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XSA1000 Series Spectrum Analyzer
Programming Guide

Contents

SCPI Introduction

SCPI (Standard Commands for Programmable Instrument) is a standard instruction set for programmable devices under IEEE 488.2. SCPI commands are divided into two parts: IEEE 488.2 Common Commands and SCPI Instrument Specific Control Commands.

Common commands are commands that the instrument specified in IEEE 488.2 must support. Its syntax and semantics follow IEEE 488.2. Common commands are independent from the measurement and are used to control reset, self-test and status inspection. For an introduction of SCPI common commands, refer to the relative chapter below.

SCPI instrument-specific control commands are used to measure, read data, and toggle switches, including all measurement functions and specific functions.。

Command Format

The SCPI command is a tree hierarchy that includes multiple subsystems, each consisting of a root key and one or more level keys. The command line usually begins with a colon ":"; the keywords are separated by the colon ":" followed by the optional parameter settings; the question mark "?" is added after the command line to query this function; the commands and parameters separate with "space".

E.g
:CALCulate:BANDwidth:NDB <rel_ampl>
:CALCulate:BANDwidth:NDB?
CALCulate is the root keyword of the command, BANDwidth and NDB are the second level, third level keywords. The command line starts with a colon ":" and at the same time separates keywords at all levels, <rel_ampl> indicates configurable parameters; the question mark "?" indicates a query; the command: CALCulate: BANDwidth: NDB and parameter <rel_ampl> "separate.

In some commands with parameters, it is common to use commas "," to separate the parameters, for example:
:SYSTem:DATE <year>,<month>,<day>

Symbol Description

The following four symbols are not part of the SCPI command, but are usually used to assist in specifying the parameters in the command.。

Brace { }
Parameters in brace are optional and can be set one or more times or even don't set them. E.g:

The frequency and magnitude of {, <freq>, <rel_ampl>} in the command [:: SENSe]: CORRection: CSET <n>: DATA <freq>, <rel ampl> {, <freq>, <rel ampl>} can be omitted, or to set one or more pairs of frequency and amplitude parameters.

Vertical bar |
Vertical bars are used to separate multiple parameter options, one of which must be selected when sending commands. E.g,
In DISPlay: MENU: STATe OFF | ON | 0 | 1 command, the parameters that can be selected are "OFF", "ON", "0" or "1".

Square bracket [ ]
The contents of the square bracket (command key) are optional and are executed regardless of whether they are omitted. E.g
[:SENSe]:CORRection:OFFSet[:MAGNitude]?
The effect of sending the following three commands is the same:
:CORRection:OFFSet?
:CORRection:OFFSet:MAGNitude?
:SENSe:CORRection:OFFSet?

Triangle bracket < >
The parameters in the triangle brackets must be replaced with a valid value. E.g:
:DISPlay:BRIGtness <integer>
:DISPlay:BRIGtness 10

Parameter Type

The parameters contained in the commands described in this manual can be divided into the following six types: Bool, Keywords, Integer, Continuous Real, Discrete, and ASCII Character Strings.

Bool
The parameter is set to "OFF", "ON", "0" or "1". E.g
:DISPlay:MENU:STATe OFF|ON|0|1

Keyword
The value of the parameter is the listed value. E.g
:DISPlay:AFUnction:POSition BOTTom|CENTer|TOP
Parameters is "BOTTom"、"CENTer" or "TOP"。

Integer
Unless otherwise specified, parameters can take any integer value within the valid range. Please note, do not set the parameter to decimal format at this moment, otherwise the error situation will appear. E.g:
:DISPlay:BRIGtness <integer>
The <integer> parameter can take any integer from 0 to 255.

Continuous Real

Parameters within the range of valid values according to the accuracy requirements (usually the default accuracy of six decimal places after the valid value), can be arbitrary value. E.g:

:CALCulate:BANDwidth:NDB <rel_ampl>

The parameter <rel ampl> can use the real number between -100 and 100.

Discrete

Parameters can only take the specified value, and these values are not continuous. E.g,

CALCulate:MARKer<n>:MAXimum:MAX

The parameter <n> can only take values of 1, 2, 3 or 4.

ASCII character string

The parameter is a combination of ASCII characters. E.g,

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

Parameters are date format string.

Command abbreviation

All commands are not case sensitive, you can use all uppercase or lowercase. However, if you want to abbreviate, you must enter all capital letters in the command format, for example:

:CALCulate:BANDwidth:NDB? can be abbreviated into:CALC:BAND:NDB?

Contact information

If you have any questions or needs regarding the use of this product, contact **OWON**:

Service and support phone: **4006 909 365**

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Third-party programming entrance

The analyzer and the computer can communicate through the following interfaces: LAN interface and USB interface. please refer to the product's user manual for the use of various communication interface.

When using commands to program, all command words are sent and recognized as ASCII strings for operation and secondary development.

You can implement the following actions by programming:
● Set the analyzer
● Implement the measurement
Get data from the spectrum analyzer (instrument working status and measurement data results)

SCPI Command Set

In this command set, unless otherwise specified, the query function returns **"N/A"** (without the quotes) when the function is optional and not installed. And when the query function is not turned on or the type does not match, it returns **"ERR"** (without quotes).

IEEE 488.2 Common Commands

The IEEE standard defines some common commands for querying basic information about the instrument or performing common basic operations. The commands usually start with "*" and the command keyword is three characters in length.

*IDN?	
Command format	*IDN?
Description	Query instrument ID string *IDN?
Comment	ID string contains four parts: Company abbreviation + model + serial number + version number

*RST	
Command format	*RST
Description	Reset the instrument to a factory defined condition
Comment	

:CALCulate 5

:CALCulate:MARKer:FCOunt	
Command format	:CALCulate:MARKer:FCOunt[:STATe]
	:CALCulate:MARKer:FCOunt[:STATe]?
Description	Turn on and off the frequency counter
Comment	Turn on and off the frequency counter

:CALCulate:MARKer:FCOunt:RESolution <bw>	
Command format	:CALCulate:MARKer:FCOunt:RESolution
	:CALCulate:MARKer:FCOunt:RESolution？
Description	Set the frequency counter resolution
Comment	<bw> can be 1,10,100,1000

:CALCulate:MARKer:FCOunt:X?	
Command format	:CALCulate:MARKer:FCOunt:X?
Description	Query the frequency counter value
Comment	

:CALibration 6

:CALibration[:ALL]	
Command format	:CALibration[:ALL] :CALibration[:ALL]?
Description	Performs the calibration
Comment	After accessing the user calibration signal, execute: CAL to perform user calibration

:CALibration:RESTore	
Command format	:CALibration:RESTore
Description	Restore default calibration
Comment	

:DISPlay

:DISPlay:WINdow:TRACe:Y:SCALe:RLEVel	
Command format	:DISPlay:WINdow:TRACe:Y:SCALe:RLEVel <ampl>
	:DISPlay:WINdow:TRACe:Y:SCALe:RLEVel?
Description	Set the reference level, the default unit is dBm when the scale type is logarithmic, and the default is mV when the scale type is linear.
	For example:
	:DISP:WIN:TRAC:Y:SCAL:RLEV -10
	Return -10
Comment	The range of <ampl> is -80dBm to + 30dBm
	When the reference level unit changes or the type of scale changes, the range of values also changes accordingly
Default	0dBm
Panel operation	Ampt→Ref Level

:INITiate 8

[:INITiate]:CONTinuous	
Command format	[:INITiate]:CONTinuous OFF|ON|0|1
	[:INITiate]:CONTinuous?
Description	Set the sweep mode, 0 or OFF is single sweep, 1 and ON are
	continuous sweep, for example:
	:INIT:CONT 0
	Return 0
Comment	There are two ways to sweep: single sweep and continuous sweep
Default	ON|1, continuous sweep

:OUTPut

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:OUTPut:TRACe	
Command format	:OUTPut:TRACe:[STATe] ON|1|PFF|1
	:OUTPut:TRACe:[STATe]?
Description	Controls the tracking generator output, for example:
	:OUTP:TRAC 1;
	Return 1
Comment	ON|1 turn on the tracking generator
	OFF|0 turn off the tracking generator
Default	Turn off the tracking generator

[:SENSe]

[:SENSe]:FREQuency:CENTer	
Command format	[:SENSe]:FREQuency:CENTer <freq>
	[:SENSe]:FREQuency:CENTer?
Description	Set the center frequency, in unit GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:FREQ:CENT 200000000 or: FREQ:CENT 200000000Hz
	Return 200000000
Comment	<freq> range between 9kHz to 1.000009GHz
Default	500GHz
Panel operation	✧ Freq➔Center Freq

[:SENSe]:FREQuency:STARt	
Command format	[:SENSe]:FREQuency:STARt <freq>
	[:SENSe]:FREQuency:STARt?
Description	Set the start frequency unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:FREQ:STAR 1000000 or :FREQ:STAR 1MHz
	Return 1000000
Comment	<freq> range between 9kHz to 1.000009GHz
Default	9kHz
Panel operation	✧ FREQ➔Start Freq

[:SENSe]:FREQuency:STOP	
Command format	[:SENSe]:FREQuency:STOP <freq>
	[:SENSe]:FREQuency:STOP?
Description	Set the stop frequency unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:FREQ:STOP 1000000000 or :FREQ:STOP 1GHz
	Return 1000000000
Description	<freq> range between 9kHz to 1.000009GHz
Default	1.000009GHz
Panel operation	✧ FREQ➔Stop Freq

[:SENSe]:FREQuency:CENTer:STEP	
Command format	[:SENSe]:FREQuency:CENTer:STEP <freq>
	[:SENSe]:FREQuency:CENTer:STEP?
Description	Set the center frequency step size, unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:FREQ:CENT:STEP 1000 or :FREQ:CENT:STEP 1KHz
	Return 1000

Comment	<freq> range between 9kHz to 1.000009GHz
Default	100MHz
Panel operation	✧ FREQ➔Freq Step

[:SENSe]:FREQuency:CENTer:STEP:AUTO

Command format	[:SENSe]:FREQuency:CENTer:STEP:AUTO ON|OFF|0|1
	[:SENSe]:FREQuency:CENTer:STEP:AUTO?
Description	Set the center frequency step size to automatic / manual mode, the default is automatic coupling mode, for example:
	:FREQ:CENT:STEP:AUTO ON
	Return 1
Comment	✧ ON|1 indicates auto coupling
	✧ OFF|0 indicates manual input
Default	Auto coupling mode
Panel operation	✧ FREQ➔Freq Step

[:SENSe]:FREQuency:REFerence INTernal\|EXTernal

Command format	[:SENSe]:FREQuency:REFerence INTernal|EXTernal
	[:SENSe]:FREQuency:REFerence?
Description	Set internal and external reference, the default is internal reference, for example:
	:FREQ:REF INT
	Return: INTernal
Comment	INTernal: internal reference
	EXTernal: external reference
Default	INTernal (internal reference)

[:SENSe]:FREQuency:SPAN

Command format	[:SENSe]:FREQuency:SPAN <freq>
	[:SENSe]:FREQuency:SPAN?
Description	Set the frequency span, unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:FREQ:SPAN 1000000 or :FREQ:SPAN 1MHz
	Return 1000000
Comment	<freq> range between 0Hz to 1GHz
	Setting the span to 0 Hz puts the analyzer into zero span.
Default	1GHz
Panel operation	✧ Span➔Span

[:SENSe]:FREQuency:SPAN:FULL

Command format	[:SENSe]:FREQuency:SPAN:FULL
Description	Set full span
Comment	Full span

Default	
Panel operation	✧ Span➔Full Span

[:SENSe]:FREQuency:SPAN:ZERO

Command format	[:SENSe]:FREQuency:SPAN:ZERO
Description	Set zero span
Comment	Zero span, that is, the span is zero, the horizontal axis change from the frequency to time
Default	
Panel operation	✧ Span➔Zero Span

[:SENSe]:FREQuency:SPAN:PREVious

Command format	[:SENSe]:FREQuency:SPAN:PREVious
Description	Set to the previous span
Comment	Set the frequency span to the previous span setting.
Defaul	
Panel operation	✧ Span➔Last Span

:CALCulate:TUNE:AUTO

Command format	:CALCulate:TUNE:AUTO ON|OFF|0|1 :CALCulate:TUNE:AUTO?
Description	Enable/disable the analyzer's auto tune function, the default setting is disable the auto tune function
Comment	ON|1 enables auto tune OFF|0 disables auto tune
Default	Disable auto tune
Panel operation	✧ AUTO

[:SENSe]:BANDwidth\|BWIDth[:RESolution]

Command format	[:SENSe]:BANDwidth[:RESolution] <freq> or [:SENSe]:BWIDth[:RESolution] <freq> [:SENSe]:BANDwidth[:RESolution]? Or [:SENSe]:BWIDth[:RESolution]?
Description	Set the resolution bandwidth. Unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example: :BAND:RES 1000 or :BAND:RES 1KHz Return 1000
Comment	Resolution bandwidth
Default	3MHz
Panel operation	✧ BW➔RBW

[:SENSe]:BANDwidth\|BWIDth[:RESolution]:AUTO

Command format	[:SENSe]:BANDwidth[:RESolution]:AUTO OFF|ON|0|1

	Or [:SENSe]:BWIDth[:RESolution]:AUTO OFF|ON|0|1
	[:SENSe]:BANDwidth[:RESolution]:AUTO？
	Or [:SENSe]:BWIDth[:RESolution]:AUTO？
Description	Switch the resolution bandwidth to auto / manual mode, the default is auto, for example:
	:BAND:RES:AUTO OFF
	Return 0
Comment	✧ ON|1 indicates auto coupling
	✧ OFF|0 indicates manual input
Default	Auto coupling
Panel operation	✧ BW→RBW

[:SENSe]:BANDwidth\|BWIDth[:RESolution]:STEP:MODE

Command format	[:SENSe]:BANDwidth[:RESolution]:STEP:MODE 0|1
	Or [:SENSe]:BWIDth[:RESolution]:STEP:MODE 0|1
	[:SENSe]:BANDwidth[:RESolution]:STEP:MODE?
	Or [:SENSe]:BWIDth[:RESolution]:STEP:MODE?
Description	Set the resolution bandwidth step mode to default or continuous, the default is the default mode, for example:
	:BAND:STEP:MODE 0
	Return 0
Comment	✧ ON|1 indicates default, step at 1,3,5
	✧ OFF|0 indicates continuous, it steps continuously
Default	Default at default mode
Panel operation	✧ BW→RBW Step

[:SENSe]:BANDwidth\|BWIDth:VIDeo

Command format	[:SENSe]:BANDwidth:VIDeo <freq>
	Or [:SENSe]:BWIDth:VIDeo <freq>
	[:SENSe]:BANDwidth:VIDeo?
	Or [:SENSe]:BWIDth:VIDeo?
Description	Set the video bandwidth unit in GHz, MHz, KHz, Hz; the default unit is Hz, for example:
	:BAND:VID 1000000 or:BAND:VID 1MHz
	Return 1000000
Comment	There are 18 sets of resolution bandwidth
	3MHz, 1MHz, 500kHZ, 300kHZ, 100kHZ, 50kHZ, 30kHZ, 10kHZ,
	5kHZ, 3kHZ, 1kHZ, 500Hz, 300Hz, 100Hz, 50Hz, 30Hz, 10Hz, 0Hz
Default	3MHz
Panel operation	✧ BW→RBW

[:SENSe]:BANDwidth\|BWIDth:VIDeo:AUTO

Command format	[:SENSe]:BANDwidth:VIDeo:AUTO OFF|ON|0|1

	Or [:SENSe]:BWIDth:VIDeo:AUTO OFF|ON|0|1
	[:SENSe]:BANDwidth:VIDeo:AUTO?
	Or [:SENSe]:BWIDth:VIDeo:AUTO?
Description	Set the video bandwidth mode to auto or manual, the default is auto, for example:
	:BAND:VID:AUTO OFF
	Return 0
Comment	✧ ON|1 indicates auto coupling
	✧ OFF|0 indicates manual input
Default	Auto coupling
Panel operation	✧ BW➔VBW

[:SENSe]:AVERage:COUNt	
Command format	[:SENSe]:AVERage:COUNt <integer>
	[:SENSe]:AVERage:COUNt?
Description	Set the trace average, default at 30, for example:
	:AVER:COUN 50
	Return 50
Comment	When setting the average value of the trace, turn on the average state of the trace
Default	30
Panel operation	✧ BW➔AVERage

[:SENSe]:AVERage[:STATe]	
Command format	[:SENSe]:AVERage[:STATe] OFF|ON|0|1
	[:SENSe]:AVERage[:STATe]?
Description	Turn on track average, default at off, for example:
	:AVER 1
	Return 1
Comment	
Default	0
Panel operation	✧ BW➔AVERage

[:SENSe]:POWer[:RF]:ATTenuation	
Command format	[:SENSe]:POWer[:RF]:ATTenuation <att>
	[:SENSe]:POWer[:RF]:ATTenuation？
Description	Set the attenuator unit in dBm, dBmV, dBuV, mW, mV; the default unit is dBm, for example:
	:POW:ATT 10.0 or :POW:ATT 10.0dBm
	Return 10.0
Comment	<value> range between 0 to 30.0dB
Default	10dB
Panel operation	✧ AMPT➔Attenuation

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[:SENSe]:POWer[:RF]:ATTenuation:AUTO

Command format	[:SENSe]:POWer[:RF]:ATTenuation:AUTO ON|OFF|1|0 [:SENSe]:POWer[:RF]:ATTenuation:AUTO?
Description	Attenuator auto / manual control, the default is automatic coupling. For example: :POW:ATT:AUTO OFF Return 0
Comment	ON|1 auto coupling OFF|0 manual coupling
Default	Auto coupling
Panel operation	✧ AMPT➔Attenuation

[:SENSe]:POWer[:RF]:GAIN[:STATe]:AUTO

Command format	[:SENSe]:POWer[:RF]:GAIN[:STATe]:AUTO ON|OFF|1|0 [:SENSe]:POWer[:RF]:GAIN[:STATe]:AUTO?
Description	Turn on or off the pre-amplifier, default at off. For example: :POWer:GAIN:AUTO OFF Return 0
Comment	ON|1 turn on the pre-amplifier OFF|0 turn off the pre-amplifier
Default	Turn off the pre-amplifier
Panel operation	✧ AMPT➔Preamplifiler

[:SENSe]:SWEep:TIME

Command format	[:SENSe]:SWEep:TIME <time> [:SENSe]:SWEep:TIME?
Description	Set the sweep time unit in ks (kilo-seconds), s (seconds), ms (milliseconds). The default unit is ms (milliseconds), for example: :SWE:TIME 100 or :SWE:TIME 100ms Return100
Comment	The value range of <time> is determined according to the following conditions: ✧ Non-zero span, the scan time range between 10ms to 3000s ✧ Zero span, the scan time range between 1ms to 3000s
Default	Sweep time in full-span mode (span 1GHz)
Panel operation	✧ SWEEP➔Sweep Time

[:SENSe]:SWEep:TIME:AUTO

Command format	[:SENSe]:SWEep:TIME:AUTO OFF|ON|0|1 [:SENSe]:SWEep:TIME:AUTO?
Description	Set the sweep time coupling mode, the default is the auto coupling, for example:

	:SWE:TIME:AUTO OFF
	Return 0
Comment	✧ ON|1 indicates auto coupling
	✧ OFF|0 indicates manual input
Default	Auto coupling
Panel operation	✧ SWEEP→Sweep Time

[:SENSe]:DETector[:FUNCtion]	
Command format	[:SENSe]:DETector[:FUNCtion] AUTO|NORMal|POSitive|SAMPle|NEGative
	[:SENSe]:DETector[:FUNCtion]?
Description	Set the detection mode, for example:
	:DET POS
	Return POS
Comment	AUTO auto detect mode
	NORMal normal detect mode
	POSitive positive peak detect mode
	SAMPle sampling detect mode
	NEGative negative peak detect mode
Default	NORMal normal detect mode

:SOURce

:SOURce:POWer:TRACe:POWer	
Command format	:SOURce:POWer:TRACe:POWer <pow>
	:SOURce:POWer:TRACe:POWer?
Description	Set the tracking source power, the default unit is -dBm. For example:
	:SOURce:POWer:TRACe:POWer -20;
	Return -20
Comment	<pow> range between -30 dBm to 0dBm
Default	-10dBm

:SYSTem

:SYSTem:DATE	
Command format	:SYSTem:DATE <year>,<month>,<day>
	:SYSTem:DATE?
Description	Set the date, for example:
	:SYST:DATE 2011,7,1
	Return 2011,7,1
Comment	<year> year, an integer between 2000 and 2100
	<month> month, an integer between 1 and 12
	<day> day, an integer between 1 and 31
Panel operation	✧ System➔Date/Time➔Set Date

:SYSTem:TIME	
Command format	:SYSTem:TIME <hour>,<minute>,<second>
	:SYSTem:TIME?
Description	Set the time, for example:
	:SYST:TIME 12,00,00
	Return 12,00,00
Comment	<hour>, an integer from 0 to 23
	<minute> minutes, an integer between 0 and 59
	<second> second, an integer from 0 to 59
Panel operation	✧ System➔Date/Time➔Set Time

:SYSTem:PRESet:TYPE	
Command format	:SYSTem:PRESet:TYPE FACTory|USER
	:SYSTem:PRESet:TYPE?
Description	Se het preset state, for example:
	:SYST:PRES:TYPE FACT
	Return FACT
Comment	FACT, factory-defined preset conditions
	USER, user-defined preset conditions
Panel operation	✧ System➔Preset Set

:SYSTem:PON:TYPE	
Command format	:SYSTem:PON:TYPE FACTory|USER
	:SYSTem:PON:TYPE?
Description	Set the reset status, for example:
	:SYST:PON:TYPE FACT
	Return FACT
Comment	FACT, factory-defined preset conditions
	USER, user-defined preset conditions

Panel operation	✧ System→PONSet

:SYSTem:COMMunicate:LAN:IP:ADDRess

Command format	:SYSTem:COMMunicate:LAN:IP:ADDRess <ip>
	:SYSTem:COMMunicate:LAN:IP:ADDRess?
Description	Set the device IP address, for example:
	:SYST:COMM:LAN:IP:ADDR
	Return
Comment	<ip> is the IP address needed to be set

:SYSTem:COMMunicate:LAN:MASK

Command format	:SYSTem:COMMunicate:LAN:MASK <mask>
	:SYSTem:COMMunicate:LAN:MASK?
Description	Set the device subnet mask address, for example:
	:SYST:COMM:LAN:MASK 255.255.255.0
	Return 255.255.255.0
Comment	Mask (subnet mask address) should match with IP address

:SYSTem:COMMunicate:LAN:GATE

Command format	:SYSTem:COMMunicate:LAN:GATE <gate>
	:SYSTem:COMMunicate:LAN:GATE？
Description	Set the gateway address, for example:
	:SYST:COMM:LAN:GATE
	Return
Comment	Gate (gateway address) should match with IP address

:TRACe

:TRACe[:DATA]	
Command format	:TRACe[:DATA]? TRACE1|TRACE2|TRACE3|TRACE4|TRACE5
Description	Query and return the specific trace data, for example: :TRAC? TRACE1 Return 64.7301,-68.163, …, -36.195,-57.951
Comment	The device offers 5 traces, TRACE1,TRACE2,TRACE3,TRACE4,TRACE5 The return value data is separated by a comma "," and each data length is fixed at 7 bits.
Default	

:TRACE<n>:MODE	
Command format	:TRACE<n>:MODE WRITe|MAXHold|MINHold|VIEW|BLANk :TRACE<n>:MODE?
Description	Set the trace mode, for example: :TRACE1:MODE MAXH Return MAXH
Comment	The analyzer provides 5 traces, TRACE1|TRACE2|TRACE3|TRACE4|TRACE5 Analyzer provides five display mode for the selected trace. **Write** puts the trace in the normal mode, updating the data. **Maximum hold** displays the highest measured trace value for all the data that has been measured since the function was turned on. **Minimum hold** displays the lowest measured trace value for all the data that has been measured since the function was turned on. **View** turns on the trace data so that it can be viewed on the display. **Blank** turns off the trace data so that it is not viewed on the display.
Default	TRACE1 defaults to Write mode; TRACE2, TRACE3, TRACE4, TRACE5 defaults to Blank mode.
Panel operation	✧ Trace→Clear Write|Max Hold|Min Hold|View|Blank