  - REFC represents reference channel C
  - REFD represents reference channel D

  <disk> represents memory medium { FLASH | UDISK }，optional parameter，omitting represents internal data of FLASH.

  - FLASH represents internal data.
  - UDISK represents U flash disk data.

- **For example：**

  FILE:LOAD "test.csv ",REFA,UISK

  Load test.csv waveform data from U flash disk into reference channel A.

  FILE:LOAD "system-set-up01.set"

  Load position 1 configuration data from internal medium into the oscilloscope.

  Notes：When the oscilloscope can not self-defined the file name and suffix

- The file name of internal storage setting must be"system-set-up01.set"~ "system-set-up255.set", the maximum limit is 255 files.
- The file name of internal storage bsv file must be"wave01.bsv"~" wave255.bsv", the maximum limit is 255 files.

:FILE:SAVE

- **Command format：**

  :FILE:SAVE <filename>, [<source>], [<disk>]

- **Functional description：**

This command is used to set channel waveform or the setting data into file.

<filename> represents the file name and it must be character string data with double quotation mark, for example "test.bsv"

- The file name of *.bsv or *.csv represents load waveform data of a file into the reference channel, it matched with the oscilloscope's suffix name.
- The file name of *.set or *.dat represents load waveform data of a file into the reference channel, it matched with the oscilloscope's suffix name.

<source> represents physical channel {CHANnel1 | CHANnel2 }**, optional parameter. Only valid when saving waveform data.**

- CHANnel1 represents channel 1.
- CHANnel2 represents channel 2.

<disk> represents storage medium { FLASH | UDISK **}, optional parameter. Omitting represents internal data of FLASH.**

- FLASH represents internal data.
- UDISK represents U flash disk data.

➢ **For example：**

FILE:SAVE "test.csv ", CHANnel1, UDISK

Save waveform data of channel 1 as test.csv format into U flash disk.

FILE:SAVE "system-set-up01.set"

The configuration data of oscilloscope save as 1 position of internal medium.

FILE:SAVE "wave01.csv", CHANnel1, FLASH

Save waveform data of channel 1 into internal medium.

FILE:SAVE "wave01.csv", CHANnel1

Save waveform data of channel 1 into internal medium.

FILE:SAVE "system-set-up01.set", FLASH

The configuration data of oscilloscope save as internal medium.

FILE:SAVE "system-set-up01.set"

The configuration data of oscilloscope save as 1 position of internal medium.

Notes：When the oscilloscope can not self-defined the file name and suffix

- The file name of internal storage setting must be"system-set-up01.set"~ "system-set-up255.set", maximum limit 255 files.
- The file name of internal storage bsv file must be"wave01.bsv"~" wave255.bsv", maximum limit 255 files.

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RECord Command

This command is used to set recording waveform function of the oscilloscope.

:RECord:ENABle

- **Command format:**
  :RECord:ENABle {{1|ON}|{0|OFF}}
  :RECord:ENABle?
- **Functional description:**
  This command is used to turn on/off recording waveform function.
- **Return format:**
  Query returns 1 or 0, it respectively represents ON or OFF.
- **For example:**
  :RECord:ENABle ON Turn on recording waveform function.
  :RECord:ENABle?
  Query returns 1, it represents recording waveform function is turned on.

:RECord:STARt

- **Command format:**
  :RECord:STARt {{1|ON}|{0|OFF}}
  :RECord:STARt?
- **Functional description:**
  This command is used to start/stop recording waveform.
- **Return format:**
  Query returns 1 or 0, it respectively represents ON or OFF.
- **For example:**
  :RECord:STARt ON Start to recording waveform.
  :RECord:STARt?
  Query returns 1, it represents the recording waveform is started.

:RECord:INTerval

- **Command format:**
  :RECord:INTerval <time>
  :RECord:INTerval?
- **Functional description:**
  This command is used to set time interval of recording waveform.
- **Return format:**
  Query returns time interval of recording waveform in scientific notation, unit is s.
- **For example:**
  :RECord:INTerval 200ns Set play delay time of recording waveform to 200ns.

  :RECord:INTerval? Query returns 2.000e-004.

:RECord:PLAY

- **Command format:**
  :RECord:PLAY {{1|ON}|{0|OFF}}
  :RECord:PLAY?
- **Functional description:**
  This command is used to start or stop play recording waveform.
- **Return format:**
  Query returns 1 or 0, it respectively represents ON or OFF.
- **For example:**
  :RECord:PLAY ON Start to play recording waveform.
  :RECord:PLAY?
  Query returns 1, it represents start to play the recording waveform.

:RECord:PLAY:DELay

- **Command format:**
  :RECord:PLAY:DELay <time>
  :RECord:PLAY:DELay?
- **Functional description:**
  This command is used to set play delay time of recording waveform.
- **Return format:**
  Query returns play delay time of recording waveform in scientific notation, unit is s.
- **For example:**
  :RECord:PLAY:DELay 20ms Set play delay time of recording waveform to 20ms.
  :RECord:PLAY:DELay? Query returns 2.000e-002.

:RECord:CURRent

- **Command format:**
  :RECord:CURRent <value>
  :RECord:CURRent?
- **Functional description:**
  This command is used to set or query the current frame of recording waveform.
- **Return format:**
  Query returns the curren frame of recording waveform, it is integer data.
- **For example:**
  :RECord:CURRent 100 Set the current frame of recording waveform to 100.
  :RECord:CURRent? Query returns 100.

:RECord:FRAMes

- **Command format:**
  :RECord:FRAMes <value>
  :RECord:FRAMes?
- **Functional description:**

This command is used to set or query the frame number of recording waveform.

- **Return format:**

  Query returns the frame of recording waveform, it is integer data.

- **For example:**

:RECord:FRAMes 400	Set the frame number of recording waveform to 400.
:RECord:FRAMes?	Query returns 400.

DVM Command

This command is used to set digital voltage meter.

:DVM:ENABle

- **Command format:**

  :DVM:ENABle {{1|ON}|{0|OFF}}

  :DVM:ENABle?

- **Functional description:**

  This command is used to set or query the status of digital voltage meter function (ON or OFF).

- **Return format:**

  Query returns 1 or 0, it represents ON or OFF separately.

- **For example:**

:DVM:ENABle ON	Turn on digital voltage meter.
:DVM:ENABle?	Query returns 1.

:DVM:SOURCe

- **Command format:**

  :DVM:SOURCe <source>

  :DVM:SOURCe?

- **Functional description:**

  This command is used to set or query the information source of digital voltage meter.

  <source>: CHANnel<n>, n take value from 1, 2.

- **Return format:**

  Query returns {CHANnel1|CHANnel2}.

- **For example:**

:DVM:SOURCe CHANnel1	Set source as channel 1.
:DVM:SOURCe?	Query returns CHANnel1.

:DVM:MODE

- **Command format:**

  :DVM:MODE {ACRMs|DC|DCRMs}

  :DVM:MODE?

- **Functional description:**

  This command is used to set or query the mode of digital voltage meter.

- **Return format:**
  Query returns {ACRMs|DC|DCRMs}.
- **For example:**

:DVM:MODE DC	Set the mode of digital voltage meter to DC.
:DVM:MODE?	Query returns DC.

:DVM:CURRent?

- **Command format:**
  : DVM:CURRent?
- **Functional description:**
  This command is used to query the current measured voltage value of digital voltage meter.
- **Return format:**
  Query returns the current measured voltage value of digital voltage meter in scientific notation, unit is determined by:DVM:MODE.
- **For example:**

:DVM:CURRent?	The current measured voltage value is 3.000e-003.

PF Command

This command is used to set Pass/Fail test function.

:PF:ENABle

- **Command format:**
  :PF:ENABle {{1|ON}|{0|OFF}}
  :PF:ENABle?
- **Functional description:**
  This command is used to set or query Pass/Fail test function (ON or OFF).
- **Return format:**
  Query returns 1 or 0, it respectively represents ON or OFF.
- **For example:**

:PF:ENABle ON	Turn on Pass/Fail test function.
:PF:ENABle?	Query returns 1.

:PF:SOURCe

- **Command format:**
  :PF:SOURCe <source>
  :PF:SOURCe?
- **Functional description:**
  This command is used to set or query the measuring source of Pass/Fail test.
  <source>: CHANnel<n>, take value from 1, 2.
- **Return format:**
  Query returns {CHANnel1|CHANnel2}.

- **For example:**

  :PF:SOURCe CHANnel1 Set the measuring source as channel 1.

  :PF:SOURCe? Query returns CHANnel1.

:PF:OPERate

- **Command format:**

  :PF:OPERate {RUN|STOP}

  :PF:OPERate?

- **Functional description:**

  This command is used to run or stop Pass/Fail test.

- **Return format:**

  Query returns {RUN|STOP}.

- **For example:**

  :PF:OPERate RUN Run Pass/Fail test.

  :PF:OPERate? Query returns RUN.

:PF:OUTPut

- **Command format:**

  :PF:OUTPut {PASS|FAILED}

  :PF:OUTPut?

- **Functional description:**

  This command is used to set or query the output of Pass/Fail test.

- **Return format:**

  Query returns {PASS|FAILED}.

- **For example:**

  :PF:OUTPut PASS Set the output of Pass/Fail test to PASS.

  :PF:OUTPut? Query returns PASS.

:PF:STOP:TYPe

- **Command format:**

  :PF:STOP:TYPe {PCOUNT|FCOUNT}

  :PF:STOP:TYPe?

- **Functional description:**

  This command is used to set or query stop type of Pass/Fail test.

  PCOUNT represents the number of pass; FCOUNT represents the number of fail.

- **Return format:**

  Query returns {PCOUNT|FCOUNT}.

- **For example:**

  :PF:STOP:TYPe PCOUNT Set stop type of Pass/Fail test to PCOUNT.

  :PF:STOP:TYPe? Query returns PCOUNT.

:PF:STOP:QUALifier

- **Command format:**
  :PF:STOP:QUALifier {LEQual | GEQual}
  :PF:STOP:QUALifier?
- **Functional description:**
  This command is used to set or query the stop condition of Pass/Fail test.
  GEQual represents greater than or equal to; LEQual represents less than or equal to.
- **Return format:**
  Query returns {LEQual | GEQual}.
- **For example:**

:PF:STOP:QUALifier GEQual	Set the stop condition of Pass/Fail test to ≥.
:PF:STOP:QUALifier?	Query returns GEQual.

:PF:STOP:THReshold

- **Command format:**
  :PF:STOP:THReshold <value>
  :PF:STOP:THReshold?
- **Functional description:**
  This command is used to set or query the stop threshold of Pass/fail test.
  <value>: stop threshold, range is 1~30000, the specified range will self-adapting according to the oscilloscope.
- **Return format:**
  Query returns stop threshold, it is integer data.
- **For example:**

:PF:STOP:THReshold 100	Set the stop threshold of Pass/fail test to 100.
:PF:STOP:THReshold?	Query returns 100.

:PF:TEMPlate:SOURce

- **Command format:**
  :PF:TEMPlate:SOURce <source>
  :PF:TEMPlate:SOURce?
- **Functional description:**
  This command is used to set or query the reference channel of template setting of Pass/fail test.
  <source>: CHANnel<n>, n take value from 1, 2.
- **Return format:**
  Query returns {CHANnel1 | CHANnel2}.
- **For example:**
  :PF:TEMPlate:SOURce CHANnel1
  Set the reference channel set by template setting as channel 1.

:PF:TEMPlate:SOURce?	Query returns CHANnel1

:PF:TEMPlate:X

- **Command format:**
  :PF:TEMPlate:X <value>
  :PF:TEMPlate:X?
- **Functional description:**
  This command is used to set or query the horizontal tolerance of template setting of Pass/fail test.
  <value>: horizontal tolerance, range is 1~100, the specified range will self-adapting according to the oscilloscope.
- **Return format:**
  Query returns horizontal tolerance of template setting, it is integer data.
- **For example:**
  :PF:TEMPlate:X 50 Set horizontal tolerance of template setting to 50.
  :PF:TEMPlate:X? Query returns 50.

:PF:TEMPlate:Y

- **Command format:**
  :PF:TEMPlate:Y <value>
  :PF:TEMPlate:Y?
- **Functional description:**
  This command is used to set or query the vertical tolerance of template setting of Pass/fail test.
  <value>: vertical tolerance, range is 1~100, the specified range will self-adapting according to the oscilloscope.
- **Return format:**
  Query returns vertical tolerance of template setting, it is integer data.
- **For example:**
  :PF:TEMPlate:Y 50 Set vertical tolerance of template setting to 50.
  :PF:TEMPlate:Y? Query returns 50.

:PF:TEMPlate:CREate

- **Command format:**
  :PF:TEMPlate:CREate
- **Functional description:**
  This command is use the current horizontal and vertical adjusting parameter to create the regulation template of Pass/Fail test.
- **For example:**
  :PF:TEMPlate:CREate Create the regulation template of Pass/Fail test

:PF:RESult?

- **Command format:**
  :PF:RESult?
- **Functional description:**
  This command is used to query the statistical result of Pass/Fail test.

Return data format: <pass>, <failed>, <total>, <pass> represents the number of pass; <failed> represents the number of fail; <total> present the total number.

- **Return format:**

  Query returns the statistical result of Pass/Fail test.

- **For example:**

  :PF:RESult? Query returns 35, 42, and 77.

ACQuire Command

This command is used to set the sampling mode of the oscilloscope.

:ACQuire:TYPE

- **Command format:**

  :ACQuire:TYPE {NORMal | AVERage | PEAKdetect | HRESolution }

  :ACQuire:TYPE?

- **Functional description:**

  This command is used to set sampling mode of the oscilloscope, which is NORMal, AVERage, PEAKdetect, HRESolution.

- **Return format:**

  Query returns {NORMal | AVERage | PEAKdetect | HRESolution}.

- **For example:**

  :ACQ:TYPE AVER Set sampling mode to AVERage.

  :ACQ:TYPE? Query returns AVERage.

:ACQuire:AVERages:COUNt

- **Command format:**

  :ACQuire:AVERages:COUNt <count>

  :ACQuire:AVERages:COUNt?

- **Functional description:**

  This command is used to set the number of average sampling mode, <count> stepped as Nth power of 2, take value form 2~8192, 1≤N≤30.

- **Return format:**

  Query returns the current number of average sampling mode.

- **For example:**

  :ACQ:AVER:COUN 32 Set the number of average sampling mode to 32.

  :ACQ:AVER:COUN? Query returns 32.

:ACQuire:MEMory:DEPTh

- **Command format:**

  :ACQuire:MEMory:DEPTh { AUTO | 7K | 70K | 700K | 7M | 35M | 56M }

  :ACQuire:MEMory:DEPTh?

- **Functional description:**
  This command is used to set storage depth of sampling mode, it will self-adapting according to the storage depth of different mode.
- **Return format:**
  Query returns { AUTO | 7K | 70K | 700K | 7M | 35M | 56M }.
- **For example:**
  :ACQ:MEM:DEPT AUTO Set storage depth to AUTO.
  :ACQ:MEM:DEPT? Query returns AUTO.

DISPlay Command

This command is used to set or query the diplay function or data of the oscilloscope.

:DISPlay:DATA?

- **Command format:**
  :DISPlay:DATA?
- **Functional description:**
  This command is used to query the current image data of the oscilloscope.
- **Return format:**
  Query returns BMP format image data, returned data is conform with Appendix 2: IEEE 488.2 binary data format.
- **For example:**
  :DISPlay:DATA? Query returns image data.

:DISPlay:FORMat

- **Command format:**
  :DISPlay:FORMat { VECTors | DOTS }
  :DISPlay:FORMat?
- **Functional description:**
  This command is used to set diplay format of sampling point, which is VECTors (vector display), DOTS (direct display).
- **Return format:**
  Query returns {VECTors | DOTS}.
- **For example:**
  :DISPlay:FORMat VECT Set diplay format of sampling point to VECTors.
  :DISPlay:FORMat Query returns VECTors.

:DISPlay:GRID:BRIGhtness

- **Command format:**
  :DISPlay:GRID:BRIGhtness <count>
  :DISPlay:GRID:BRIGhtness?
- **Functional description:**

This command is used to set the gridding brightness, <count> take value from 1~100, the larger the number, the brighter the grid.

- **Return format:**

  Query returns the current gridding brightness.

- **For example:**

  :DISPlay:GRID:BRIGhtness 50 Set the gridding brightness to 50.

  :DISPlay:GRID:BRIGhtness? Query returns 50.

:DISPlay:GRAD:TIME

- **Command format:**

  :DISPlay:GRAD:TIME {MINimum|50ms|100ms|20ms|500ms|1s|2s|5s|10s|20s|INFinite}

  :DISPlay:GRAD:TIME?

- **Functional description:**

  This command is used to set the persistence time.

- **Return format:**

  Query returns {MINimum|50ms|100ms|20ms|500ms|1s|2s|5s|10s|20s|INFinite}.

- **For example:**

  :DISPlay:GRAD:TIME 50ms Set the persistence time to 50ms.

  :DISPlay:GRAD:TIME? Query returns 50ms.

:DISPlay:COLOR

- **Command format:**

  :DISPlay:COLOR {{1|ON}|{0|OFF}}

  :DISPlay:COLOR?

- **Functional description:**

  This command is used to turn on/off color temperature display.

- **Return format:**

  Query returns 1 or 0, it respectively represents ON or OFF.

- **For example:**

  :DISPlay:COLOR ON Turn on color display.

  :DISPlay:COLOR? Query returns 1, it represents color display is turned on.

:DISPlay:COLOR:INVERt

- **Command format:**

  :DISPlay:COLOR:INVERt {{1|ON}|{0|OFF}}

  :DISPlay:COLOR:INVERt?

- **Functional description:**

  This command is used to turn on/off inverse color.

- **Return format:**

  Query returns 1 or 0, it represents ON or OFF separately.

- **For example:**

  :DISPlay:COLOR:INVERt ON Turn on inverse color.

:DISPlay:COLOR:INVERt?

Query returns 1, it represents inverse color display is turned on.

:DISPlay:WAVE:BRIGhtness

- **Command format:**

  :DISPlay:WAVE:BRIGhtness <count>

  :DISPlay:WAVE:BRIGhtness?

- **Functional description:**

  This command is used to set waveform brightness, <count> take value from 1~100, larger the number, the brighter the waveform.

- **Return format:**

  Query returns the current waveform brightness.

- **For example:**

  :DISPlay:WAVE:BRIGhtness 50 Set waveform brightness to 50.

  :DISPlay:WAVE:BRIGhtness? Query returns 50.

:DISPlay:CLEar

- **Command format:**

  :DISPlay:CLEar

- **Functional description:**

  This command is used to clear and refresh the waveform on the screen. If there is reference waveform, then clear and refresh the reference waveform.

:DISPlay:TYPE

- **Command format:**

  :DISPlay:TYPE {XY12| XY34|YT}

  :DISPlay:TYPE?

- **Functional description:**

  This command is used to set timebase display type to XY12 (X-Y mode: amplitude value of channel 1 display on the horizontal axis, amplitude value of channel 2 display on the vertical axis), XY34 (X-Y mode: amplitude value of channel 3 display on the horizontal axis, amplitude value of channel 4 display on the vertical axis), YT (Y-T mode: display the relative relation of vertical voltage and horizontal time).

- **Return format:**

  Query returns XY12, XY34, YT.

- **For example:**

  :DISP:TYPE YT Set timebase format to YT mode.

  :DISP:TYPE? Query returns YT.

WAVeform Command

This command is used to read the waveform data and relative parameter on the screen of the oscilloscope.

:WAVeform:MODE

- **Command format:**
  :WAVeform:MODE {NORMal | RAW}
  :WAVeform:MODE?
- **Functional description:**
  NORMal: read the current waveform data, the count of waveform data is fixed count.
  RAW: read the waveform data from internal storage, the count of waveform data is related to storage depth.
  Note: This instruction resets the start, cut-off and waveform point. Data in internal storage can be read only the oscilloscope in stop status. This instruction is invalid in MATH channel.
- **Return format:**
  Query returns {NORMal | RAW}.
- **For example:**

:WAVeform:MODE RAW	Set the read mode of waveform data to RAW.
:WAVeform:MODE?	Query returns RAW.

:WAVeform:FORMat

- **Command format:**
  :WAVeform:FORMat { WORD | BYTE | ASCII }
  :WAVeform:FORMat?
- **Functional description:**
  The default waveform data format is AD waveform point data
  BYTE: return AD data, a waveform data takes a byte（that is 8 bits）.
  WORD: return AD data, a waveform data takes two bytes（that is 16 bits）, low 8 bits is valid, high 8 bits is 0.
  ASCII: return waveform returns the actual voltage value of each waveform point in scientific notation, and each voltage value is separated by commas. It is conform with Appendix 2：IEEE 488.2 binary data format.
  For example, #412342.00000E+01, 2.20000E+01, 2.30000E+01.....\n.
- **Return format:**
  Query returns { WORD | BYTE | ASCII }.
- **For example:**

:WAVeform:FORMat BYTE	Return format of waveform AD data is single byte mode.
:WAVeform:FORMat?	Query returns BYT.

:WAVeform:STARt

- **Command format:**
  :WAVeform:STARt <start>
  :WAVeform:STARt?
- **Functional description:**
  This command is used to set or query the start position of waveform data reading, <start> integer data type.

NORMal: 1~1400.

RAW: 1 to the maximum storage depth point.

- **Return format：**

  Query returns the start position.

- **For example：**

  :WAVeform:STARt 200 Set the start position of waveform data reading to 200.

  :WAVeform:STARt? Query returns 200.

:WAVeform:STOP

- **Command format：**

  :WAVeform:STOP <stop>

  :WAVeform:STOP?

- **Functional description：**

  This command is used to set or query the cut-off position of waveform data reading, < stop> is integer data type.

  NORMal：< stop> range is 1~1400.

  RAW：< stop> range is 1 to the maximum storage depth point.

- **Return format：**

  Query returns the cut-off position.

- **For example：**

  :WAVeform:STOP 400 Set the end point of waveform data reading to 400.

  :WAVeform:STOP? Query returns 400.

:WAVeform:SOURce

- **Command format：**

  :WAVeform:SOURce {CHANnel<n>| MATH}

  :WAVeform:SOURce?

- **Functional description：**

  This command is used to set the signal source of waveform data is to be queried. If this command is not sent, it means query the waveform data of the current channel.

- **Return format：**

  Query returns {CHANnel1 | CHANnel2 | MATH}.

- **For example：**

  :WAVeform:SOURce CHAN1

  Set the signal source of waveform data to be queried as channel 1.

  :WAVeform:SOURce? Query returns CHANnel1.

:WAVeform:POINts

- **Command format：**

  :WAVeform:POINts <points>

  :WAVeform:POINts?

- **Functional description：**

  This command is used to set the waveform point which need to returned, the default value is 0.

- **Return format：**

  Query returns the waveform point need to be returned.

- **For example：**

  :WAVeform:POINts 120 Set returned waveform point to 120.

  :WAVeform:POINts? Query returns 120.

:WAVeform:DATA?

- **Command format：**

  :WAVeform:DATA?

- **Functional description：**

  This command is used to read the waveform data from the specified data source.

- **Return format：**

  WAVeform:POINts the specified quantity of waveform data. Waveform data source is related to: WAVeform:SOURce. Data format is related to WAVeform:FORMat. Returned format is conform with Appendix 2：IEEE 488.2 binary data format.

- **For example：**

  The instructions to obtain the waveform data for the specified data source are executed in the following order.

  ◆ Obtain screen waveform data flow

  :WAVeform:SOURce CHAN1

  Set singal source of query waveform data to be queried to channel 1.

  :WAVeform:MODE NORMal

  Set to read waveform data display on the screen.

  :WAVeform:FORMat BYTE

  Return format of waveform data is AD single byte mode.

  :WAVeform:DATA?

  Acquire waveform data.

  ◆ Obtain internal waveform data flow, this flow can only valid in stop status.

  :WAVeform:SOURce CHAN1

  Set singal source of query waveform data to be queried to channel 1.

  :WAVeform:MODE RAW

  Set to read interal storage waveform data.

  :WAVeform:FORMat BYTE

  Return format of waveform data is AD single byte mode.

  :WAVeform:POINts 5000

  Reading internal waveform point is 5000.

  Cycle reading internal waveform data.

  {

  :WAVeform:DATA?

  Acquire a piece of waveform data in internal storage.

  :WAVeform:START?

Start position of waveform data reading, -1 represents the last point.

}

Explanation: when reading internal data in batch, the read back data of each time is only the data of an area in the memory, and the waveform data between two adjacent pieces is continuous. Each piece of data conforms to Appendix 2: IEEE 488.2 binary data format.

:WAVeform:PREamble?

- **Command format：**

  :WAVeform:PREamble?

- **Functional description：**

  Query returns the waveform configuration parameter of the current system.

- **Return format：**

  Query returns sparated by comma",".

  Return data format: Format, Type, Points, Count, Xinc, Xor, Xref, Yinc, Yor, Yref.

  Format: BYTE (0), WORD (1), ASCII (2).

  Type: NORMAL (0), PEAK (1), AVER (2), ENVelope (3), HRESolution (4).

  Points: Waveform data point need to be returned.

  Count: As average time in average sampling, as 1 in other mode.

  Xinc: The time difference between in two point of waveform data source in X direction.

  Xor: The relative time of trigger point.

  Xref: X reference.

  Yinc: Unit of voltage in Y direction.

  Yor: Y direction relative to Zero position of YREF.

  Yref: Reference value in Y direction, middle point of the screen.

- **For example：**

  :WAVeform:PREamble?

  Return 1, 0, 0, 1, 8.000e-009,-6.000e-006, 0, 4.000e-002, 0.000e000, 100.

:WAVeform:XINCrement?

- **Command format：**

  :WAVeform:XINCrement?

- **Functional description：**

  This command is used to query time interval between two adjacent points of the current selected channel source in X direction.

  Returned value is related to the current data reading mode.

  In NORMal mode, XINCrement=TimeScale/waveform point of time scale in horizontal poistion (50).

  In RAW mode, XINCrement=1/SampleRate

- **Return format：**

  Query returns number of timebase, unit is s.

- **For example：**

  :WAV:XINC? Query returns 3.000e-003.

:WAVeform:XORigin?

- **Command format:**
  :WAVeform:XORigin?
- **Functional description:**
  This command is used to query the start time of waveform data of the current selected channel source in X direction.
  Returned value is related to the current data reading mode, time of trigger point is zero, before the trigger point is negative.
  In NORMal mode, return start time of waveform data displayed on the screen: XORigin = -1*TimeScale*7
  In RAW mode, return start time of waveform data in internal storage, XORigin = -1*(SamplePoints/SampleRate)/2
- **Return format:**
  Query returns time value, unit is s.
- **For example:**
  :WAV:XOR? Query returns 3.000e-002.

:WAVeform:XREFerence?

- **Command format:**
  :WAVeform:XREFerence?
- **Functional description:**
  This command is used to query the reference time benchmark of waveform point of the current selected channel source in X direction, it's always zero.
- **Return format:**
  Query reference time benchmark, query returns 0.
- **For example:**
  :WAV:XREF? Query returns 0.

:WAVeform:YINCrement?

- **Command format:**
  :WAVeform:YINCrement?
- **Functional description:**
  This command is used to query the unit of voltage of current selected channel source in Y direction, unit is the same with the current amplitude unit.
  Returned value is related to the current data readinging mode:
  YINCrement = VerticalScale/ waveform point of amplitude scale in vertical position (25)
- **Return format:**
  Query returns unit voltage value in Y direction.
- **For example:**
  :WAV:YINC? Query returns 2.000e000.

:WAVeform:YORigin?

- **Command format：**
  :WAVeform:YORigin?
- **Functional description：**
  This command is used to query the current selected channel source in Y direction relative to vertical displacement of the vertical reference position.
  Returned value is related to the current data reading mode, up is positive and down is negative with the reference as the base:
  YORigin = VerticalOffset/YINCrement
- **Return format：**
  Query returns the vertical displacement, it is integer type.
- **For example：**
  :WAV:YOR? Query returns 0.

:WAVeform:YREFerence?

- **Command format：**
  :WAVeform:YREFerence?
- **Functional description：**
  This command is used to query the vertical reference position of the current selected channel source in Y direction, and ADC value of channel zero level.
  Returned value is related to the current data reading mode: YREFerence fixed as 128
- **Return format：**
  Query returns the reference position, it is integer type.
- **For example：**
  :WAV:YREF? Query returns 128.

SBUS Command

This command is used to set RS232, SPI, I2C, CAN and LIN bus decoding and trigger parameter.

Basic Attribute

:SBUS:DISPlay

- **Command format:**
  :SBUS:DISPlay {{1|ON}|{0|OFF}}
  :SBUS:DISPlay?
- **Functional description:**
  This command is used to turn on/off bus decoding status of the oscilloscope.
- **Return format:**
  Query returns 1 or 0, it repectively represents ON or OFF.
- **For example:**

:SBUS:DISPlay ON	Turn on bus decoding status to display decoding wavefrom.
:SBUS:DISPlay?	Query returns 1.

:SBUS:MODE

- **Command format:**
  :SBUS:MODE { RS232 | I2C | SPI | CAN | LIN }
  :SBUS:MODE?
- **Functional description:**
  This command is used to select bus decoding and trigger mode.
- **Return format:**
  Query returns {RS232 | I2C | SPI | CAN | LIN}.
- **For example:**

:SBUS:MODE I2C	Select I2C bus decoding mode.
:SBUS:MODE?	Query returns I2C.

:SBUS:BASE

- **Command format:**
  :SBUS:BASE {ASCII | BINary | HEX | DEC}
  :SBUS:BASE?
- **Functional description:**
  This command is used to set bus display format of the oscilloscope.
- **Return format:**
  Query returns {ASCII | BINary | HEX | DEC}.
- **For example:**

:SBUS:BASE BIN	Set bus decoding to binary display format.
:SBUS:BASE?	Query returns BINary.

:SBUS:EVENt

- **Command format:**
  :SBUS:EVENt {{1|ON}|{0|OFF}}
  :SBUS:EVENt?
- **Functional description:**
  This command is used to turn on/off bus event of the oscilloscope.
- **Return format:**
  Query returns 1 or 0, it respectively represents ON or OFF.
- **For example:**

:SBUS:EVENt ON	Turn on bus event.
:SBUS:EVENt?	Query returns 1.

:SBUS:DATA?

- **Command format:**
  :SBUS:DATA?
- **Functional description:**
  This command is used read the data of decoding event table of the oscilloscope.
- **Return format:**
  Query returns the data of decoding event table, returned data is conform with Appendix 2: IEEE 488.2 binary data format.
- **For example:**
  :SBUS:DATA? Query returns:
  #9000000089RS232,
  TIME,DATA,CHECK,
  -1us,0,0,
  -890.5ns,1,0,
  -403.4ns,0,0,
  9.8ns,1,0,
  531.7ns,0,0,
  RS232 represents decoding type (it may be I2C, SPI or CAN), the event table data in CSV format followed behind. The specified format of the event table data is automatically adapted by different devices. The data are separated by commas and will automatically line wrap according to the decoding list, the data value is related to the setting system display.

:SBUS:VERTical:POSition

- **Command format:**
  :SBUS:VERTical:POSition <value>

:SBUS:VERTical:POSition?

- **Functional description:**

  This command is used to set trigger vertical position value of the oscilloscope. Parameter is integer, step is 6, range is [-160,160]. The center of screen is zero point, up is positive, down is negative.

- **Return format:**

  Query returns vertical positon value.

- **For example:**

:SBUS:VERTical:POSition 10	Open bus vertical position value is 10.
:SBUS:VERTical:POSition?	Query returns 10.

:SBUS:TRIGger:SWEep

- **Command format:**

  :SBUS:TRIGger:SWEep {AUTO|NORMal|SINGle}

  :SBUS:TRIGger:SWEep?

- **Functional description:**

  This command is used to select bus trigger sweep mode.

  AUTO: In no trigger condition, the internal will produce trigger signal to force trigger.

  NORMal: It will be generated only trigger condition is met.

  SINGle: It will be generated one time and stop when trigger condition is met.

- **Return format:**

  Query returns trigger sweep mode {AUTO|NORMal}.

- **For example:**

:SBUS:TRIGger:SWEep AUTO	Set bus trigger sweep mode to AUTO.
:SBUS:TRIGger:SWEep?	Query returns AUTO.

RS232

:SBUS:RS232:BAUDrate

- **Command format:**

  :SBUS:RS232:BAUDrate <baudrate>

  :SBUS:RS232:BAUDrate?

- **Functional description:**

  This command is used to set RS232 decoding baud rate of the oscilloscope. Parameter is integer, range is 120~5000000.

- **Return format:**

  Query returns baud rate.

- **For example:**

:SBUS:RS232:BAUDrate 500	Set RS232 baud rate to 500b/s.
:SBUS:RS232:BAUDrate?	Query returns 500.

:SBUS:RS232:BITorder

- **Command format:**
  :SBUS:RS232:BITorder {LSBFirst | MSBFirst}
  :SBUS:RS232:BITorder?
- **Functional description:**
  This command is used to set RS232 bus decoding bit order of the oscilloscope, which includes LSBFirst and MSBFirst.
- **Return format:**
  Query returns {LSBFirst | MSBFirst}.
- **For example:**

:SBUS:RS232:BITorder LSBF	Set RS232 bit order to LSB.
:SBUS:RS232:BITorder?	Query returns LSBFirst.

:SBUS:RS232:SOURce

- **Command format:**
  :SBUS:RS232:SOURce {CHANnel1|CHANnel2 }
  :SBUS:RS232:SOURce?
- **Functional description:**
  This command is used to set RS232 bus decoding source.
- **Return format:**
  Query returns {CHANnel1|CHANnel2}.
- **For example:**

:SBUS:RS232:SOURce CHANnel1	Set channel 1 as RS232 bus decoding source.
:SBUS:RS232:SOURce?	Query returns CHANnel1.

:SBUS:RS232:POLarity

- **Command format:**
  :SBUS:RS232:POLarity { POSitive | NEGative }

  :SBUS:RS232:POLarity?
- **Functional description:**
  This command is used to set RS232 bus decoding polarity of the oscilloscope, which includes POSitive and NEGative.
- **Return format:**
  Query returns { POSitive | NEGative }.
- **For example:**

:SBUS:RS232:POLarity POSitive	Set RS232 bus decoding polarity to POSitive.
:SBUS:RS232:POLarity?	Query returns POSitive.

:SBUS:RS232:PARity

- **Command format:**
  :SBUS:RS232:PARity {EVEN|ODD|NONE}
  :SBUS:RS232:PARity?
- **Functional description:**
  This command is used to set RS232 bus parity of the oscilloscope.
- **Return format:**
  Query returns {EVEN|ODD|NONE}.
- **For example:**

:SBUS:RS232:PARity ODD	Set RS232 bus parity to ODD.
:SBUS:RS232:PARity?	Query returns 6.

:SBUS:RS232:DATA:BIT

- **Command format:**
  :SBUS:RS232:DATA:BIT {5|6|7|8}
  :SBUS:RS232:DATA:BIT?
- **Functional description:**
  This command is used to set RS232 bus data bit of the oscilloscope.
- **Return format:**
  Query returns {5|6|7|8}.
- **For example:**

:SBUS:RS232:DATA:BIT 6	Set RS232 data bit to 6.
:SBUS:RS232:DATA:BIT?	Query returns 6.

:SBUS:RS232:STOP:BIT

- **Command format:**
  :SBUS:RS232:STOP:BIT {1|2}

  :SBUS:RS232:STOP:BIT?
- **Functional description:**
  This command is used to set RS232 bus stop bit of the oscilloscope.
- **Return format:**
  Query returns {1|2}.
- **For example:**

:SBUS:RS232:STOP:BIT 6	Set RS232 stop bit to 6.
:SBUS:RS232:STOP:BIT?	Query returns 6.

:SBUS:RS232:DATA

- **Command format:**

:SBUS:RS232:DATA <value>

:SBUS:RS232:DATA?

- **Functional description:**

  This command is used to set RS232 bus trigger data of the oscilloscope. Binary character data presented by parameter 0 or 1, its range is related to the value set by instruction :SBUS:RS232:DATA:BIT, which is [0~2^databit – 1].

- **Return format:**

  Query returns binary data format.

- **For example:**

  :SBUS:RS232:DATA "01111111" Set Set RS232 bus data to 0x7F.

  :SBUS:RS232:DATA? Query returns 01111111.

:SBUS:RS232:QUALifier

- **Command format:**

  :SBUS:RS232:QUALifier {BEGFrame | ERRFrame | ECCError | DATA}

  :SBUS:RS232:QUALifier?

- **Functional description:**

  This command is used to set RS232 bus trigger condition of the oscilloscope.

- **Return format:**

  Query returns {BEGFrame|ERRFrame|ECCError|DATA}.

- **For example:**

  :SBUS:RS232:QUALifier ERRF Set RS232 bus condition to ERRFrame.

  :SBUS:RS232:QUALifier? Query returns ERRFrame.

I2C

:SBUS:I2C:CLOCk:SOURce

- **Command format:**

  :SBUS:I2C:CLOCk:SOURce {CHANnel1|CHANnel2}

  :SBUS:I2C:CLOCk:SOURce?

- **Functional description:**

  This command is used to set I2C bus clock source of the oscilloscope.

- **Return format:**

  Query returns {CHANnel1|CHANnel2}.

- **For example:**

  :SBUS:I2C:CLOCk:SOURce CHANnel1 Set channel 1 as I2C bus clock source.

  :SBUS:I2C:CLOCk:SOURce? Query returns CHANnel1.

:SBUS:I2C:DATA:SOURce

- **Command format:**
  :SBUS:I2C:DATA:SOURce {CHANnel1|CHANnel2}
  :SBUS:I2C:DATA:SOURce?
- **Functional description:**
  This command is used to set I2C bus data source of the oscilloscope.
- **Return format:**
  Query returns {CHANnel1|CHANnel2}.
- **For example:**
  :SBUS:I2C:DATA:SOURce CHANnel1 Set channel 1 as I2C bus data source.
  :SBUS:I2C:DATA:SOURce? Query returns CHANnel1.

:SBUS:I2C:ASIZe

- **Command format:**
  :SBUS:I2C:ASIZe {7|10}
  :SBUS:I2C:ASIZe?
- **Functional description:**
  This command is used to set I2C bus address bit wide of the oscilloscope.
- **Return format:**
  Query returns {7|10}.
- **For example:**
  :SBUS:I2C:ASIZe 7 Set I2C bus address bit wide to 7.
  :SBUS:I2C:ASIZe? Query returns 7.

:SBUS:I2C:ADIRection

- **Command format:**
  :SBUS:I2C:ADIRection {READ|WRITE|ANY}
  :SBUS:I2C:ADIRection?
- **Functional description:**
  This command is used to set I2C bus address direction of the oscilloscope.
- **Return format:**
  Query returns {READ|WRITE|ANY}.
- **For example:**
  :SBUS:I2C:ADIRection READ Set I2C bus address direction to READ.
  :SBUS:I2C:ADIRection? Query returns READ.

:SBUS:I2C:ADDRess

- **Command format:**

:SBUS:I2C:ADDRess <value>

:SBUS:I2C:ADDRess?

- **Functional description:**

  This command is used to set I2C bus address of the oscilloscope. Binary character string data presented by parameter is 0 or 1, its rang is related to the value set by instruction :SBUS:I2C:ASIZe, which is [0~2^addressbit – 1].

- **Return format:**

  Query returns binary character string address value.

- **For example:**

  :SBUS:I2C:ADDRess "01111111" Set I2C bus address to 0x7F.

  :SBUS:I2C:ADDRess? Query returns 01111111.

:SBUS:I2C:QUALifier

- **Command format:**

  :SBUS:I2C:QUALifier {STARt | RESTart | STOP | LOSS | ADDRess | DATA | ADATA}

  :SBUS:I2C:QUALifier?

- **Functional description:**

  This command is used to set I2C bus trigger condition of the oscilloscope.

- **Return format:**

  Query returns {STARt | RESTart | STOP | LOSS | ADDRess | DATA | ADATA}.

- **For example:**

  :SBUS:I2C:QUALifier STOP Set I2C bus trigger condition to STOP.

  :SBUS:I2C:QUALifier? Query returns STOP.

:SBUS:I2C:DATA:LEN

- **Command format:**

  :SBUS:I2C:DATA:LEN <length>

  :SBUS:I2C:DATA:LEN?

- **Functional description:**

  This command is used to set I2C bus trigger data length of the oscilloscope. It can take value from 1~8.

- **Return format:**

  Query returns I2C bus trigger data length of the oscilloscope, it is integer data.

- **For example:**

  :SBUS:I2C:DATA:LEN 2 Set I2C bus trigger data length to 2 bytes.

  :SBUS:I2C:DATA:LEN? Query returns 2.

:SBUS:I2C:DATA

- **Command format:**

  :SBUS:I2C:DATA <value>

:SBUS:I2C:DATA?

- **Functional description:**

  This command is used to set I2C bus data. Binary character string data presented by parameter is 0 or 1, its data range is 0x0~0xFFFFFFFFFFFFFFFF.

- **Return format:**

  Query returns binary character string data.

- **For example:**

  :SBUS:I2C:DATA "1111111111111111" Set I2C bus data to 0xFFFFF.

  :SBUS:I2C:DATA? Query returns 1111111111111111.

SPI

:SBUS:SPI:CS:SOURce

- **Command format:**

  :SBUS:SPI:CS:SOURce {CHANnel1|CHANnel2}

  :SBUS:SPI:CS:SOURce?

- **Functional description:**

  This command is used to set SPI bus chip selection source of the oscilloscope.

- **Return format:**

  Query returns {CHANnel1|CHANnel2}.

- **For example:**

  :SBUS:SPI:CS:SOURce CHANnel1 Set channel 1 as SPI bus chip selection source.

  :SBUS:SPI:CS:SOURce? Query returns CHANnel1.

:SBUS:SPI:CLOCk:SOURce

- **Command format:**

  :SBUS:SPI:CLOCk:SOURce {CHANnel1|CHANnel2}

  :SBUS:SPI:CLOCk:SOURce?

- **Functional description:**

  This command is used to set SPI bus clock source of the oscilloscope.

- **Return format:**

  Query returns {CHANnel1|CHANnel2}.

- **For example:**

  :SBUS:SPI:CLOCk:SOURce CHANnel1 Set channel 1 as SPI bus clock source.

  :SBUS:SPI:CLOCk:SOURce? Query returns CHANnel1.

:SBUS:SPI:MISO:SOURce

- **Command format:**

  :SBUS:SPI:MISO:SOURce {CHANnel1|CHANnel2 |OFF}

:SBUS:SPI:MISO:SOURce?

- **Functional description:**

  This command is used to set SPI bus master input slaver output source of the osciolloscope.

- **Return format:**

  Query returns {CHANnel1|CHANnel2|OFF}.

- **For example:**

  :SBUS:SPI:MISO:SOURce CHANnel1

  Set channel 1 as SPI bus master input slaver output source.

  :SBUS:SPI:MISO:SOURce? Query returns CHANnel1.

:SBUS:SPI:MOSI:SOURce

- **Command format:**

  :SBUS:SPI:MOSI:SOURce {CHANnel1|CHANnel2|OFF}

  :SBUS:SPI:MOSI:SOURce?

- **Functional description:**

  This command is used to set SPI bus master output slaver input source of the osciolloscope.

- **Return format:**

  Query returns {CHANnel1|CHANnel2|OFF}.

- **For example:**

  :SBUS:SPI:MOSI:SOURce CHANnel1

  Set channel 1 as SPI bus master output slaver input source.

  :SBUS:SPI:MOSI:SOURce? Query returns CHANnel1.

:SBUS:SPI:BITorder

- **Command format:**

  :SBUS:SPI:BITorder {LSBFirst | MSBFirst}

  :SBUS:SPI:BITorder?

- **Functional description:**

  This command is used to set SPI bus decoding byte order of the oscilloscope, which includes LSBFirst and MSBFirst.

- **Return format:**

  Query returns {LSBFirst | MSBFirst}.

- **For example:**

  :SBUS:SPI:BITorder LSBF Set SPI bus decoding byte order to LSB.

  :SBUS:SPI:BITorder? Query returns LSBFirst.

:SBUS:SPI:CS:POLarity

- **Command format:**

:SBUS:SPI:CS:POLarity {NEGative | POSitive}

:SBUS:SPI:CS:POLarity?

- **Functional description:**

  This command is used to set SPI bus chip selection polarity of the oscilloscope, which includes POSitive and NEGative.

- **Return format:**

  Query returns {NEGative | POSitive}.

- **For example:**

  :SBUS:SPI:CS:POLarity POSitive Set SPI bus chip selection polarity to POSitive.

  :SBUS:SPI:CS:POLarity? Query returns POSitive.

:SBUS:SPI:CLOCk:POLarity

- **Command format:**

  :SBUS:SPI:CLOCk:POLarity {NEGative | POSitive}

  :SBUS:SPI:CLOCk:POLarity?

- **Functional description:**

  This command is used to set SPI bus clock polarity of the oscilloscope, which includes POSitive and NEGative.

- **Return format:**

  Query returns {NEGative | POSitive}.

- **For example:**

  :SBUS:SPI:CLOCk:POLarity POSitive Set SPI bus clock polarity to POSitive.

  :SBUS:SPI:CLOCk:POLarity? Query returns POSitive.

:SBUS:SPI:MISO:POLarity

- **Command format:**

  :SBUS:SPI:MISO:POLarity {NEGative | POSitive}

  :SBUS:SPI:MISO:POLarity?

- **Functional description:**

  This command is used to set the polarity of SPI bus master input slaver output source of the osciolloscope, which includes POSitive and NEGative.

- **Return format:**

  Query returns {NEGative | POSitive}.

- **For example:**

  :SBUS:SPI:MISO:POLarity POSitive

  Set the polarity of SPI bus master input slaver output source to POSitive.

  :SBUS:SPI:MISO:POLarity? Query returns POSitive.

:SBUS:SPI:MOSI:POLarity

- **Command format:**
  :SBUS:SPI:MOSI:POLarity {NEGative | POSitive}
  :SBUS:SPI:MOSI:POLarity?
- **Functional description:**
  This command is used to set the polarity of SPI bus master output slaver intput source of the osciolloscope, which includes POSitive and NEGative.
- **Return format:**
  Query returns {NEGative | POSitive}.
- **For example:**
  :SBUS:SPI:MOSI:POLarity POSitive
  Set the polarity of SPI bus master output slaver intput source to POSitive
  :SBUS:SPI:MOSI:POLarity? Query returns POSitive

:SBUS:SPI:WIDTh

- **Command format:**
  :SBUS:SPI:WIDTh {4 | 8 | 12 | 16}
  :SBUS:SPI:WIDTh?
- **Functional description:**
  This command is used to set SPI bus data bit width of the osciolloscope.
- **Return format:**
  Query returns {4 | 8 | 12 | 16}.
- **For example:**
  :SBUS:SPI:WIDTh 4 Set SPI bus data bit width to 4.
  :SBUS:SPI:WIDTh? Query returns 4.

:SBUS:SPI:FRAMelen

- **Command format:**
  :SBUS:SPI:FRAMelen <len>
  :SBUS:SPI:FRAMelen?
- **Functional description:**
  This command is used to set SPI bus data frame length of the osciolloscope.
- **Return format:**
  Query returns <len>.
- **For example:**
  :SBUS:SPI:FRAMelen 1 Set SPI bus data frame length to 1.
  :SBUS:SPI:FRAMelen? Query returns 1.

:SBUS:SPI:DATA

- **Command format:**
  :SBUS:SPI:DATA <value>

  :SBUS:SPI:DATA?
- **Functional description:**
  This command is used to set SPI bus data of the oscilloscope. Binary character string data presented by parameter is 0, 1 or X, X represents uncertainty, its data range is 0x0~0xFFFFFFFFFFFFFFFF.
- **Return format:**
  Query returns binary character string data.
- **For example:**
  :SBUS:SPI:DATA "X00X00X1" Set SPI bus data to X00X00X1.
  :SBUS:SPI:DATA? Query returns X00X00X1.

:SBUS:SPI:QUALifier

- **Command format:**
  :SBUS:SPI:QUALifier {IDLE|IDLEDATA}
  :SBUS:SPI:QUALifier?
- **Functional description:**
  This command is used to set SPI bus condition of the oscilloscope.
- **Return format:**
  Query returns {IDLE|IDLEDATA}.
- **For example:**
  :SBUS:SPI:QUALifier IDLE Set SPI bus condition to IDLE.
  :SBUS:SPI:QUALifier? Query returns IDLE.

:SBUS:SPI:TRIGger:TIMeout

- **Command format:**
  :SBUS:SPI:TRIGger:TIMeout <vlaue>
  :SBUS:SPI:TRIGger:TIMeout?
- **Functional description:**
  This command is used to set SPI bus trigger timeout of the oscilloscope, parameter is integer. <vlaue> equal to n * 4ns and value not exceed range [100ns,1s). n take value from [25,25*10^8].
- **Return format:**
  Query returns trigger timeout value in scientific notation, unit is s.
- **For example:**
  :SBUS:SPI:TRIGger:TIMeout 100ns Set SPI bus trigger timeout value to 100ns.
  :SBUS:SPI:TRIGger:TIMeout? Query returns 1.000e-007.

CAN

This command is used to set CAN bus decoding and trigger.

:SBUS:CAN:SOURce

- **Command format:**
  :SBUS:CAN:SOURce {CHANnel1|CHANnel2 }
  :SBUS:CAN:SOURce?
- **Functional description:**
  This command used to set CAN bus input source of the oscilloscope.
- **Return format:**
  Query returns {CHANnel1|CHANnel2}.
- **For example:**

:SBUS:CAN:SOURce CHANnel1	Set channel 1 as CAN bus input source.
:SBUS:CAN:SOURce?	Query returns CHANnel1.

:SBUS:CAN:SIGNal:DEFinition

- **Command format:**
  :SBUS:CAN:SIGNal:DEFinition { CANH | CANL}
  :SBUS:CAN:SIGNal:DEFinition?
- **Functional description:**
  This command used to set CAN bus signal type of the oscilloscope.
- **Return format:**
  Query returns { CANH | CANL}.
- **For example:**

:SBUS:CAN:SIGNal:DEFinition CANH	Set channel 1 as CAN bus signal CANH.
:SBUS:CAN:SIGNal:DEFinition?	Query returns CANH.

:SBUS:CAN:SIGNal:BAUDrate

- **Command format:**
  :SBUS:CAN:SIGNal:BAUDrate <baudrate>
  :SBUS:CAN:SIGNal:BAUDrate?
- **Functional description:**
  This command used to set baud rate of CAN bus signal of the oscilloscope, <baudrate> range is 10000~1000000, unit is bps.
- **Return format:**
  Query returns baud rate of signal.
- **For example:**
  :SBUS:CAN:SIGNal:BAUDrate 100000
  Set the baud rate of CAN bus signal to 100kbps.

:SBUS:CAN:SIGNal:BAUDrate? Query returns 100000.

:SBUS:CAN:QUALifier

- **Command format:**
  :SBUS:CAN:QUALifier {START|ID|DATA|ACKerror|BITFILL|IDDATA|END}
  :SBUS:CAN:QUALifier?
- **Functional description:**
  This command is used to set CAN bus trigger condition of the oscilloscope.
  {START|ID|DATA|ACKerror|BITFILL|IDDATA|END}, it respectively represents start, identifier, data frame, lost confirming, bit stuffing, identifier &data and end.
- **Return format:**
  Query returns {START | ID | DATA | ACKerror | BITFILL | IDDATA | END}.
- **For example:**
  :SBUS:CAN:QUALifier ACK Set CAN bus trigger condition to ACKerror.
  :SBUS:CAN:QUALifier? Query returns ACKerror.

:SBUS:CAN:FRAMe:TYPE

- **Command format:**
  :SBUS:CAN:FRAMe:TYPE { DATA | REMote | OVERload | ERRor }
  :SBUS:CAN:FRAMe:TYPE?
- **Functional description:**
  This command is used to set CAN bus trigger frame type of the oscilloscope.
- **Return format:**
  Query returns { DATA | REMote | OVERload | ERRor }.
- **For example:**
  :SBUS:CAN:FRAMe:TYPE ERRor Set CAN bus trigger frame type to ERRor.
  :SBUS:CAN:FRAMe:TYPE? Query returns ERRor.

:SBUS:CAN:ID:MODE

- **Command format:**
  :SBUS:CAN:ID:MODE {STANdard | EXTended}
  :SBUS:CAN:ID:MODE?
- **Functional description:**
  This command is used to set ID identifier frame format of CAN bus of the oscilloscope.
- **Return format:**
  Query returns {STANdard | EXTended}.
- **For example:**
  :SBUS:CAN:ID:MODE STANdard
  Set ID identifier frame format of CAN bus to STANdard.
  :SBUS:CAN:ID:MODE? Query returns STANdard.

:SBUS:CAN:ID

- **Command format:**
  :SBUS:CAN:ID <string>
  :SBUS:CAN:ID?
- **Functional description:**
  This command is used to set ID identifier frame data of CAN bus of the oscilloscope. Set the corresponding ID identifier according by the mode of :SBUS:CAN:ID:MODE. Binary character string data presented by parameter is 0, 1 or X, X represents uncertainty.
  Standard frame range is 0x0~0xFFF; Extend frame range is 0x0~0xFFFFF.
- **Return format:**
  Query returns binary character data.
- **For example:**

:SBUS:CAN:ID "X00X00X1"	Set ID identifier frame data of CAN bus to X00X00X1.
:SBUS:CAN:ID?	Query returns X00X00X1.

:SBUS:CAN:ID:DIRection

- **Command format:**
  :SBUS:CAN:ID:DIRection { READ | WRITE | ANY}
  :SBUS:CAN:ID:DIRection?
- **Functional description:**
  This command is used to set ID identifier direction of CAN bus of the oscilloscope.
- **Return format:**
  Query returns { READ | WRITE | ANY}.
- **For example:**

:SBUS:CAN:ID:DIRection READ	Set ID identifier direction of CAN bus to READ.
:SBUS:CAN:ID:DIRection?	Query returns READ.

:SBUS:CAN:DATA:LEN

- **Command format:**
  :SBUS:CAN:DATA:LEN <length>
  :SBUS:CAN:DATA:LEN?
- **Functional description:**
  This command is used to set trigger data length of CAN bus of the oscilloscope. It can take value from 1~8.
- **Return format:**
  Query returns trigger data length of CAN bus of the oscilloscope, it is integer data.
- **For example:**

:SBUS:CAN:DATA:LEN 2	Set trigger data length of CAN bus to 2 bytes.
:SBUS:CAN:DATA:LEN?	Query returns 2.

:SBUS:CAN:DATA

- **Command format:**
  :SBUS:CAN:DATA <string>
  :SBUS:CAN:DATA?
- **Functional description:**
  This command is used to set CAN bus data of the oscilloscope. Binary character string data presented by parameter is 0, 1 or X, X represents uncertainty. Its data range is 0x0~0xFFFFFFFFFFFFFFFF.
- **Return format:**
  Query returns binary character data.
- **For example:**
  :SBUS:CAN:DATA "X00X00X1" Set CAN bus data to X00X00X1.
  :SBUS:CAN:DATA? Query returns X00X00X1.

LIN

:SBUS:LIN:SOURce

- **Command format:**
  :SBUS:LIN:SOURce {CHANnel1|CHANnel2 }
  :SBUS:LIN:SOURce?
- **Functional description:**
  This command is used to set LIN bus decoding source of the oscilloscope.
- **Return format:**
  Query returns {CHANnel1|CHANnel2}.
- **For example:**
  :SBUS:LIN:SOURce CHANnel1 Set channel 1 as LIN bus decoding source.
  :SBUS:LIN:SOURce? Query returns CHANnel1.

:SBUS:LIN:POLarity

- **Command format:**
  :SBUS:LIN:POLarity {NORMal | INVert}
  :SBUS:LIN:POLarity?
- **Functional description:**
  This command is used to set LIN bus polarity of the oscilloscope, which includes NORMal (normal, high =1) and INVert (invert, high=0).
- **Return format:**
  Query returns {NORMal | INVert}.
- **For example:**
  :SBUS:LIN:POLarity NORMal Set LIN bus polarity to NORMal.
  :SBUS:LIN:POLarity? Query returns POSitive.

:SBUS:LIN:VERSion

- **Command format:**
  :SBUS:LIN:VERSion {VER1|VER2|ANY}
  :SBUS:LIN:VERSion?
- **Functional description:**
  This command is used to set LIN bus version of the oscilloscope.
  {VER1| VER2|ANY}: V1.x, V2.x, and random version.
- **Return format:**
  Query returns {VER1| VER2|ANY}.

- **For example:**

:SBUS:LIN:VERSion VER1	Set LIN bus version to V1.x version.
:SBUS:LIN:VERSion?	Query returns POSitive.

:SBUS:LIN:SIGNal:BAUDrate

- **Command format:**
  :SBUS:LIN:SIGNal:BAUDrate <baudrate>
  :SBUS:LIN:SIGNal:BAUDrate?
- **Functional description:**
  This command is used to set baud rate of LIN bus signal of the oscilloscope. <baudrate> range is 1~100000, unit is bps.
- **Return format:**
  Query returns baud rate of signal.
- **For example:**

:SBUS:LIN:SIGNal:BAUDrate 100000	Set baud rate of LIN bus signal to 100kbps.
:SBUS:LIN:SIGNal:BAUDrate?	Query returns 100000.

:SBUS:LIN:PARity:DISPlay

- **Command format:**
  :SBUS:LIN:PARity:DISPlay {{1|ON}|{0|OFF}}
  :SBUS:LIN:PARity:DISPlay?
- **Functional description:**
  This command is used to set LIN bus ID parity bit of the oscilloscope, which can set to ON (yes) or OFF (no).
- **Return format:**
  Query returns 1 or 0, it respectively represents ON of OFF.
- **For example:**

:SBUS:LIN:PARity:DISPlay ON	LIN bus decoding ID includes parity bit.
:SBUS:LIN:PARity:DISPlay?	Query returns 1.

:SBUS:LIN:DATA:LENGth:DISPlay

- **Command format:**
  :SBUS:LIN:DATA:LENGth:DISPlay {{1|ON}|{0|OFF}}
  :SBUS:LIN:DATA:LENGth:DISPlay?
- **Functional description:**
  This command is used to set LIN bus ID whether set data length of the oscilloscope, which can set to ON (yes) or OFF (no).
- **Return format:**
  Query returns 1 or 0, it respectively represents ON of OFF.
- **For example:**
  :SBUS:LIN:DATA:LENGth:DISPlay ON
  LIN bus decoding ID includes the setting data length.
  :SBUS:LIN:DATA:LENGth:DISPlay? Query returns 1.

:SBUS:LIN:DATA:LENGth

- **Command format:**
  :SBUS:LIN:DATA:LENGth <length>
  :SBUS:LIN:DATA:LENGth?
- **Functional description:**
  This command is used to set the length of LIN bus setting data of the oscilloscope, setting data length is opend by default when using this instruction.
  <length>: data length, it is integer data type, range is 1~8.
- **Return format:**
  Query returns data length.
- **For example:**
  :SBUS:LIN:DATA:LENGth 6 Set LIN bus decoding setting data length to 6.
  :SBUS:LIN:DATA:LENGth? Query returns 6.

:SBUS:LIN:QUALifier

- **Command format:**
  :SBUS:LIN:QUALifier {SYNC|ID|DATA|IDDATA|WAKE|SLEEP|ERROR}
  :SBUS:LIN:QUALifier?
- **Functional description:**
  This command is used to set LIN bus trigger condition of the oscilloscope.
  {SYNC|ID|DATA|IDDATA|WAKE|SLEEP|ERROR}: synchronization, identifier, data, ID and data, wake frame, sleep frame, error.
- **Return format:**
  Query returns {SYNC|ID|DATA|IDDATA|WAKE|SLEEP|ERROR}.
- **For example:**
  :SBUS:LIN:QUALifier SYNC Set LIN bus trigger condition to SYNC.

:SBUS:LIN:QUALifier? Query returns SYNC.

:SBUS:LIN:ID

- **Command format:**
  :SBUS:LIN:ID <string>
  :SBUS:LIN:ID?
- **Functional description:**
  This command is used to set LIN bus indetifier data of the oscilloscope. Binary character data presented by parameter 0, 1 or X, X represents uncertainty. Its range is 0x0~0xFFFFFFFFFFFFFFFF.
- **Return format:**
  Query returns binary character string data.
- **For example:**
  :SBUS:LIN:ID "X00X00X1" Set LIN bus indetifier data to X00X00X1.
  :SBUS:LIN:ID? Query returns X00X00X1.

:SBUS:LIN:TRIGger:DATA:LENGth

- **Command format:**
  :SBUS:LIN:TRIGger:DATA:LENGth <length>
  :SBUS:LIN:TRIGger:DATA:LENGth?
- **Functional description:**
  This command is used to set LIN bus trigger data length of the oscilloscope. It can take value from 1~8.
- **Return format:**
  Query returns LIN bus trigger data length of the oscilloscope, it is integer data.
- **For example:**
  :SBUS:LIN:TRIGger:DATA:LENGth 2 Set LIN bus trigger data length to 2 bytes.
  :SBUS:LIN:TRIGger:DATA:LENGth? Query returns 2.

:SBUS:LIN:DATA

- **Command format:**
  :SBUS:LIN:DATA <string>
  :SBUS:LIN:DATA?
- **Functional description:**
  This command is used to set LIN bus data of the oscilloscope. Binary character data presented by parameter 0, 1 or X, X represents uncertainty. Its range is 0x0~0Xffffffffffffffff.
- **Return format:**
  Query returns binary character string data.
- **For example:**
  :SBUS:LIN:DATA "X00X00X1" Set LIN bus data to X00X00X1.
  :SBUS:LIN:DATA? Query returns X00X00X1.

:SBUS:LIN:ERRor:TYPE

- **Command format：**
  :SBUS:LIN:ERRor:TYPE { SYNC | PARity | SUM}
  :SBUS:LIN:ERRor:TYPE?
- **Functional description：**
  This command is used to set error type of LIN bus trigger condition of the oscilloscope.
  {SYNC | PARity | SUM}: synchronization, ID parity bit, checksum.
- **Return format：**
  Query returns { SYNC | PARity | SUM}.
- **For example：**

:SBUS:LIN:ERRor:TYPE SYNC	Set LIN bus trigger condition to SYNC.
:SBUS:LIN:ERRor:TYPE?	Query returns SYNC.

Explanation of Programming

This chapter is to describe troubleshooting in process of programming. If you meet any of the following problems, please handle them according to the related instructions.

Programming Preparation

Programming preparation is only applicable for using Visual Studio and LabVIEW development tools to programming under Windows operating system.

Firstly, user need to confirm that whether NI –VISA libray is installed (it can be download from the website https://www.ni.com/en-ca/support/downloads/drivers/download.ni-visa.html).

In this manual, the default installment path is C:\Program Files\IVI Foundation\VISA.

Build communication with PC via USB or LAN interface of the instrument, use USB data line to connect USB DEVICE port on the rear panel of the instrument with USB port of PC, or use LAN data line to connect LAN port on the rear panel of the instrument with LAN port of PC.

VISA Programming Example

There are some example in this section. Throught these examples, user can know how to use VISA, and it can combined with the command of programming manual to realize the control of the instrument. With these examples, user can develop more applications.

VC++ Example

- Environment:Window system,Visual Studio

- Decription: Access the instrument via USBTMC and TCP/IP, and send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Open Visual Studio software to create a new VC++ win32 console project.
2. Set project environment that can adjust NI-VISA libray, which are static library and dynamic library.

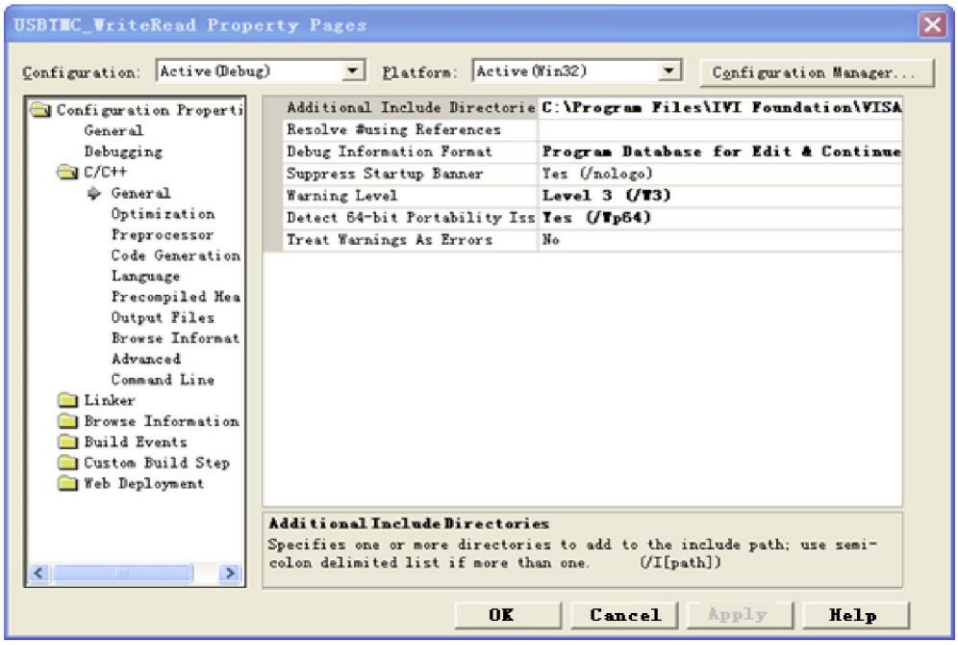
a) Static library:

In NI-VISA installment path to find file visa.h, visatype.h and visa32.lib and copy them to the root path of VC++ project and add it to the project. Add two lines of code into file projectname.cpp as follows.

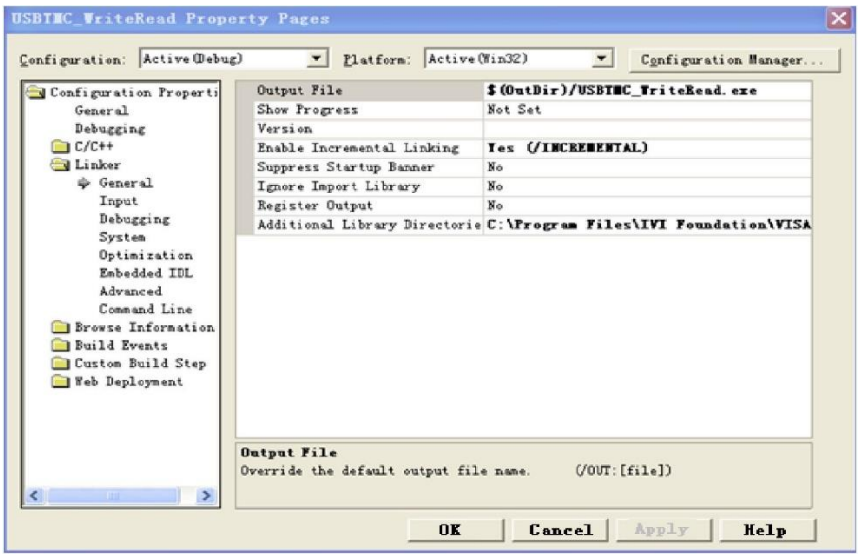
```
#include "visa.h"
#pragma comment(lib,"visa32.lib")
```

b) Dynamic library:

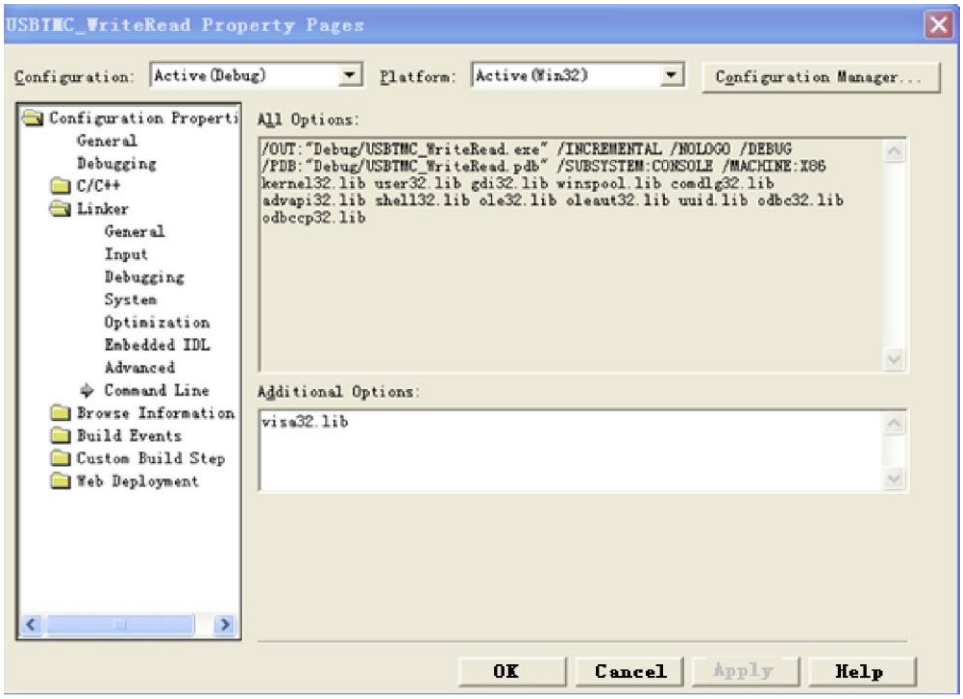
Press "project>>properties", select"c/c++---General" in attribute dialog on the leftside, set the value of "Additional Include Directories" as the installment path of NI-VIS (such as C:\ProgramFiles\IVI Foundation\VISA\WinNT\include), as shown in the following figure.



Select "Linker-General" in attribute dialog on the leftside, set the value of "Additional Library Directories" as the installment path of NI-VIS (such as C:\Program Files\IVI Foundation\VISA\WinNT\include), as shown in the following figure.



Select “Linker-Command Line ”in attribute dialog on the leftside, set the value of "Additional" as visa32.lib, as shown in the following figure.



Add file visa.h in projectname.cpp file

#include <visa.h>

1. Source code:

a) USBTMC Example

```
int usbtmc_test()
{ /** This code demonstrates sending synchronous read & write commands
    * to an USB Test & Measurement Class (USBTMC) instrument using NI-VISA
    * The example writes the "*IDN?\n" string to all the USBTMC
    * devices connected to the system and attempts to read back
```

```
* results using the write and read functions.
* Open Resource Manager
* Open VISA Session to an Instrument
* Write the Identification Query Using viPrintf
* Try to Read a Response With viScanf
* Close the VISA Session*/
ViSession defaultRM;
ViSession instr;
ViUInt32 numInstrs;
ViFindList findList;
ViStatus status;
char instrResourceString[VI_FIND_BUFLEN];

unsigned char buffer[100];
int i;

status = viOpenDefaultRM(&defaultRM);
if (status < VI_SUCCESS)
{
        printf("Could not open a session to the VISA Resource Manager!\n");
        return status;
}
/*Find all the USB TMC VISA resources in our system and store the number of resources in the system in numInstrs.*/
status = viFindRsrc(defaultRM, "USB?*INSTR", &findList, &numInstrs, instrResourceString);
if (status<VI_SUCCESS)
{
        printf("An error occurred while finding resources. \nPress Enter to continue.");
        fflush(stdin);
        getchar();
        viClose(defaultRM);
        return status;
}
/** Now we will open VISA sessions to all USB TMC instruments.
*       We must use the handle from viOpenDefaultRM and we must
*       also use a string that indicates which instrument to open. This
*       is called the instrument descriptor. The format for this string
*       can be found in the function panel by right clicking on the
*       descriptor parameter. After opening a session to the
*       device, we will get a handle to the instrument which we
*       will use in later VISA functions. The AccessMode and Timeout
*       parameters in this function are reserved for future
*       functionality. These two parameters are given the value VI_NULL. */
for (i = 0; i < int(numInstrs); i++)
```

```
{
    if (i > 0)
    {
        viFindNext(findList, instrResourceString);
    }
    status = viOpen(defaultRM, instrResourceString, VI_NULL, VI_NULL, &instr);
    if (status < VI_SUCCESS)
    {
        printf("Cannot open a session to the device %d. \n", i + 1);
        continue;
    }
    /** At this point we now have a session open to the USB TMC instrument.
    *We will now use the viPrintf function to send the device the string "*IDN?\n",

    *asking for the device's identification. */

    char * cmmand = "*IDN?\n";
    status = viPrintf(instr, cmmand);
    if (status < VI_SUCCESS)
    {
        printf("Error writing to the device %d. \n", i + 1);
        status = viClose(instr);
        continue;
    }
    /** Now we will attempt to read back a response from the device to
    *the identification query that was sent. We will use the viScanf
    *function to acquire the data.
    *After the data has been read the response is displayed. */
    status = viScanf(instr, "%t", buffer);
    if (status < VI_SUCCESS)
    {
        printf("Error reading a response from the device %d. \n", i + 1);
    }
    else
    {
        printf("\nDevice %d: %s\n", i + 1, buffer);
    }
    status = viClose(instr);
}
/*Now we will close the session to the instrument using viClose. This operation frees all
system resources.*/
status = viClose(defaultRM);
printf("Press Enter to exit.");
fflush(stdin);
```

```
    getchar();
    return 0;
}

int _tmain(int argc, _TCHAR* argv[ ])
{
    usbtmc_test();
    return 0;
}
```

b) TCP/IP Example

```
int tcp_ip_test(char *pIP)
{
    char outputBuffer[ VI_FIND_BUFLEN ];
    ViSession defaultRM, instr;
    ViStatus status;
    /* First we will need to open the default resource manager. */
    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
        printf("Could not open a session to the VISA Resource Manager!\n");
    }
    /* Now we will open a session via TCP/IP device */
    char head[ 256 ] = "TCPIP0::";
    char tail[ ] = "::inst0::INSTR";
    strcat(head, pIP);
    strcat(head, tail);
    status = viOpen(defaultRM, head, VI_LOAD_CONFIG, VI_NULL, &instr);
    if (status < VI_SUCCESS)
    {
        printf("An error occurred opening the session\n");
        viClose(defaultRM);
    }
    status = viPrintf(instr, "*idn?\n");
    status = viScanf(instr, "%t", outputBuffer);
    if (status < VI_SUCCESS)
    {
        printf("viRead failed with error code: %x \n", status);
        viClose(defaultRM);
    }
    else
    {
        printf("\nMesseage read from device: %*s\n", 0, outputBuffer);
    }
```

```
        status = viClose(instr);
        status = viClose(defaultRM);
        printf("Press Enter to exit.");
        fflush(stdin);
        getchar();
        return 0;
    }
    int _tmain(int argc, _TCHAR* argv[ ])
    {
        printf("Please input IP address:");
        char ip[256];
        fflush(stdin);

        gets(ip);
        tcp_ip_test(ip);
        return 0;
    }
```

C# Example

- Environment:Window system, Visual Studio
- Description: Access the instrument via USBTMC and TCP/IP, and send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Open Visual Studio software and create a new C# console project.
2. Add C# quote Ivi.Visa.dll and NationalInstruments.Visa.dll of VISA.
3. Source code:

a) USBTMC Example

```
class Program
{
    void usbtmc_test()
    {
        using (var rmSession = new ResourceManager())
        {
            var resources = rmSession.Find("USB?*INSTR");
            foreach (string s in resources)
            {
                try
                {
                    var mbSession = (MessageBasedSession)rmSession.Open(s);
                    mbSession.RawIO.Write("*IDN?\n");
                    System.Console.WriteLine(mbSession.RawIO.ReadString());
                }
```

```
                catch (Exception ex)
                {
                    System.Console.WriteLine(ex.Message);
                }
            }
        }
    }

    void Main(string[ ] args)
    {
        usbtmc_test();
    }
}
```

b) TCP/IP Example

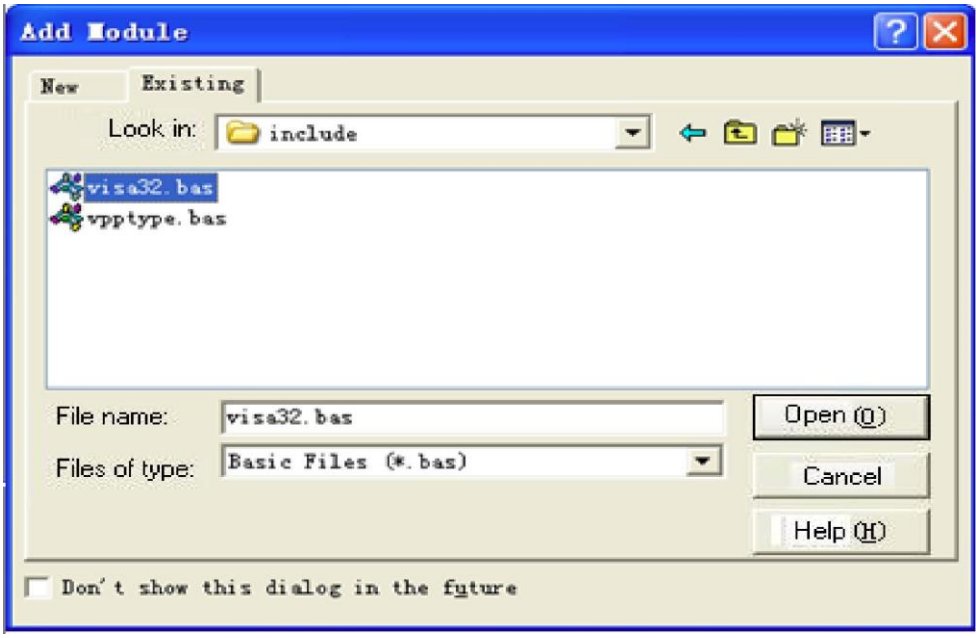
```
class Program
 {
    void tcp_ip_test(string ip)
    {
        using (var rmSession = new ResourceManager())
        {
            try
            {
                var resource = string.Format("TCPIP0::{0}::inst0::INSTR", ip);
                var mbSession = (MessageBasedSession)rmSession.Open(resource);
                mbSession.RawIO.Write("*IDN?\n");
                System.Console.WriteLine(mbSession.RawIO.ReadString());
            }
            catch (Exception ex)
            {
                System.Console.WriteLine(ex.Message);
            }
        }
    }

    void Main(string[ ] args)
    {
        tcp_ip_test("192.168.20.11");
    }
 }
```

VB Example

- Environment: Window systm, Microsoft Visual Basic 6.0.
- Description: Access the instrument via USBTMC and TCP/IP, and send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Open Visual Basic software and create a new standard application program project.
2. Set the project environment that can adjust NI-VISA libray, press Existing tab of Project>>Add Existing Item, in file "include" of NI-VISA installement path to find file visa32.bas and add this file, as shown in the following figure.



3. Source code:

a) USBTMC Example

```
PrivateFunction usbtmc_test() AsLong
' This code demonstrates sending synchronous read & write commands
' to an USB Test & Measurement Class (USBTMC) instrument using NI-VISA
' The example writes the "*IDN?\n" string to all the USBTMC
' devices connected to the system and attempts to read back
' results using the write and read functions.
' The general flow of the code is
' Open Resource Manager
' Open VISA Session to an Instrument
' Write the Identification Query Using viWrite
' Try to Read a Response With viRead
' Close the VISA Session

Const MAX_CNT = 200
Dim defaultRM AsLong
Dim instrsesn AsLong
Dim numInstrs AsLong
Dim findList AsLong
```

```
Dim retCount AsLong
Dim status AsLong
Dim instrResourceString AsString *VI_FIND_BUFLEN
Dim Buffer AsString * MAX_CNT
Dim i AsInteger

' First we must call viOpenDefaultRM to get the manager
' handle. We will store this handle in defaultRM.
status = viOpenDefaultRM(defaultRM)
If(status < VI_SUCCESS) Then
    resultTxt.Text = "Could not open a session to the VISA Resource Manager!"
    usbtmc_test = status
ExitFunction
EndIf

' Find all the USB TMC VISA resources in our system and store the
' number of resources in the system in numInstrs.
status = viFindRsrc(defaultRM, "USB?*INSTR", findList, numInstrs, instrResourceString)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "An error occurred while finding resources."
    viClose(defaultRM)
    usbtmc_test = status
ExitFunction
EndIf

' Now we will open VISA sessions to all USB TMC instruments.
' We must use the handle from viOpenDefaultRM and we must
' also use a string that indicates which instrument to open.    This
' is called the instrument descriptor.    The format for this string
' can be found in the function panel by right clicking on the
' descriptor parameter. After opening a session to the
' device, we will get a handle to the instrument which we
' will use in later VISA functions.    The AccessMode and Timeout
' parameters in this function are reserved for future
' functionality.    These two parameters are given the value VI_NULL.
For i = 0 To numInstrs
If (i > 0) Then
    status = viFindNext(findList, instrResourceString)

EndIf

    status = viOpen(defaultRM, instrResourceString, VI_NULL, VI_NULL, instrsesn)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Cannot open a session to the device " + CStr(i + 1)
```

```
GoTo NextFind
EndIf

' At this point we now have a session open to the USB TMC instrument.
' We will now use the viWrite function to send the device the string "*IDN?",
' asking for the device's identification.
status = viWrite(instrsesn, "*IDN?", 5, retCount)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Error writing to the device."
    status = viClose(instrsesn)
GoTo NextFind
EndIf

' Now we will attempt to read back a response from the device to
' the identification query that was sent.  We will use the viRead
' function to acquire the data.
' After the data has been read the response is displayed.
status = viRead(instrsesn, Buffer, MAX_CNT, retCount)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Error reading a response from the device." + CStr(i + 1)
Else
    resultTxt.Text = "Read from device: " + CStr(i + 1) + " " + Buffer
EndIf
    status = viClose(instrsesn)
Next i

' Now we will close the session to the instrument using
' viClose. This operation frees all system resources.
status = viClose(defaultRM)
usbtmc_test = 0
EndFunction
```

b) TCP/IP Example

```
PrivateFunction tcp_ip_test(ByVal ip AsString) AsLong
Dim outputBuffer AsString * VI_FIND_BUFLEN
Dim defaultRM AsLong
Dim instrsesn AsLong
Dim status AsLong
Dim count AsLong

' First we will need to open the default resource manager.
status = viOpenDefaultRM(defaultRM)
If (status < VI_SUCCESS) Then
    resultTxt.Text = "Could not open a session to the VISA Resource Manager!"
```

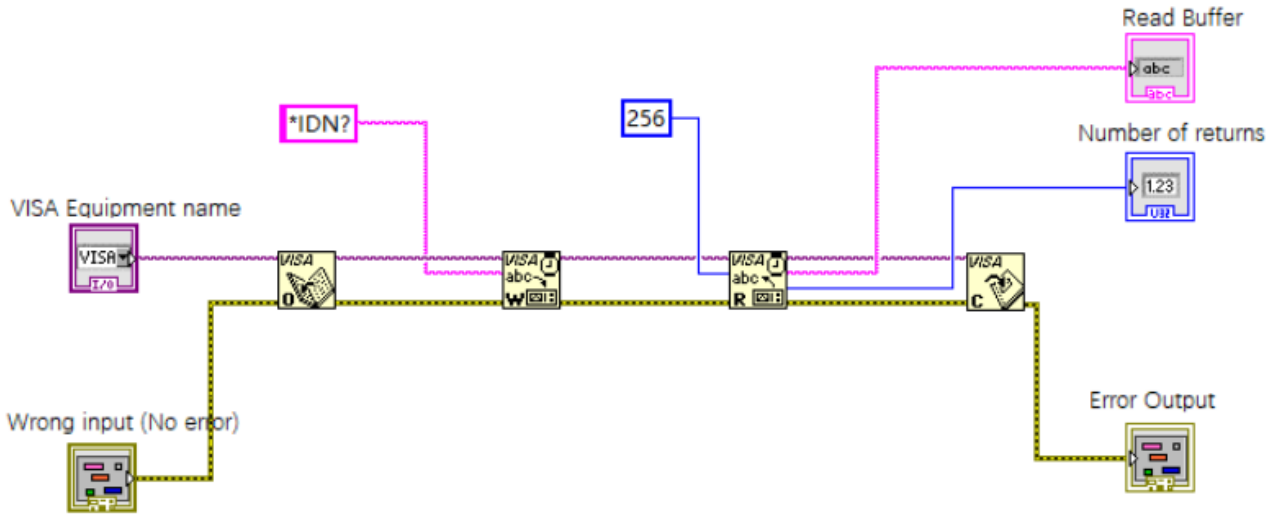
```
        tcp_ip_test = status
    ExitFunction
    EndIf

    ' Now we will open a session via TCP/IP device
    status = viOpen(defaultRM, "TCPIP0::" + ip + "::inst0::INSTR", VI_LOAD_CONFIG, VI_NULL, instrsesn)
    If (status < VI_SUCCESS) Then
        resultTxt.Text = "An error occurred opening the session"
        viClose(defaultRM)
        tcp_ip_test = status
    ExitFunction
    EndIf
    status = viWrite(instrsesn, "*IDN?", 5, count)
    If (status < VI_SUCCESS) Then
        resultTxt.Text = "Error writing to the device."
    EndIf
        status = viRead(instrsesn, outputBuffer, VI_FIND_BUFLEN, count)
    If (status < VI_SUCCESS) Then
        resultTxt.Text = "Error reading a response from the device." + CStr(i + 1)
    Else
        resultTxt.Text = "read from device:" + outputBuffer
    EndIf
        status = viClose(instrsesn)
        status = viClose(defaultRM)
        tcp_ip_test = 0
    EndFunction
```

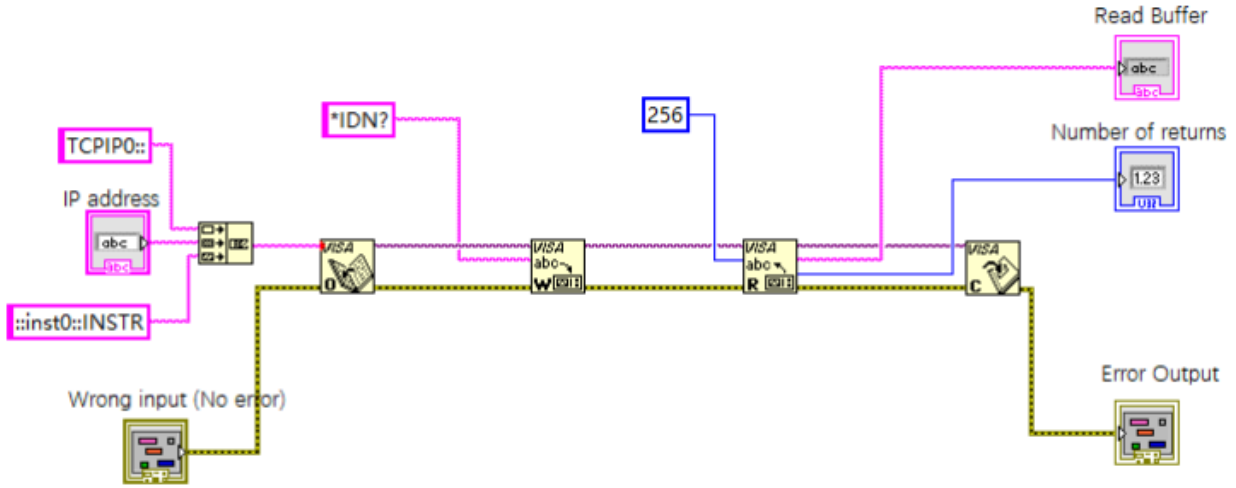
LabVIEW Example

- Environment: Window system, LabVIEW
- Description: Access the instrument via USBTMC and TCP/IP, and send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Open LabVIEW software and create a VI file.
2. Add control, press the front panel interface, select and add VISA resource name, error input, error output and partial indetifier on control flow diagram.
3. Open diagram, press VISA resource name and then select and add function VISA Write, VISA Read, VISA Open and VISA Close on pop-out menu.
4. VI open a VISA session of USBTMC device and wrote *IDN? command and read back the response value. When all communication is complete, VI will close the VISA session.



5. Communication with the device via TCP/IP is similar with USBTMC, it need to set VISA write and read function to synchronous I/O, set LabVIEW to asynchronous IO by default. Right click on the node and select "Synchronous I/O Mode>>Synchronous" from shortcut menu to enable synchronous writing or reading of data, as shown in the following figure.



MATLAB Example

- Environment: Window system, MATLAB
- Description: Access the instrument via USBTMC and TCP/IP, and send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Open MATLAB software, click File>>New>>Script on Matlab interface to create an empty M file.
2. Source code:

a) USBTMC Example

```
function usbtmc_test()
% This code demonstrates sending synchronous read & write commands
% to an USB Test & Measurement Class (USBTMC) instrument using
% NI-VISA
```

```
%Create a VISA-USB object connected to a USB instrument
vu = visa('ni','USB0::0x5345::0x1234::SN20220718::INSTR');

%Open the VISA object created
fopen(vu);

%Send the string "*IDN?",asking for the device's identification.
fprintf(vu,'*IDN?');

%Request the data

outputbuffer = fscanf(vu);

disp(outputbuffer);

%Close the VISA object
fclose(vu);
delete(vu);
clear vu;

end
```

b) TCP/IP Example

```
function tcp_ip_test()
% This code demonstrates sending synchronous read & write commands
% to an TCP/IP instrument using NI-VISA
%Create a VISA-TCPIP object connected to an instrument

%configured with IP address.
vt = visa('ni',['TCPIP0::','192.168.20.11','::inst0::INSTR']);

%Open the VISA object created

fopen(vt);

%Send the string "*IDN?",asking for the device's identification.
fprintf(vt,'*IDN?');

%Request the data
outputbuffer = fscanf(vt);
disp(outputbuffer);

%Close the VISA object
fclose(vt);
```

```
delete(vt);
clear vt;

end
```

Python Example

- Environment: Window system, Python3.8, PyVISA 1.11.0
- Description: Access the instrument via USBTMC and TCP/IP, send "*IDN?" command on NI-VISA to query the device information.
- Steps:

1. Install python firs, and then turn on Python script compiling software, create an empty test.py file.
2. Use pip install PyVISA instruction to install PyVISA, if it cannot install, please refer to this link (https://pyvisa.readthedocs.io/en/latest/)
3. Source code:

a) USBTMC Example

```
import pyvisa
rm = pyvisa.ResourceManager()
rm.list_resources()
my_instrument = rm.open_resource('USB0::0x5345::0x1234::SN20220718::INSTR')
print(my_instrument.query('*IDN?'))
```

b) TCP/TP Example

```
import pyvisa
rm = pyvisa.ResourceManager()
rm.list_resources()
my_instrument = rm.open_resource('TCPIP0::192.168.20.11::inst0::INSTR')
print(my_instrument.query('*IDN?'))
```

Programming Application Example

Set bandwidth limit

When observing the low-frequency signal, it is necessary to reduce the high-frequency noise in the signal, then attenuate the high-frequency signal above 20 MHz in the signal. It can use the following command to set bandwidth limit, such as set channel 1,

CHANnel1:BWLimit ON #turn on bandwidth limit of channel 1.

CHANnel1:BWLimit?

#query returns 1，it represents bandwidth limit of channel 1 has turned on.

Set channel unit

Set channel unit, it can be set as the following command, such as set the unit of channel 1 to A:

CHANnel1:UNITs AMPeres #set the unit of channel 1 to :A.

:CHANnel1:UNITs? #query unit of channel 1.

Set volts/div scale

Set volts/div scale of channel, it can be set as the following command, such as set

volts/div scale of channel 1,

CHANnel1:SCALe 500 mV #set volts/div scale of channel 1 to 500 mV.

CHANnel1:SCALe? #query volts/div scale value of channel 1.

Set timebase scale

Set timebas scale of the oscilloscope, it can be set as the following command,

TIMebase:SCALe 0.005 #set timebase scale of the oscilloscope to 5ms.

TIMebase:SCALe? #query timebase scale of the oscilloscope.

Query amplitude value

User can run the following command to query the amplitude measurement results without opening the measurement window, such as query amplitude value of channel 1 waveform,

MEASure:VPP? CHANnel1 #query amplitude value of channel 1 waveform.

Query rising delay time value

User can run the following command to query rising delay measuring time without opening the measurement window, such as query rising delay value of channel 1 and channel 2,

MEASure:PDELay? CHANnel1, CHANnel2

query rising delay value of channel 1 and channel 2.

Appendix 1：Keypad List

Key	Functional Description	LED
CH1	Channel 1 switch	√
CH2	Channel 2 switch	√
MATH	Mathematical operation and menu	√
AUTO	The control values of the oscilloscope are automatically set to condign display the waveform for observation	
RS	Control the oscilloscope's running status, continuous send this command, the oscilloscope can switch to stop or run	√
TMENu	Trigger menu	
DEFault	Restore to default setting	
HELP	Help system	
HMENu	Horizontal system menu	
DISPlay	Display menu	
F1	Select the first menu item of the current menu	
F2	Select the second menu item of the current menu	
F3	Select the third menu item of the current menu	
F4	Select the fourth menu item of the current menu	
F5	Select the fifth menu item of the current menu	
MENu	Menu display switch	
PSCReen	One-key print or One-key save screen image	
MEASure	Meaurement function	
CURSor	Cursor measurement function and menu	
ACQuire	Sampling menu	
STORage	Storage menu	
UTILity	System auxiliary menu	
FKNob	Multifunction knob	
FKNLeft	Multifunction left knob	

FKNRight	Multifunction right knob	
VPKNob	Vertical position knob	
VPKNLeft	Vertical position left knob	
VPKNRight	Vertical position right knob	
HPKNob	Horizontal position knob	
HPKNLeft	Horizontal position left knob	
HPKNRight	Horizontal position right knob	
TPKNob	Trigger position knob	
TPKNLeft	Trigger position left knob	
TPKNRight	Trigger position right knob	
VBKNob	Voltage benchmark knob	

VBKNLeft	Voltage benchmark left knob	
VBKNRight	Voltage benchmark right knob	
TBKNob	Time benchmark knob	
TBKNLeft	Time benchmark left knob	
TBKNRight	Time benchmark right knob	
DECODE	Decoding key	

Appendix 2：IEEE 488.2 Binary Data Format

DATA is data flow, other is ASCII character, as shown in the following figure<#812345678 + DATA + \n>

Start（1Byte）	Length Bit Wide（1Byte）	Total Data Length（Bit Wide Byte）	DATA（n Byte）	End（1Byte）
#	x	xxxxxxxx	.....	\n