DG6000 Series

Function/Arbitrary Waveform Generator

Programming Guide

Dec. 2025

Guaranty and Declaration

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1   Document Overview

This manual introduces how to program and control the DG6000 Series Function/ Arbitrary Waveform Generator via the remote interface by using the SCPI (Standard Commands for Programmable Instruments) commands. The DG6000 series can communicate with PC through USB or LAN interface.

TIP

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

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Software upgrade might change or add product features. Please acquire the latest version of the manual from RIGOL website or contact RIGOL to upgrade the software.

Format Conventions in this Manual

1. Key

The front panel key is denoted by the menu key icon. For example, `Default` indicates the "Default" key.

2. Menu

The menu item is denoted by the format of "Menu Name (Bold) + Character Shading" in the manual. For example, **Setup**.

3. Operation Procedures

The next step of the operation is denoted by "**>**" in the manual. For example,

> **Utility** indicates first clicking or tapping and then clicking or tapping **Utility**.

Content Conventions in this Manual

The DG6000 series Function/Arbitrary Waveform Generator includes the following models. Unless otherwise specified, this manual takes DG6104 as an example to illustrate the basic operation methods of the DG6000 series.

Model	No. of Channels	Sample Rate	Max. Output Frequency
DG6052	2	2.5 GSa/s	500 MHz

Model	No. of Channels	Sample Rate	Max. Output Frequency
DG6054	4	2.5 GSa/s	500 MHz
DG6102	2	2.5 GSa/s	1 GHz
DG6104	4	2.5 GSa/s	1 GHz

2   Programming Overview

2.1   SCPI Introduction

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

Syntax

The command line usually starts with a colon; the keywords are separated by colons, and following the keywords are the parameter settings available. The command ending with a question mark indicates querying a certain function and returns the query results. The keywords of the command and the first parameter are separated by a space.

For example,

`:SYSTem:PSTatus` <*type*>

`:SYSTem:PSTatus?`

`SYSTem` is the root keyword of the command, `PSTatus` is the second-level keyword. The command line starts with a colon, and different levels of keywords are also separated by colons. <*type*> indicates a settable parameter. The command ending with a quotation mark indicates querying a function. The command keywords `:SYSTem:PSTatus` and the parameter <*type*> are separated by a space.

In some commands with parameters, "**,**" is often used to separate multiple parameters. For example,

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

Symbol Description

The following symbols are not sent with the commands.

1. Braces { }

The contents in the braces can contain one or multiple parameters. These parameters can be omitted or used for several times. Parameters are usually separated by the vertical bar "|". When using the command, you must select one of the parameters.

2. Vertical Bar |

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

3. Square Brackets [ ]

The contents in the square brackets can be omitted.

4. Angle Brackets < >

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

Parameter Type

1. Bool

The parameter can be set to ON, OFF, 1, or 0. For example,

:SYSTem:BEEPer:STATe <*bool*>

:SYSTem:BEEPer:STATe?

Wherein, <*bool*> can be set to {0|1|OFF|ON}. The query returns 1 or 0.

2. Discrete

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

:SYSTem:PSTatus <*sat*>

:SYSTem:PSTatus?

Wherein,

- <*sat*> can be set to DEFault|OPEN.

- The query returns an abbreviated form: DEF or OPEN.

3. Integer

Unless otherwise specified, the parameter can be any integer (NR1 format) within the effective value range.

CAUTION
Do not set the parameter to a decimal; otherwise, errors will occur.

For example,

[**:SOURce**[<*n*>]]**:SWEep:STEP** {<*step*>|<*lim*>}

Wherein, <*step*> can be set to an integer ranging from 2 to 1024. The query returns an integer ranging from 2 to 1024.

4. Real

The parameter can be any real number within the effective value range, and this command accepts parameter input in decimal (NR2 format) and scientific notation (NR3 format). For example,

[:**SOURce**[<*n*>]]:**AM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**AM:INTernal:FREQuency?** [<*lim_query*>]

Wherein, <*frequency*> can be set to any real number ranging from 2E-3 (2 mHz) to 1E+6 (1 MHz). The query returns a real number in scientific notation.

5. ASCII String

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

:**SYSTem:COMMunicate:LAN:GATEway** <*string*>

Wherein, <*string*> can be set to 192.168.1.1.

Use the MINimum, MAXimum, and DEFault parameters

For many commands, you can substitute "MINimum" or "MAXimum" in place of a parameter. In some cases, you can also substitute "DEFault". For example,

[:**SOURce**[<*n*>]]:**FREQuency:STARt** {<*frequency*>|<*lim_set*>}

Wherein, <*lim_set*> can be set to MINimum|MAXimum|DEFault.

Instead of selecting a specific value for <*frequency*>, you can substitute MINimum to set the frequency to its minimum value and MAXimum to set the frequency to its maximum value. You can also use DEFault to set the frequency to its default value.

Command Abbreviation

All the commands are case-insensitive. They can all be in upper case or in lower case. If abbreviation is used, you must input all the capital letters in the command. For example,

:**SYSTem:LANGuage?**

can be abbreviated as

:**SYST:LANG?**

2.2 Remote Control

This instrument can be connected to the PC via the USB and LAN interfaces to set up communication and realize remote control through the PC. The remote control can be realized by using SCPI (Standard Commands for Programmable Instruments) commands.

PC Software

Users usually need to use the PC software to send commands to control the instrument remotely. When the instrument is connected to the PC via the USB or LAN interface, the PC software can search for instrument resources and enable command interaction.

Web Control

When the instrument is connected to the PC via the LAN interface, you can use Web Control to send SCPI commands from the PC to the instrument. Operation Procedures:

1. Obtain the instrument's IP address and input it in the browser address bar to log in to the Web Control page.

2. After you enter the Web Control interface, click the "SCPI Panel Control" button to enter the SCPI Command interface.

3. Input the specified SCPI command and then click **Send & Read** to send the command. The operation process and the returned value will be displayed in the current interface.

2.2.1   Remote Control via USB

1. Connect the device

Use the USB cable to connect the rear-panel USB DEVICE interface of the instrument to the USB HOST interface of the PC.

2. Search for the device resource

Start up Ultra Sigma and the software will automatically search for the resource currently connected to the PC via the USB interface. You can also click **USB-TMC** to search for the resource.

3. View the device resource

The resources found will appear under the "RIGOL Online Resource" directory, and the model number and USB interface information of the instrument will also be displayed.

4. Control the instrument remotely

Right-click the device resource name and select "SCPI Panel Control" to open the remotely command control panel. Then you can send commands and read data through the panel. For details about the SCPI commands and programming, refer to the Programming Guide of this instrument.

2.2.2   Remote Control via LAN

1. Connect the device

Use the network cable to connect the instrument to your local area network (LAN).

2. Configure network parameters

Configure the network parameters of the instrument in **Utility**>**IO** menu.

3. Search for Search device resource

EN

Start up Ultra Sigma and click **LAN** to open the panel as shown in the figure below. Click **Search** and the software searches for the instrument resources currently connected to the LAN and the resources found are displayed at the right section of the window as shown in the figure below. Click **OK** to add it.

Besides, you can input the IP address of the instrument manually into the text field under "Manual Input LAN Instrument IP", then click **TEST**. If the instrument passes the test, click **Add** to add the instrument to the LAN instrument resource list in the right section; if the instrument fails the test, please check whether the IP address that you input is correct, or use the auto search method to add the instrument resource.

4. **View the device resource**

The resources found will appear under the "RIGOL Online Resource" directory.

5. **Control the instrument remotely**

Right-click the device resource name and select "SCPI Panel Control" to open the remotely command control panel. Then you can send commands and read data through the panel.

6. **Load LXI webpage**

As this instrument conforms to LXI CORE 2011 DEVICE standards, you can load LXI web page through Ultra Sigma (right-click the instrument resource name and select "LXI-Web"). Various important information about the instrument (including the model, manufacturer, serial number, description, MAC address, and IP address) will be displayed on the web page. You can also directly input the IP address of the instrument in the address bar of the PC browser to load the LXI web page.

3   Command System

This chapter introduces the syntax, functions, parameters, usage of each DG6000 command.

For the parameter setting command (frequency, amplitude range, offset, high level, low level, time), the instrument can recognize the unit. If omitted, it is interpreted as the default unit. For the default units of parameters, see the table below.

Table 3.1 Unit Description

Parameter	Available Units	Default Unit
Frequency	GHZ, MHZ, KHZ, HZ, UHZ	HZ
Amplitude Range	VPP, MVPP, VRMS, MVRMS, DBM	VPP, VRMS, or DBM (related to the current amplitude range unit)
Offset/High Level/Low Level	V, MV	V
Time	KS, S, MS, US, NS	S

NOTE

Since the SCPI parser is case-insensitive, there is some confusion over the letter "M" (or "m"). For your convenience, this instrument interprets "mV" (or "MV") as millivolts and "ms" (or "Ms") as milliseconds. However, it interprets "MHZ" (or "mhz") as megahertz.

3.1   :ABORt

Syntax

`:ABORt`

Description

Stops any operation that is triggered.

Parameter

None.

Remarks

None.

Return Format

None.

Examples

```
:ABORt /*Stops any operation that is triggered.*/
```

3.2 :ALL[:STATe]

Syntax

:ALL[**:STATe**] <*bool*>

Description

Enables or disables the outputs of all channels.

Parameter

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

Remarks

None.

Return Format

None.

Examples

```
:ALL:STATe ON /*Enables the outputs of all channels.*/
```

3.3 :DISPlay Commands

:DISPlay commands are used to set or query the status of the current channel and display, and select the method to specify the voltage range, frequency sweep range, and pulse duration.

3.3.1 :DISPlay:BRIGhtness

Syntax

:DISPlay:BRIGhtness {<*brightness*>|<*lim*>}

:DISPlay:BRIGhtness? [<*lim*>]

Description

Sets or queries the brightness of the display.

Parameter

Name	Type	Range	Default
<brightness>	Integer	1% to 100%	50%
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

None.

Return Format

The query returns an integer. For example, the query might return 80, indicating that the brightness is 80%.

Examples

```
:DISPlay:BRIGhtness 80 /*Sets the brightness of the display to
80%.*/
:DISPlay:BRIGhtness? /*Queries the brightness of the display. The
query returns 80.*/
```

3.3.2   :DISPlay:FOCus

Syntax

:DISPlay:FOCus <*chan*>

:DISPlay:FOCus?

Description

Sets or queries the current channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CH1|CH2|CH3|CH4}	CH1

Remarks

When the output type is set to single-ended, the range of <chan> is {CH1|CH2|CH3|CH4|CH5|CH6|CH7|CH8}.

Return Format

The query returns the current channel.

Examples

```
:DISPlay:FOCus CH1 /*Sets the current channel to CH1.*/
:DISPlay:FOCus? /*Queries the current channel. The query returns
CH1.*/
```

3.3.3   :DISPlay[:STATe]

Syntax

`:DISPlay[:STATe] <bool>`

`:DISPlay[:STATe]?`

Description

Enables or disables the front-panel screen. Queries the current state of the front-panel screen.

Parameter

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

Remarks

• When it is disabled, the front-panel screen is black but the UI progress will not be blocked.

• When you press the front-panel Utility to return to local operation, the screen is automatically enabled.

Return Format

The query returns 1 or 0.

Examples

```
:DISPlay:STATe OFF /*Disables the front-panel screen.*/
:DISPlay:STATe? /*Queries the state of the front-panel screen. The
query returns 0.*/
```

3.3.4   :DISPlay:TEXT

Syntax

`:DISPlay:TEXT <string>`

`:DISPlay:TEXT?`

Description

Sets or queries the text message displayed on the front-panel screen.

Parameter

Name	Type	Range	Default
<string>	ASCII string	A string with a maximum of 40 characters enclosed by double quotation marks.	-

Remarks

When a text message is displayed on the front-panel screen, the instrument will enter

the notifier mode. You can only press the front-panel ⌐Utility⌐ key to return to local

mode or clear the text message (*:DISPlay:TEXT:CLEar*) to restore the screen to its

normal display.

Return Format

The query returns a character string, for example, Test in progress.

Examples

```
:DISPlay:TEXT "Test in progress" /*Sets the text message to Test in
progress.*/
:DISPlay:TEXT? /*Queries the text message displayed on the front-
panel screen. The query returns Test in progress.*/
```

3.3.5   :DISPlay:TEXT:CLEar

Syntax

```
:DISPlay:TEXT:CLEar
```

Description

Clears the text message displayed on the front-panel screen.

Parameter

None.

Remarks

None.

Return Format

None.

Examples

```
:DISPlay:TEXT:CLEar /*Clears the text message displayed on the
front-panel screen.*/
```

3.3.6 :DISPlay:UNIT:PULSe

Syntax

`:DISPlay:UNIT:PULSe <`*type*`>`

`:DISPlay:UNIT:PULSe?`

Description

Sets or queries the method to specify the pulse width.

Parameter

Name	Type	Range	Default
<type>	Discrete	{WIDTh|DUTY}	WIDTh

Remarks

- **WIDTh:** pulse width, to specify the pulse width in seconds (s).

- **DUTY:** duty cycle, to specify the pulse width in percentage (%).

Return Format

The query returns WIDT or DUTY

Examples

```
:DISPlay:UNIT:PULSe DUTY /*Sets the method to specify the pulse
width to duty cycle.*/
:DISPlay:UNIT:PULSe? /*Queries the method to specify the pulse
width. The query returns DUTY.*/
```

3.3.7 :DISPlay:UNIT:RATE

Syntax

`:DISPlay:UNIT:RATE <`*unit*`>`

`:DISPlay:UNIT:RATE?`

Description

Sets or queries the rate unit for Sine, Square, Ramp, Pulse, Arb, and Harmonic.

Parameter

Name	Type	Range	Default
<unit>	Discrete	{FREQuency|PERiod}	FREQuency

Remarks

- **FREQuency:** frequency in Hz.

- **PERiod:** period in s.

Return Format

The query returns FREQ or PER.

Examples

```
:DISPlay:UNIT:RATE PERiod /*Sets the rate unit to s for Sine,
Square, Ramp, Pulse, Arb, and Harmonic.*/
:DISPlay:UNIT:RATE? /*Queries the rate unit for Sine, Square, Ramp,
Pulse, Arb, and Harmonic. The query returns PER.*/
```

3.3.8   :DISPlay:UNIT:SWEep

Syntax

:DISPlay:UNIT:SWEep <*type*>

:DISPlay:UNIT:SWEep?

Description

Sets or queries the method to specify the frequency sweep range.

Parameter

Name	Type	Range	Default
<type>	Discrete	{STARtstop|CENTerspan}	STARtstop

Remarks

- **STARtstop:** uses the start value (*[:SOURce[<n>]]:FREQuency:STARt*) and stop value (*[:SOURce[<n>]]:FREQuency:STOP*) to specify the frequency sweep range.
- **CENTerspan:** uses the middle value (*[:SOURce[<n>]]:FREQuency:CENTer*) and span (*[:SOURce[<n>]]:FREQuency:SPAN*) to specify the frequency sweep range.

Return Format

The query returns STAR or CENT.

Examples

```
:DISPlay:UNIT:SWEep CENTerspan /*Uses the middle value and span to
specify the frequency sweep range.*/
:DISPlay:UNIT:SWEep? /*Queries the method to specify the frequency
sweep range. The query returns CENT.*/
```

3.3.9   :DISPlay:UNIT:VOLTage

Syntax

:DISPlay:UNIT:VOLTage <*type*>

:DISPlay:UNIT:VOLTage?

Description

Sets or queries the method to specify the voltage range.

Parameter

Name	Type	Range	Default
<type>	Discrete	{AMPLitudeoff|HIGHlow}	AMPLitudeoff

Remarks

- **AMPLitudeoff:** uses the amplitude range (*[:SOURce[<n>]]:VOLTage*) and offset (*[:SOURce[<n>]]:VOLTage:OFFSet*) to specify the voltage range.

- **HIGHlow:** uses the high level (*[:SOURce[<n>]]:VOLTage:HIGH*) and low level (*[:SOURce[<n>]]:VOLTage:LOW*) to specify the voltage range. This parameter is only available for single-ended output type. You cannot set the high/low level when the output type is set to differential (AMP/HBW).

Return Format

The query returns AMPL or HIGH.

Examples

```
:DISPlay:UNIT:VOLTage HIGHlow /*Uses the high level and low level
to specify the voltage range.*/
:DISPlay:UNIT:VOLTage? /*Queries the method to specify the voltage
range. The query returns HIGH.*/
```

3.3.10   :DISPlay:VIEW

Syntax

:DISPlay:VIEW <*mode*>

:DISPlay:VIEW?

Description

Sets or queries the Multi-window mode.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{AUTO|SINGle|DUAL|FOUR|EIGHt}	AUTO

Remarks

- **AUTO:** Auto display mode. It selects the display mode automatically based on the number of enabled channels.

- **SINGle:** single-channel display mode.

- **DUAL:** 2-channel display mode.

- **FOUR:** 4-channel display mode. It is only available for 2-channel models (single-ended) and 4-channel models.

- **EIGHt:** 8-channel display mode. It is only available for 4-channel models (single-ended).

Return Format

The query returns AUTO, SING, DUAL, FOUR, or EIGH.

Examples

```
:DISPlay:VIEW FOUR /*Sets the Multi-window mode to 4-channel
display mode.*/
:DISPlay:VIEW? /*Queries the Multi-window mode. The query returns
FOUR.*/
```

3.4   :HCOPy Commands

:HCOPy commands are used to set or query the image format and execute the screenshot operation.

3.4.1   :HCOPy:SDUMp:DATA?

Syntax

:HCOPy:SDUMp:DATA?

Description

Captures the current screen.

Parameter

None.

Remarks

Use *:HCOPy:SDUMp:DATA:FORMat* to set and query the returned image format (BMP/PNG).

Return Format

The query returns the data stream of the screen image.

Examples

```
None.
```

3.4.2 :HCOPy:SDUMp:DATA:FORMat

Syntax

:HCOPy:SDUMp:DATA:FORMat <*type*>

:HCOPy:SDUMp:DATA:FORMat?

Description

Sets or queries the format of the screen image.

Parameter

Name	Type	Range	Default
<type>	Discrete	{BMP|PNG}	-

Remarks

None.

Return Format

The query returns BMP or PNG.

Examples

```
:HCOPy:SDUMp:DATA:FORMat PNG /*Sets the format of the image to
PNG.*/
:HCOPy:SDUMp:DATA:FORMat? /*Queries the format of the screen image.
The query returns PNG.*/
```

3.5 IEEE488.2 Common Commands

The IEEE488.2 common commands are used to query the basic information of the instrument or executing basic operations. These commands usually start with "*", and the command keywords contain 3 characters and are related with status registers.

The standard event status register (SESR) and status byte register (SBR) record the event of a certain type happened during the use of the instrument. IEEE488.2 defines to record one specific type of event for each bit in the status register.

Table 3.13 Table of the Bit Definition of Standard Event Status Register

Bit No.	Bit Name	Decimal Value	Description
0	Operation Complete (OPC)	1	"Operation complete" indicates that all pending operations were completed following the execution of the command.
1	Not Used	2	-
2	Query Error (QYE)	4	The instrument tries to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input buffer and output buffer are full.
3	Device-Specific Error (DDE)	8	Indicates that an error has occurred that is neither a Command Error, a Query Error, nor an Execution Error. A Device-Specific Error is any executed device operation that did not properly complete due to some condition, such as self-check error, calibration error, or other device-specific errors.
4	Execution Error (E)	16	An execution error occurred.
5	Command Error (CME)	32	A command error (command syntax error) has occurred.
6	Not Used	64	-
7	Power On (PON)	128	Indicates that an off-to-on transition has occurred in the device's power supply since last reading or the event register was cleared.

Table 3.14 Table of the Bit Definition of Status Byte Register

Bit No.	Bit Name	Decimal Value	Description
0	Not Used	1	-
1	Not Used	2	-

Bit No.	Bit Name	Decimal Value	Description
2	Error Queue	4	1 or multiple errors in the error queue
3	Questionable Data Summary	8	Sets 1 or multiple bits (must be the enabled bit) in the questionable data register.
4	Message Available (MAV)	16	Indicates the available data in the output buffer.
5	Standard Event Summary	32	Sets 1 or multiple bits (must be the enabled bit) in the standard event register.
6	Master Summary Status (MSS)	64	Sets 1 or multiple bits (must be the enabled bit) in the Status Byte Register and generate the service request.
7	Operation Status Register	128	Sets 1 or multiple bits (must be the enabled bit) in the Operation Status Register.

3.5.1 *CLS

Syntax

`*CLS`

Description

Clears all the event registers, and also clears the error queue.

Parameter

None.

Remarks

None.

Return Format

None.

Example

```
None.
```

3.5.2 *ESE

Syntax

`*ESE` <*maskargument*>

`*ESE?`

Description

Sets or queries the enable register of the standard event register set.

Parameter

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

Remarks

For the definitions of the bits in the standard event register, refer to *Table 3.13 Table of the Bit Definition of Standard Event Status Register* . The value of <maskargument> is the sum of the decimal values of all bits set in the standard event register. For example, to enable Bit 2 (4 in decimal), Bit 3 (8 in decimal), and Bit 7 (128 in decimal), set the <maskargument> to 140 (4+8+128).

Return Format

The query returns an integer. The integer equals to the decimal-weighted sum of all the bits set in the register.

Example

```
*ESE 16 /*Enables Bit 4 (16 in decimal) in the register.*/
*ESE? /*The query returns the enable value of the register 16.*/
```

3.5.3 *ESR?

Syntax

`*ESR?`

Description

Queries and clears the event register of the standard event status register.

Parameter

None.

Remarks

Bit 1 and Bit 6 in the standard event status register (*Table 3.13 Table of the Bit Definition of Standard Event Status Register*) are not used and are always treated as

0; therefore, the range of the returned value is a decimal number corresponding to a binary number X0XXXX0X (X is 1 or 0).

Return Format

The query returns an integer. The integer equals to the binary-weighted sum of all the bits set in the register.

Example

```
None.
```

3.5.4   *IDN?

Syntax

```
*IDN?
```

Description

Queries the ID string of the instrument.

Parameter

None.

Remarks

None.

Return Format

The query returns RIGOL TECHNOLOGIES,<model>,<serial number>,<software version>.

- **<model>:** indicates the model number of the instrument.

- **<serial number>:** indicates the serial number of the instrument.

- **<software version>:** indicates the software version of the instrument.

Example

```
None.
```

3.5.5   *OPC

Syntax

```
*OPC
```

```
*OPC?
```

Description

Sets the OPC (bit 0, "Operation Complete") of the Standard Event register to 1 after all commands are executed.

Queries whether all the previous commands are executed. The query returns 1 to the output buffer after the command is executed.

Parameter

None.

Remarks

- Operation complete means that all the previous commands including the *OPC command have been executed.

- When setting the instrument configuration through programming (by executing the command string), using this command as the last command can determine when the command queue is executed (when the command queue is executed, the bit0 (OPC, "operation complete" bit) in the event register of the Standard Event register will be set).

- Sending the *OPC? command and reading the result can ensure synchronization.

Return Format

Queries whether all the previous commands are executed. The query returns 1 when all commands are executed.

Examples

```
None.
```

3.5.6   *OPT?

Syntax

`*OPT?`

Description

Queries the options installed in your instrument

Parameter

None.

Remarks

None.

Return Format

The query returns the options installed, separated by ",". If an option has been installed, the query returns the option name; if it is not installed, the query returns NONE.

Examples

```
*OPT? /*Queries the options installed. The query returns NONE.*/
```

3.5.7   *PSC

Syntax

*PSC <*bool*>

*PSC?

Description

Enables or disables the function of clearing the enable registers of the Status Byte and Standard Event registers at power-on.

Queries the on/off state of the function of clearing the enable registers of the Status Byte and Standard Event registers at power-on.

Parameter

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

Remarks

- *PSC 1 denotes clearing the enable registers of the Status Byte and Standard Event registers at power-on; *PSC 0 denotes that the enable registers of the Status Byte and Standard Event registers will not be affected at power-on.

- You can also send *SRE (*SRE 0) or (*ESE 0) to clear the enable registers of the Status Byte and Standard Event registers respectively.

Return Format

The query returns 0 or 1.

Examples

```
*PSC 1 /*Enables the function of clearing the enable registers of
the Status Byte and Standard Event registers at power-on.*/
*PSC? /*Queries the on/off state of the function of clearing the
registers at power-on. The query returns 1.*/
```

3.5.8 *RCL

Syntax

`*RCL <value>`

Description

Recalls a previously stored instrument state from the specified non-volatile memory location.

Parameter

Name	Type	Range	Default
<value>	Discrete	{0|1|2|3|4|5}	0

Remarks

None.

Return Format

None.

Examples

```
*RCL 1 /*Recalls the instrument state stored in memory location 1.*/
```

3.5.9 *RST

Syntax

`*RST`

Description

Resets the instrument to its factory default state.

Parameter

None.

Remarks

None.

Return Format

None.

Examples

```
None.
```

3.5.10 *SAV

Syntax

*SAV <*value*>

Description

Stores the current instrument state to a specified location in non-volatile memory.

Parameter

Name	Type	Range	Default
<value>	Discrete	{0|1|2|3|4|5}	0

Remarks

If a file has already been stored in the specified location, this command will overwrite the original file directly without any prompt message.

Return Format

None.

Examples

```
*SAV 1 /*Stores the current instrument state to memory location 1.*/
```

3.5.11 *SRE

Syntax

*SRE <*maskargument*>

*SRE?

Description

Sets or queries the enable register of the status byte register set.

Parameter

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

Remarks

For the definitions of the bits in the status byte register, refer to *Table 3.14 Table of the Bit Definition of Status Byte Register*. The value of <maskargument> is the sum of the decimal values of all bits set in the status byte register. For example, to enable Bit 2 (4 in decimal), Bit 3 (8 in decimal), and Bit 7 (128 in decimal), set the <maskargument> to 140 (4+8+128).

Return Format

The query returns an integer. The integer equals to the decimal-weighted sum of all the bits set in the register.

Example

```
*SRE 16 /*Enables Bit 4 (16 in decimal) in the register.*/
*SRE? /*The query returns the enable value of the register 16.*/
```

3.5.12 *STB?

Syntax

*STB?

Description

Queries the event register for the status byte register. After executing the command, the value in the status byte register is cleared.

Parameter

None.

Remarks

Bit 0 and Bit 1 in the status byte register (*Table 3.14 Table of the Bit Definition of Status Byte Register*) are not used and are always treated as 0; therefore, the range of the returned value is a decimal number corresponding to a binary number XXXXXX00 (X is 1 or 0).

Return Format

The query returns an integer. The integer equals to the decimal-weighted sum of all the bits set in the register.

Example

```
None.
```

3.5.13 *TRG

Syntax

*TRG

Description

Generates a trigger event.

Parameter

None.

Remarks

- This command is valid for channels whose trigger source is set to manual trigger.

- When the trigger source is set to manual, you can also send *:TRIGger<n>[:IMMediate]* to generate a trigger event for the specified channel.

Return Format

None.

Examples

```
*TRG /*Generates a trigger event.*/
```

3.5.14 *WAI

Syntax

`*WAI`

Description

Waits for the operation to complete. This command is used to make sure that the previous command is complete before the next command is issued.

Parameter

None.

Remarks

For example, you want to use `:SOURce1:SWEep:SPACing LINear` and then use `:TRIGger1:IMMediate`. To make sure that `:SOURce1:SWEep:SPACing LINear` can be completed before executing the next command, you can insert `*WAI` between the two commands.

Return Format

None.

Examples

```
None.
```

3.6 :INITiate Commands

:INITiate commands are used to set or query the "wait-for-trigger" state of the instrument.

The states of the trigger system include "wait-for-trigger", "action-in-progress", and "idle".

- Wait-for-trigger: when the system is in "wait-for-trigger" state, it can detect the trigger event. Once a trigger event is generated, the system enters the "action-in-progress" state.

- Action-in-progress: once a channel is triggered, the system leaves the "wait-for-trigger" state and enters the"action-in-progress" state (e.g. burst-in-progress or sweep-in-progress). After the output is finished, the system returns to the "idle" state or "wait-for-trigger" state (set by *:INITiate[<n>]:CONTinuous* or *:INITiate[<n>]:CONTinuous:ALL*).

- Idle: the system ignores the trigger signal in the "idle" state. You can use *:INITiate[<n>][:IMMediate]* or *:INITiate[<n>][:IMMediate]:ALL* to change the trigger state from "idle" to "wait-for-trigger" for a specified channel or all channels.

3.6.1   :INITiate[<n>]:CONTinuous

Syntax

`:INITiate[<`*n*`>]:CONTinuous <`*bool*`>`

`:INITiate[<`*n*`>]:CONTinuous?`

Description

Sets or queries whether the trigger system always returns to the "wait-for-trigger" state for the specified channel.

Parameter

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

Remarks

- 1|ON: returns to the "wait-for-trigger" state; 0|OFF: remains in the "idle" state, ignoring triggers until *:INITiate[<n>][:IMMediate]* or *:INITiate[<n>][:IMMediate]:ALL* is sent.

- With 1|ON, the trigger count setting (*:TRIGger<n>:COUNt*) will be invalid. If you need to count the triggers, you must select 0|OFF.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:INITiate1:CONTinuous ON /*Sets CH1 to automatically return to
"wait-for-trigger".*/
:INITiate1:CONTinuous? /*Queries whether CH1 automatically returns
to "wait-for-trigger". The query returns 1.*/
```

3.6.2 :INITiate[<n>]:CONTinuous:ALL

Syntax

:INITiate[<*n*>]**:CONTinuous:ALL** <*bool*>

Description

Sets whether the trigger system always returns to the "wait-for-trigger" state for all channels.

Parameter

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

Remarks

- 1|ON: returns to the "wait-for-trigger" state; 0|OFF: remains in the "idle" state, ignoring triggers until *:INITiate[<n>][:IMMediate]* or *:INITiate[<n>] [:IMMediate]:ALL* is sent.

- With 1|ON, the trigger count setting (*:TRIGger<n>:COUNt*) will be invalid. If you need to count the triggers, you must select 0|OFF.

- When the output type is set to single-ended, the range of [<n>] is {1|2|3|4|5|6|7| 8}.

Return Format

None.

Examples

```
None.
```

3.6.3 :INITiate[<n>][:IMMediate]

Syntax

:INITiate[<*n*>][**:IMMediate**]

Description

Changes the status of the trigger system from "idle" to "wait-for-trigger" for the specified channel.

Parameter

Parameter	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1

Remarks

- Use *:ABORt* to return the instrument to idle.

- If the specified channel has *:INITiate[<n>]:CONTinuous* set to ON, *:INITiate[<n>][:IMMediate]* and *:INITiate[<n>][:IMMediate]:ALL* have no effect on the trigger system.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
None.
```

3.6.4 :INITiate[<n>][:IMMediate]:ALL

Syntax

:INITiate[<*n*>][:IMMediate]:ALL

Description

Changes the status of the trigger system from "idle" to "wait-for-trigger" for all channels.

Parameter

Parameter	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1

Remarks

- Use *:ABORt* to return the instrument to idle.

- If the specified channel has *:INITiate[<n>]:CONTinuous* set to ON, *:INITiate[<n>][:IMMediate]* and *:INITiate[<n>][:IMMediate]:ALL* have no effect on the trigger system.

- When the output type is set to single-ended, the range of \<n> is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
None.
```

3.7   :LXI Commands

:LXI commands are used to set the on/off status of mDNS, restart the LAN, and restore the network settings to default values.

3.7.1   :LXI:MDNS:STATe

Syntax

:LXI:MDNS:STATe <*bool*>

:LXI:MDNS:STATe?

Description

Sets or queries the on/off status of the multicast Domain Name System (mDNS).

Parameter

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

Remarks

You can enable this system to provide the function of DNS server for service discovery in a small network without a DNS server.

Return Format

The query returns 0 or 1.

Examples

```
:LXI:MDNS:STATe ON /*Enables the mDNS.*/
:LXI:MDNS:STATe? /*Queries whether the mDNS is enabled. The query
returns 1.*/
```

3.7.2   :LXI:MDNS:SNAMe:DESired

Syntax

:LXI:MDNS:SNAMe:DESired <*name*>

```
:LXI:MDNS:SNAMe:DESired?
```

Description

Sets or queries the service name for mDNS.

Parameter

Name	Type	Range	Default
<name>	ASCII string	Refer to *Remarks*	-

Remarks

<name> specifies the mDNS service name, which can contain English characters, numbers, and strikethrough. The total length is no more than 28 characters.

Return Format

The query returns the ASCII string.

Examples

```
:LXI:MDNS:SNAMe:DESired RIGOL /*Sets the mDNS service name to
RIGOL.*/
:LXI:MDNS:SNAMe:DESired? /*Queries the service name for mDNS. The
query returns RIGOL.*/
```

3.7.3 :LXI:RESet

Syntax

```
:LXI:RESet
```

Description

Sets the network settings to default values.

Parameter

None.

Remarks

It may take a few seconds for the LAN interface to restart after you send this command.

Return Format

None.

Examples

```
:LXI:RESet /*Sets the network settings to default values.*/
```

EN

3.7.4   :LXI:RESTart

Syntax

`:LXI:RESTart`

Description

Restarts the LAN interface.

Parameter

None.

Remarks

It may take a few seconds for the LAN interface to restart after you send this command.

Return Format

None.

Examples

`:LXI:RESTart /*Restarts the LAN interface.*/`

3.8   :MEMory Commands

:MEMory commands are used to set and query the state file stored in the internal non-volatile memory of the instrument.

3.8.1   :MEMory:NSTates?

Syntax

`:MEMory:NSTates?`

Description

Queries the number of memory locations for storing states.

Parameter

None.

Remarks

None.

Return Format

The query returns 6.

Examples

```
:MEMory:NSTates? /*Queries the number of memory locations for the
state files in the non-volatile memory of the instrument. The query
returns 6.*/
```

3.8.2 :MEMory:STATe:CATalog?

Syntax

:MEMory:STATe:CATalog?

Description

Queries the names of the state files in the internal non-volatile memory of the instrument.

Parameter

None.

Remarks

This instrument provides 6 memory locations for state files in the internal non-volatile memory.

Return Format

The query returns a string which consists of six parts (representing the filenames of the files stored in locations 0 to 5 respectively), separated by commas. For example, the query might return
"AUTO_RECALL","STATE_1","STATE_2","STATE_3","STATE_4","STATE_5".

Examples

```
:MEMory:STATe:CATalog? /*Queries the names of locations 0 to 5. The
query returns
"AUTO_RECALL","STATE_1","STATE_2","STATE_3","STATE_4","STATE_5".*/
```

3.8.3 :MEMory:STATe:DELete

Syntax

:MEMory:STATe:DELete <*n*>

Description

Deletes the state files stored in the specified memory location.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1|2|3|4|5}	-

Remarks

- This instrument provides 6 memory locations for state files in the internal non-volatile memory. 0 to 5 represents the state files stored in the specified locations respectively.

- This command is valid only when a state file has been stored in the specified memory location.

Return Format

None.

Examples

```
:MEMory:STATe:DELete 1 /*Deletes the state file stored in location
1.*/
```

3.8.4　:MEMory:STATe:NAME

Syntax

:MEMory:STATe:NAME *<n>*[,*<name>*]

:MEMory:STATe:NAME? *<n>*

Description

Sets or queries the filename of the state file stored in the internal non-volatile memory of the instrument.

Parameter

Name	Type	Range	Default
<n>	Discrete	{0|1|2|3|4|5}	-
<name>	ASCII string	Refer to *Remarks*	-

Remarks

- The parameter <name> is a string without quotation marks. It can contain up to 12 characters. The first character of <name> must be an English letter (a~z, A~Z). The other characters can be English letters, numbers (0-9), or underline (_). If the name is omitted, the factory default name will be used.

- This instrument provides 6 memory locations for state files in the internal non-volatile memory. 0 to 5 represents the state file stored in the specified locations respectively.

Return Format

The query returns a string with double quotation marks. For example, the query might return "state".

Examples

```
:MEMory:STATe:NAME 2,state /*Sets the filename to state for the
state file stored in location 2 of the internal non-volatile memory
of the instrument.*/
:MEMory:STATe:NAME? 2 /*Queries the filename of the state file
stored in location 2 of the internal non-volatile memory of the
instrument. The query returns "state".*/
```

3.8.5   :MEMory:STATe:RECall:AUTO

Syntax

:MEMory:STATe:RECall:AUTO <*bool*>

:MEMory:STATe:RECall:AUTO?

Description

Sets or queries whether to enable the automatic recall of the last power-on setting.

Parameter

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

Remarks

- **ON/1:** the instrument recalls the instrument state (at last power-off) in memory location 0 at the next power-on.

- **OFF/0:** the instrument uses the factory default values (except the parameters not affected by factory default settings) at the next power-on.

Return Format

The query returns 0 or 1.

Examples

```
:MEMory:STATe:RECall:AUTO ON /*Enables the automatic recall of the
last power-on setting in location 0 at the next power-on.*/
:MEMory:STATe:RECall:AUTO? /*Queries whether to enable the
automatic recall of the last power-on setting in location 0. The
query returns 1.*/
```

3.8.6   :MEMory:STATe:VALid?

Syntax

:MEMory:STATe:VALid? <*state*>

Description

Queries whether a state file is available in the specified memory location in the internal non-volatile memory of the instrument.

Parameter

Name	Type	Range	Default
<state>	Discrete	{0|1|2|3|4|5}	-

Remarks

Before using *SAV*, you can use this query command to avoid overwriting an existing file accidentally.

Return Format

The query returns 1 or 0 . 1 indicates that an existing state file has been stored in the specified location while 0 indicates that no state file is stored in the specified location.

Examples

```
:MEMory:STATe:VALid? 2 /*Queries whether an existing state file is
stored in the location 2 in the internal non-volatile memory of the
instrument. The query returns 1.*/
```

3.9   :MMEMory Commands

:MMEMory commands are used to set and query the related information of the internal and external memory. The internal memory ("INT:/") of the instrument is always present while the external memory ("USB:/") is available only when the USB HOST interface detects the USB storage device.

:MMEMory commands refer to folders and files. These folders and files have specific structures, described below.

- Absolute paths begin with "/" and start at the driver identifier (INT or USB).

- Folder and file names cannot contain the following characters: \ / : * ? " < > |, and cannot start with ".".

- The combination of folder and file name cannot exceed 200 characters.

Arb File Format Description

This series Function/Arbitrary Waveform Generator supports *.arb, *.csv, and *.txt Arb file formats. These formats are used to store waveform data points, facilitating the generation and loading of waveforms through programming interfaces such as C++.

*.arb File Format Description
- File type: binary data file, no file header
- Data type: 16-bit signed integer

- Value range: -32768 to +32767
- Data format: each code value occupying 2 bytes
- File structure: The file consists of continuous waveform data points, with no file header information.
- Simple C++ Code Example:

```
std::ofstream arbFile("D:\
\waveTable.txt");                        //open file
Generate waveform data points and store in waveData array //
Generate waveform table
fwrite(waveData, sizeof(waveData), 1, arbFile); //Write to file
fclose(arbFile);                   //Close and save file
```

*.txt File Format Description

- File type: plain text data file, no file header
- Data type: integer waveform point data (16-bit signed integer, from -32768 to +32767); floating-point voltage data (from -1.0 to +1.0)
- Storage format: string
- Supported delimiters: Newline (\n), comma (,), semicolon (;)
- File structure: waveform point data or voltage data separated by delimiters; only one type of delimiter can be used in the same file
- Simple C++ Code Example:

```
std::ofstream arbFile("D:\\waveTable.txt");        //open file
Generate waveform data points or voltage data and store them in
waveData array       //Generate the waveform table
for (int i = 0; i < dataLength; i++) {
  arbFile << std::to_string(waveData[i]) + "delimiter"; //Write
to file
}
arbFile.close();             //Close and save file
```

*. csv File Format Description

- File type: plain text data file, no file header
- Data type: floating-point voltage data (from -1.0 to +1.0)
- Storage format: string
- File structure: each line containing one voltage data value
- Simple C++ Code Example:

```
std::ofstream arbFile("D:\\waveTable.csv"); //Open file
Generate waveform data points and store them in waveData
array          //Generate waveform table
for (int i = 0; i < dataLength; i++) {
  arbFile << std::to_string(waveData[i]) + "\n"; //Write to file
}
arbFile.close();             //Close and save file
```

3.9.1   :MMEMory:CATalog[:ALL]?

Syntax

:MMEMory:CATalog[:ALL]? [<*folder*>]

Description

Queries all the files in the specified directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory	-

Remarks

The parameter <folder> is a valid directory in the internal or external memory. The query might return INT:/folder or USB:/Rigol/. If it is omitted, this command queries the directory specified by *:MMEMory:CDIRectory*.

Return Format

The query returns a string in the format of space used,space available,"file name,file property,file size",......; wherein, the units of the space used and space available are byte; the file name includes the file extension (if any); the file property is either STAT for state files (*.sta), ASC for Arb files (*.csv), FOLD for folders, SEQ for *.seq files, ARB for Arb files (*.arb), TXT for Arb files (*.txt), GEL for upgrade files (*.GEL, *.gel), or null for all other file extensions; the file size is expressed in bytes. For example, the query might return 96256,1019770880,"command.exe,,375808", "MySetup.sta,STAT,8192", "MyWave.csv,ASC,11265", indicating that the space used is 96256 bytes and the space available is 1019770880 bytes; it contains one executable file, one state file (MySetup.sta), and one Arb file (MyWave.csv).

If no file exists in the target directory, the query only returns the space used and space available.

Examples

```
:MMEMory:CATalog:ALL? USB:/Mydata /*Queries all the files in the
folder named Mydata in the USB storage device. The query returns
96256,1019770880,"command.exe,,375808", "MySetup.sta,STAT,8192",
"MyWave.csv,ASC,11265".*/
```

3.9.2   :MMEMory:CATalog:DATA:ARBitrary?

Syntax

:MMEMory:CATalog:DATA:ARBitrary? [<*folder*>]

Description

Queries all the arbitrary waveform files (*.arb/*.txt/*.csv) and sequence files (*.seq) in the specified directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory	-

Remarks

The parameter <folder> is the valid directory in the internal or external memory. For example, it can be INT:/ or USB:/Rigol. If it is omitted, this command queries the directory specified by *:MMEMory:CDIRectory*.

Return Format

The query returns a string in the format of space used,space available,"file name,file property,file size",......; wherein, the units of the space used and space available are byte; the file name includes the file extension; the file property is either SEQ for *.seq files, ARB for Arb files (*.arb), ASC for Arb files (*.csv), or TXT for Arb files (*.txt); the file size is amount of space that the file uses. For example, the query might return 28672,4102361088,"Rigol1.seq,SEQ,1254","test.arb,ARB,587", indicating that the space used is 28672 bytes and the space available is 4102361088 bytes; it contains one sequence file (Rigol1.seq) and one Arb file (test.arb); their sizes are 1254 bytes and 587 bytes.

If no Arb file or sequence file exists in the directory, the query only returns the space used and space available.

Examples

```
:MMEMory:CATalog:DATA:ARBitrary? INT:/folder /*Queries all the
arbitrary waveform files and sequence files in the folder named
"folder" under C disk. The query returns
28672,4102361088,"Rigol1.seq,SEQ,1254","test.arb,ARB,587".*/
```

3.9.3   :MMEMory:CATalog:STATe?

Syntax

:MMEMory:CATalog:STATe? [<*folder*>]

Description

Queries the state file (*.sta) under the specified directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory	-

Remarks

The parameter <folder> is a valid directory in the internal or external memory. For example, it can be INT:/ or USB:/Rigol. If it is omitted, this command queries the current directory.

Return Format

The query returns a string in the format of space used,space available,"file name,file property,file size",......; wherein, the units of the space used and space available are byte; the file name includes the file extension; the file property is STAT; the file size is the amount of space that file uses. For example, the query might return 28672,4102361088,"MySetup.sta,STAT,8192", indicating that the space used is 28672 bytes and the space available is 4102361088 bytes; it contains one state file (MySetup.sta); the file size is 8192 bytes.

If no state file exists in the target directory, the query only returns the space used and space available.

Examples

```
:MMEMory:CATalog:STATe? /*Queries the state file under the current
directory. The query returns
28672,4102361088,"MySetup.sta,STAT,8192".*/
```

3.9.4 :MMEMory:CDIRectory

Syntax

:MMEMory:CDIRectory <*directory_name*>

:MMEMory:CDIRectory?

Description

Sets or queries the default directory for *:MMEMory Commands*.

Parameter

Name	Type	Range	Default
<directory_name>	ASCII string	Valid directory	-

Remarks

The parameter <directory_name> is the valid directory in the internal or external memory. For example, it can be INT:/folder or USB:/Rigol.

Return Format

The query returns a string. For example, the query might return INT:/folder, representing the folder named "folder" under local disk C.

Examples

```
:MMEMory:CDIRectory INT:/folder  /*Sets the default directory to
INT:/folder (the "folder" in internal memory).*/
:MMEMory:CDIRectory? /*Queries the default directory. The query
returns INT:/folder/.*/
```

3.9.5 :MMEMory:COPY

Syntax

:MMEMory:COPY *<file_name>*,*<directory_name>*

Description

Copies a file to the specified directory (not the current directory).

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	Valid filename	-
<directory_name>	ASCII string	Valid directory	-

Remarks

- The parameter <file_name> specifies the name of the file to be copied, for example, INT:/Arb.raf.

- The parameter <directory_name> specifies the target path, for example, INT:/TextFolder.

- The copy operation fails if there are files with the same name under the target path.

Return Format

None.

Examples

```
:MMEMory:COPY INT:/Arb.raf,INT:/TextFolder /*Copies the Arb.raf
file under C disk to the directory named "TextFolder" under C
disk.*/
```

3.9.6 :MMEMory:COPY:SEQuence

Syntax

:MMEMory:COPY:SEQuence *<sequence>*,*<directoryname>*

Description

Copies a specified sequence file (.seq) to the specified directory.

Parameter

Name	Type	Range	Default
<sequence>	ASCII string	Valid sequence filename	-
<directoryname>	ASCII string	Valid directory	-

Remarks

- The parameter <sequence> is the filename of the sequence to be copied. The filename must contain the file extension, for example, INT:/SEQ.seq.

- The parameter <directoryname> specifies the target path, for example, INT:/ TextFolder.

- The copy operation fails if there are files with the same name under the target path.

Return Format

None.

Examples

```
:MMEMory:COPY:SEQuence INT:/Rigol/MySequence.seq,USB:/rigol
/*Copies the sequence file named MySequence.seq in the "Rigol"
folder of C disk to the "rigol" folder of USB storage device.*/
```

3.9.7   :MMEMory:DELete

Syntax

:MMEMory:DELete <*file_name*>

Description

Deletes a specific file under the specified directory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	Valid filename	-

Remarks

- The parameter <file_name> is a valid directory in internal or external memory, for example, INT:/screenshot.png.

- To delete a folder, use *:MMEMory:RDIRectory*.

Return Format

None.

Examples

```
:MMEMory:DELete INT:/screenshot.png /*Deletes the image named
screenshot.png under C disk.*/
```

3.9.8 :MMEMory:LOAD:DATA

Syntax

:MMEMory:LOAD:DATA <*n*>,<*file_name*>[,<*separator*>,<*datatype*>]

Description

Loads the sequence file (*.seq) or arbitrary waveform file (*.arb/*.csv/*.txt) from internal or external memory into the volatile memory of the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<file_name>	ASCII string	Valid filename	-
<separator>	Discrete	{ENTer|COMMa|SEMicolon}	-
<datatype>	Discrete	{NORMal|VOLtage}	-

Remarks

- The parameter <n> specifies the number of the channel to which the specified sequence or Arb file under the current directory is loaded. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

- The parameter <file_name> specifies the name of the file under the specified directory, for example, INT:/SEQ.seq.

- Available file types are *.seq, *.arb, *.csv, and *.txt.

  - *.seq files are configuration files for the sequence step.

  - *.arb files are data files that store binary values.

  - *.csv files are voltage data stored in plain text, floating type.

  - *.txt files are plaintext voltage data (floating) or wave point data (-32768 to +32767) files separated by separators. Only one data type and separator can be used in the same file.

- The parameter <separator> specifies the type of separator of the data in the *.txt file: ENTer (Enter), COMMa (","), and SEMicolon (";").

- The parameter <datatype> sets the data type of *.txt file: NORMal (wave point data, integer, -32768 to +32767), VOLtage (voltage data, floating).

- For *.txt files, you must specify the separator <separator> and the data type <datatype>; For *.seq, *.arb, and *.csv files, the two parameters are not valid.

- In non-sequence output mode, loading sequence files is also supported while it does not change the current output mode.

- In non-advanced output mode, only an Arb waveform with a length of 16,384 pts is supported. After it is loaded successfully, the basic waveform of the corresponding channel will be modified to this Arb waveform. In advanced output mode, the available waveform length is related to the file type and the output type. For *.arb files, in single-ended output, the length is from 32 pts to 128 Mpts (256 Mpts optional); in differential output, the length is from 32 pts to 256 Mpts (512 Mpts optional). For *.txt files, the length is from 32 pts to 8 Mpts. For *.csv files, the length is from 32 pts to 1 Mpts.

Return Format

None.

Examples

```
:MMEMory:LOAD:DATA 1,INT:/SEQ.seq /*Loads the sequence file named
SEQ.seq under the C disk into CH1.*/
```

3.9.9   :MMEMory:LOAD:STATe

Syntax

:MMEMory:LOAD:STATe <*file_name*>

Description

Loads the specified state file.

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	Valid name of state file	-

Remarks

The parameter <file_name> specifies the name of the state file under the specified directory, for example, INT:/Mystate.sta.

Return Format

None.

Examples

```
:MMEMory:LOAD:STATe INT:/Mystate.sta /*Loads the instrument state
file named Mystate.sta from the root directory of the internal
memory.*/
```

3.9.10   :MMEMory:MDIRectory

Syntax

`:MMEMory:MDIRectory` <*dir_name*>

Description

Creates an empty folder with the specified name in the mass memory system.

Parameter

Name	Type	Range	Default
<dir_name>	ASCII string	Refer to *Remarks*	-

Remarks

•   The parameter <dir_name> specifies the name of the folder to be created.

•   It is not allowed to create folders with the same name.

Return Format

None.

Examples

```
:MMEMory:MDIRectory TestFolder /*Creates a folder named
"TestFolder" in the internal mass memory.*/
```

3.9.11   :MMEMory:MOVE

Syntax

`:MMEMory:MOVE` <*file1*>,<*file2*>

Description

Moves file 1 under the current directory to the specified directory, or renames file 1 to file 2.

Parameter

Name	Type	Range	Default
<file1>	ASCII string	Valid filename	-
<file2>	ASCII string	Valid directory or filename	-

Remarks

•   The parameter <file1> is the file under the current directory or the specified directory, for example, Rigol.sta.

- The parameter <file2> is the valid directory or filename in the internal or external memory. For example, it can be INT:/ or USB:/Rigol/.

- If you want to rename the file, <file1> and <file2> should share the same folder; if you want to move the file, then <file2> should be specified as another valid directory such as USB:/Rigol/.

Return Format

None.

Examples

```
:MMEMory:MOVE INT:/Rigol.sta,USB:/Rigol/ /*Moves the file named
Rigol.sta in internal memory to the folder named Rigol in the USB
storage device.*/
:MMEMory:MOVE USB:/Rigol1.sta,USB:/Rigol2.sta /*Renames the file
named Rigol1.sta in the USB storage device to Rigol2.sta.*/
```

3.9.12 :MMEMory:RDIRectory

Syntax

:MMEMory:RDIRectory <*folder*>

Description

Deletes the specified directory (empty folder) in the mass memory system.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Folder name of the empty folder	-

Remarks

You can only delete empty folders, or an error message will be displayed.

Return Format

None.

Examples

```
:MMEMory:RDIRectory folder /*Deletes the empty folder named
"folder" in the internal mass memory.*/
```

3.9.13 :MMEMory:STORe:DATA

Syntax

:MMEMory:STORe:DATA <*n*>,<*file_name*>

Description

Stores a sequence file (*.seq) in volatile memory of the specified channel to the specified directory.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<file_name>	ASCII string	Valid directory	-

Remarks

When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

None.

Examples

```
:MMEMory:STORe:DATA 1,INT:/Seq_1.seq /*Stores a sequence file
(*.seq) in volatile memory of CH1 to the internal memory with the
name of Seq_1.seq.*/
```

3.9.14   :MMEMory:STORe:STATe

Syntax

:MMEMory:STORe:STATe <*file_name*>

Description

Stores the current instrument state with the specified name in the specified directory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	Valid directory	-

Remarks

None.

Return Format

None.

Examples

```
:MMEMory:STORe:STATe INT:/state.sta  /*Stores the instrument state
in the file named state.sta under C disk.*/
```

3.9.15   :MMEMory[:TRACe]:ARB:DATA

Syntax

`:MMEMory[:TRACe]:ARB:DATA` *<arb_name>,<flag>,<data>*

Description

Sends floating point values from -1.0 to 1.0 to the specified Arb file.

Parameter

Name	Type	Range	Default
<arb_name>	ASCII string	Valid filename	-
<flag>	Discrete	{HEADer|CONTinue|END}	-
<data>	ASCII string	Refer to *Remarks*	-

Remarks

- The parameter <arb_name> specifies the name of the file under the specified directory. The file name must end with .arb, for example, INT:/ARB.arb. If there is no file with the same name in the specified path, create an Arb file with the specified file name and write data. If a file with the same name already exists, the new data overwrites the original data.

- <flag> specifies the data transmission status.

    - **HEADer** indicates discarding the previous data and using this data as the beginning of a waveform data package.

    - **CONTinue** indicates that there is data package following this data package.

    - **END** indicates that this is the last data package and the data transmission finishes. If you want to send only one data package, you must use "END".

- The parameter <data> is the data to be sent. The values are separated by comma. For example, the data can be 0,0.0975,0.1913,0.2777,0.3535,0.415,0.4619,0.4903,0.5,0.4903,0.4619,0.415,0.3535,0.2777,0.1913,0.0975...

- The total length of data sent to a file is limited to 32 pts to 256 Mpts (512 Mpts optional). If you send data outside of the range, the data writing fails. It is recommended to send data within 20 kbytes at a time. You can send data multiple times until the max. memory depth is reached.

Return Format

None.

Examples

```
:MMEMory:TRACe:ARB:DATA INT:/
ARB.arb,END,0,0.0975,0.1913,0.2777,0.3535,0.415,0.4619,0.4903,0.5,0.
4903,0.4619,0.415,0.3535,0.2777,0.1913,0.0975,0,-0.0975,-0.1913,-0.2
777,-0.3535,-0.418,-0.461,-0.4903,-0.5,-0.4903,-0.4619,-0.415,-0.353
5,-0.2777,-0.1913,-0.0975 /*Sends floating point values to INT:/
ARB.arb.*/
```

3.9.16   :MMEMory[:TRACe]:ARB:DATA:DAC

Syntax

:MMEMory[:TRACe]:ARB:DATA:DAC *<arb_name>*,*<flag>*,*<data>*

Description

Sends integers between -32768 and +32767 or data stream to the specified Arb file.

Parameter

Name	Type	Range	Default
<arb_name>	ASCII string	Valid filename	-
<flag>	Discrete	{HEADer|CONTinue|END}	-
<data>	ASCII string or IEEE 488.2 block	Refer to *Remarks*	-

Remarks

- The parameter <arb_name> specifies the name of the file under the specified directory. The file name must end with .arb, for example, INT:/ARB.arb. If there is no file with the same name in the specified path, create an Arb file with the specified file name and write data. If a file with the same name already exists, the new data overwrites the original data.

- <flag> specifies the data transmission status.

  - **HEADer** indicates discarding the previous data and using this data as the beginning of a waveform data package.

  - **CONTinue** indicates that there is data package following this data package.

  - **END** indicates that this is the last data package and the data transmission finishes. If you want to send only one data package, you must use "END".

- The parameter <data> specifies the data to be sent.

  - When sending integers, the values are separated by comma. For example, the data can be 10,20,30,40,50,60,70,80,90,100,200,300,400,500,600,700,800,900,1000,1100, 1200,1300,1400,1500,1600,1700,1800,1900,2000,2100,2200,2300...

- When sending the data stream, the data format is TMC header + binary waveform data. The TMC header is in the form of #NXXXXXXXXX. Wherein, # is the header identifier specified by TMC, N indicates that the following part contains N bytes, and the length of the waveform data point is described in the form of ASCII characters. For example, #9000001024 indicates 9 bytes to describe the data length. 000001024 indicates the length of the sent data is 1024 bytes.

• The total length of data sent to a file is limited to 32 pts to 256 Mpts (512 Mpts optional). If you send data outside of the range, the data writing fails. It is recommended to send data within 20 kbytes at a time. You can send data multiple times until the max. memory depth is reached.

Return Format

None.

Examples

```
:MMEMory:TRACe:ARB:DATA:DAC INT:/
ARB.arb,END,10,20,30,40,50,60,70,80,90,100,200,300,400,500,600,700,8
00,900,1000,1100,1200,1300,1400,1500,1600,1700,1800,1900,2000,2100,2
200,2300 /*Sends integer data to INT:/ARB.arb.*/
```

3.10 :OUTPut Commands

:OUTPut commands are used to set and query the channel outputs.

3.10.1 :OUTPut[<n>]:DEBounce[:STATe]

Syntax

:OUTPut[<*n*>]**:DEBounce**[**:STATe**] <*bool*>

:OUTPut[<*n*>]**:DEBounce**[**:STATe**]?

Description

Sets or queries the on/off status of the debounce function for the specified channel.

Parameter

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

Remarks

• When the debounce function is enabled for the specified channel, the channel first closes the relay (establishing the output path), and after it has stabilized, the

DDS then starts outputting the target waveform. This mechanism effectively suppresses ringing in the output waveform.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:OUTPut1:DEBounce:STATe ON /*Enables the debounce function for
CH1.*/
:OUTPut1:DEBounce:STATe? /*Queries whether the debounce function is
enabled for CH1. The query returns 1.*/
```

3.10.2 :OUTPut[<n>]:IDLE

Syntax

:**OUTPut**[<*n*>]:**IDLE** {<*idle*>|<*position*>}

:**OUTPut**[<*n*>]:**IDLE?**

Description

Sets or queries the idle level position of the burst mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<idle>	Integer	0 to 65535	-
<position>	Discrete	{FPT|TOP|CENTer|BOTTom}	FPT

Remarks

- The parameter <idle> is used to self-define the idle level position and <position> allows you to set the position to the first point (FPT), the top (TOP), the center (CENTer), or the bottom (BOTTom) of the waveform.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns FPT, TOP, CENT, or BOTT; or returns the idle level position in an integer.

Examples

```
:OUTPut1:IDLE TOP /*Sets the idle level to the top point of the
waveform.*/
:OUTPut1:IDLE? /*Queries the idle level position of the burst
signal. The query returns TOP.*/
```

3.10.3   :OUTPut[<n>]:LOAD

Syntax

:**OUTPut**[<*n*>]:**LOAD** {<*ohms*>|<*lim_set*>}

:**OUTPut**[<*n*>]:**LOAD?** [<*lim_query*>]

Description

Sets or queries the output impedance for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<ohms>	Integer	1 Ω to 10 kΩ	50 Ω
<lim_set>	Discrete	{INFinity|MINimum|MAXimum|DEFault}	INFinity
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

- When the output type is differential (AMP/HBW), the output impedance cannot be set. The query returns the output impedance (50 Ω) of a single differential output terminal.

- <ohms> sets the output impedance of the output connector of the specified channel to a specified value. <lim_set> can set the impedance to INFinity (HighZ), MINimum (minimum value), MAXimum (maximum value), and DEFault (default value).

- The output impedance setting affects the output amplitude range and the DC offset. If the actual load impedance differs from the value specified, the voltage level displayed would not match the voltage level of the device under test. To ensure correct voltage level, the load impedance setting must match the actual load.

Return Format

The query returns the output impedance in scientific notation. For example, the query might return +1.000000000000000E+02, indicating that the output impedance is 100 Ω. If the output impedance of the output connector of the specified channel is set to HighZ (INFinity), the query returns 9.9E+37.

Examples

```
:OUTPut1:LOAD INFinity /*Sets the output impedance to HighZ for CH1
output connector.*/
:OUTPut1:LOAD? /*Queries the output impedance for CH1 output
connector. The query returns 9.9E+37.*/
```

3.10.4   :OUTPut[<n>]:POLarity

Syntax

:OUTPut[<*n*>]**:POLarity** <*polarity*>

:OUTPut[<*n*>]**:POLarity?**

Description

Sets or queries the output polarity for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{NORMal|INVerted}	NORMal

Remarks

- The output polarity sets the signal on the output connector to normal (NORMal) or inverted (INVerted). In Normal mode, the instrument outputs a normal waveform; in Invert mode, the instrument inverts the waveform and then outputs the inverted waveform.

- The waveform is inverted relative to the offset voltage. The offset voltage remains unchanged when the waveform is inverted. The sync signal related to the waveform is not inverted.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NORM or INV.

Examples

```
:OUTPut1:POLarity NORMal /*Sets the CH1 output polarity to Normal.*/
:OUTPut1:POLarity? /*Queries the CH1 output polarity. The query
returns NORM.*/
```

3.10.5 :OUTPut[<n>]:SKEW:TIME

Syntax

:OUTPut[<*n*>]**:SKEW:TIME** {<*time*>|<*lim*>}

:OUTPut[<*n*>]**:SKEW:TIME?** [<*lim*>]

Description

Sets or queries the channel-to-channel skew (relative timing of the analog output).

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	-200 ns to +200 ns	0 s
<lim>	Discrete	{MINimum|MAXimum|DEFault}	-

Remarks

- The actual precision of <time> is ± 200 ps.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the skew in scientific notation. For example, the query might return +1.200000000000000E-09, indicating that the skew is 1.2 ns.

Examples

```
:OUTPut1:SKEW:TIME 1.2E-9 /*Sets the skew to 1.2 ns for CH1.*/
:OUTPut1:SKEW:TIME? /*Queries the skew for CH1. The query returns
+1.200000000000000E-09.*/
```

3.10.6 :OUTPut[<n>][:STATe]

Syntax

:OUTPut[<*n*>][**:STATe**] <*state*>

:OUTPut[<*n*>][**:STATe**]**?**

Description

Sets or queries the output on/off status for the specified channel.

Parameter

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

Remarks

- 0/OFF disables the channel output; 1/ON enables the channel output.

- [<n>] determines the channel number. When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns 0 or 1.

Examples

```
:OUTPut1:STATe ON /*Enables the output of CH1.*/
:OUTPut1:STATe? /*Queries the output on/off status for CH1. The
query returns 1.*/
```

3.10.7 :OUTPut[<n>]:SYNC

Syntax

:**OUTPut**[<*n*>]:**SYNC** <*state*>

:**OUTPut**[<*n*>]:**SYNC?**

Description

Sets or queries the output state of the sync signal.

Parameter

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

Remarks

- Sine, Square, Ramp, Pulse, Arb, Sweep waveforms, Bursts, modulated waveforms, and Advanced Arb waveforms have corresponding sync signals. For the

characteristics of sync signals for different signals, refer to the user manual of this product.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:OUTPut1:SYNC ON /*Enables the sync signal output.*/
:OUTPut1:SYNC? /*Queries the output state of the sync signal. The
query returns 1.*/
```

3.10.8   :OUTPut[<n>]:SYNC:MODE

Syntax

:OUTPut[<*n*>]:SYNC:MODE <*mode*>

:OUTPut[<*n*>]:SYNC:MODE?

Description

Sets or queries whether the frequency mark function is enabled for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<mode>	Discrete	{NORMal|MARKer}	NORMal

Remarks

- **NORMal:** disables the frequency mark function.

- **MARKer:** enables the frequency mark function.

- This function can be enabled only when the Sweep function (*[:SOURce[<n>]]:SWEep:STATe*) is enabled for the specified channel.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NORM or MARK.

Examples

```
:OUTPut1:SYNC:MODE MARKer /*Enables the frequency mark function for
CH1.*/
:OUTPut1:SYNC:MODE? /*Queries whether the frequency mark function
is enabled for CH1. The query returns MARK.*/
```

3.10.9 :OUTPut[<n>]:SYNC:POLarity

Syntax

:OUTPut[<*n*>]**:SYNC:POLarity** <*polarity*>

:OUTPut[<*n*>]**:SYNC:POLarity?**

Description

Sets or queries the polarity of sync signal for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{NORMal|INVerted}	NORMal

Remarks

- You can set the instrument to output normal sync signals (NORMal) or inverted sync signals (INVerted).

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NORM or INV.

Examples

```
:OUTPut1:SYNC:POLarity NORMal /*Sets the output polarity of CH1
sync signal to Normal.*/
:OUTPut1:SYNC:POLarity? /*Queries the output polarity of CH1 sync
signal. The query returns NORM.*/
```

3.10.10 :OUTPut[<n>]:TRIGger

Syntax

:OUTPut[<*n*>]**:TRIGger** <*bool*>

:OUTPut[<*n*>]**:TRIGger?**

Description

Sets or queries whether the trigger output is enabled for Sweep or Burst mode.

Parameter

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

Remarks

- After it is enabled, the instrument outputs a pulse with the specified edge (*:OUTPut[\<n\>]:TRIGger:SLOPe*) via the front-panel **[Sync Out]** connector.

- The trigger output is disabled when the burst trigger source is set to External or the burst type is set to Gated.

- The trigger output is disabled when the sweep trigger source is set to External.

- When [\<n\>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns 0 or 1.

Examples

```
:OUTPut:TRIGger ON /*Enables the trigger output for CH1.*/
:OUTPut:TRIGger? /*Queries whether the trigger output is enabled
for CH1. The query returns 1.*/
```

3.10.11 :OUTPut[\<n\>]:TRIGger:SLOPe

Syntax

:OUTPut[\<*n*\>]**:TRIGger:SLOPe** \<*type*\>

:OUTPut[\<*n*\>]**:TRIGger:SLOPe?**

Description

Sets or queries the edge of the trigger output signal for the specified channel.

Parameter

Name	Type	Range	Default
\<n\>	Discrete	{1|2|3|4}	1
\<type\>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- POSitive: outputs the pulse at the leading edge; NEGative: outputs the pulse at the trailing edge.

- After the trigger output is enabled (*:OUTPut[<n>]:TRIGger*), the instrument outputs a pulse with the specified edge from the front-panel **[Sync Out]** connector.

- When [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns POS or NEG.

Examples

```
:OUTPut1:TRIGger:SLOPe NEGative /*Sets the edge of the trigger
output signal to trailing edge for CH1.*/
:OUTPut1:TRIGger:SLOPe? /*Queries the edge of the trigger output
signal for CH1. The query returns NEG.*/
```

3.11 :SYNChro Commands

:SYNChro commands are used to set and query the benchmark channel and the target channel of the channel coupling and track functions.

3.11.1 :SYNChro:BENChmark

Syntax

:SYNChro:BENChmark *<chan>*

:SYNChro:BENChmark?

Description

Sets or queries the benchmark channel.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CH1|CH2|CH3|CH4}	CH1

Remarks

When the output type is set to single-ended, the range of <chan> is {CH1|CH2|CH3|CH4|CH5|CH6|CH7|CH8}.

Return Format

The query returns CH1, CH2, CH3, or CH4.

Examples

```
:SYNChro:BENChmark CH1 /*Sets the benchmark channel to CH1.*/
:SYNChro:BENChmark? /*Queries the benchmark channel. The query
returns CH1.*/
```

3.11.2 :SYNChro:BUNDle

Syntax

`:SYNChro:BUNDle <`*chan*`>,<`*bool*`>`

`:SYNChro:BUNDle? <`*chan*`>`

Description

Adds the specified channel to the Bundled Channels or removes the specified channel from the Bundled Channels.

Queries whether the specified channel is added to the Bundled Channels.

Parameter

Name	Type	Range	Default
<chan>	Discrete	{CH1|CH2|CH3|CH4}	-
<bool>	Bool	{0|1|OFF|ON}	1|ON

Remarks

- When the output type is set to single-ended, the range of <chan> is {CH1|CH2|CH3|CH4|CH5|CH6|CH7|CH8}.

- For the <bool> parameter, 1|ON adds the specified channel to the Bundled Channels while 0|OFF removes the specified channel from the Bundled Channels.

- After a channel is set to the benchmark channel (*:SYNChro:BENChmark*), it is automatically added to the Bundled Channels.

- The benchmark channel cannot be removed.

Return Format

The query returns 0 or 1.

Examples

```
:SYNChro:BUNDle CH2,ON /*Adds CH2 to the Bundled Channels.*/
:SYNChro:BUNDle? CH2 /*Queries whether CH2 is added to the Bundled
Channels. The query returns 1.*/
```

3.12 :SOURce Commands

:SOURce commands are used to set and query channel and waveform parameters, including basic waveform, Arb waveform, harmonic, modulation, sweep, burst, Advanced mode, coupling, and channel track.

Table 3.59 Range of Continuous Waveform Frequency

Waveform	DG6052/DG6054	DG6102/DG6104
Sine	SND/AMP: 1 µHz to 350 MHz HBW: 1 µHz to 500 MHz	SND/AMP: 1 µHz to 500 MHz[1] HBW: 1 µHz to 1 GHz
Square[2]	Fast transition enabled: SND: 1 µHz to 170 MHz; HBW: 1 µHz to 300 MHz Fast transition disabled: 1 µHz to 120 MHz	Fast transition enabled: SND: 1 µHz to 170 MHz; HBW: 1 µHz to 300 MHz Fast transition disabled: 1 µHz to 120 MHz
Ramp[3]	1 µHz to 5 MHz	1 µHz to 5 MHz
Pulse	1 µHz to 120 MHz	1 µHz to 120 MHz
Arb	1 µHz to 100 MHz	1 µHz to 100 MHz
Harmonic	1 mHz to 175 MHz	1 mHz to 250 MHz

NOTE

[1]: In Modulation and Burst output modes, the maximum frequency available of the sine wave is limited to 350 MHz for DG6102/DG6104.

[2]: In Modulation and Burst output modes, the square fast transition mode is forcibly turned off. The maximum frequency of the square wave is limited to 120 MHz.

[3]: In Modulation and Burst output modes, the maximum frequency available of the ramp wave is limited to 2.5 MHz.

Table 3.60 Range of Continuous Waveform Period

Waveform	DG6052/DG6054	DG6102/DG6104
Sine	SND/AMP: 2.9 ns to 1 Ms HBW: 2 ns to 1 Ms	SND/AMP: 2 ns to 1 Ms[1] HBW: 1 ns to 1 Ms
Square[2]	Fast transition enabled: SND: 5.9 ns to 1 Ms; HBW: 3.4 ns to 1 Ms Fast transition disabled: 8.4 ns to 1 Ms	Fast transition enabled: SND: 5.9 ns to 1 Ms; HBW: 3.4 ns to 1 Ms Fast transition disabled: 8.4 ns to 1 Ms
Ramp[3]	200 ns to 1 Ms	200 ns to 1 Ms

Waveform	DG6052/DG6054	DG6102/DG6104
Pulse	8.4 ns to 1 Ms	8.4 ns to 1 Ms
Arb	10 ns to 1 Ms	10 ns to 1 Ms
Harmonic	5.8 ns to 1 ks	4 ns to 1 ks

NOTE

[1]: In Modulation and Burst output modes, the minimum period available of the sine wave is limited to 2.9 ns for DG6102/DG6104.

[2]: In Modulation and Burst output modes, the square fast transition mode is forcibly turned off. The minimum period available of the square wave is 8.4 ns.

[3]: In Modulation and Burst output modes, the minimum period available of the ramp wave is limited to 400 ns.

Table 3.61 SND Output Amplitude Range

| Frequency | HighZ | | Load (50 Ω) | |
	Amplitude Range	Maximum Peak Value[1]	Amplitude Range	Maximum Peak Value[1]
≤100 MHz	2 mVpp to 20 Vpp	10 V	1 mVpp to 10 Vpp	5 V
≤250 MHz	2 mVpp to 10 Vpp	5 V	1 mVpp to 5 Vpp	2.5 V
≤350 MHz	2 mVpp to 4 Vpp	2 V	1 mVpp to 2 Vpp	1 V
≤500 MHz	2 mVpp to 2 Vpp	1 V	1 mVpp to 1 Vpp	500 mV

Table 3.62 AMP Output Amplitude Range (Load)

Frequency	Amplitude Range	Maximum Peak Value[1]
≤100 MHz	2 mVpp to 20 Vpp	10 V
≤250 MHz	2 mVpp to 10 Vpp	5 V
≤350 MHz	2 mVpp to 4 Vpp	2 V

Frequency	Amplitude Range	Maximum Peak Value[1]
≤500 MHz	2 mVpp to 2 Vpp	1 V

Table 3.63 HBW Output Amplitude Range (Load)

Frequency	Amplitude Range
≤500 MHz	400 mVpp to 2 Vpp
≤1 GHz	400 mVpp to 1 Vpp

TIP

The amplitude ranges of noise for each output type are as follows:

- For AMP output, the amplitude range of noise is from 2 mVpp to 2 Vpp.
- For HBW output, the amplitude range of noise is from 400 mVpp to 2 Vpp.
- For SND output, the amplitude range of noise is related to the impedance setting:
  - HighZ: 2 mVpp to 2 Vpp.
  - Load (50 Ω): 1 mVpp to 1 Vpp.

3.12.1 [:SOURce[<n>]]:AM

[:SOURce[<n>]]:AM commands are used to set and query the AM parameters such as the AM modulation source, modulating waveform, modulation depth, modulating waveform frequency, and the on/off status of the DSSC function and the AM modulation function.

3.12.1.1 [:SOURce[<n>]]:AM:DEPTh

Syntax

[:SOURce[<*n*>]]:AM[:DEPTh] {<*percent*>|<*lim*>}

[:SOURce[<*n*>]]:AM[:DEPTh]? [<*lim*>]

Description

Sets or queries the AM modulation depth for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<percent>	Real	0% to 120%	100%
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- Modulation depth is a percentage that represents the amplitude variation. When DSSC is off, Output Amplitude = (1 + Modulation Depth)/2*Carrier Amplitude; when DSSC is on, Output Amplitude = Modulation Depth*Carrier Amplitude.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the AM modulation depth in scientific notation. For example, the query might return +5.000000000000000E+01, indicating that the modulation depth is 50%.

Examples

```
:SOURce1:AM:DEPTh 50 /*Sets the AM Modulation Depth to 50% for
CH1.*/
:SOURce1:AM:DEPTh? /*Queries the AM Modulation Depth for CH1. The
query returns +5.000000000000000E+01.*/
```

3.12.1.2 [:SOURce[<n>]]:AM:DSSC

Syntax

[:SOURce[<n>]]:AM:DSSC <state>

[:SOURce[<n>]]:AM:DSSC?

Description

Sets or queries the on/off status of the AM DSSC function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<state>	Discrete	{0|1|OFF|ON}	0|OFF

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:AM:DSSC ON /*Enables the AM DSSC function for CH1.*/
:SOURce1:AM:DSSC? /*Queries the on/off status of the AM DSSC
function for CH1. The query returns 1.*/
```

3.12.1.3   [:SOURce[<n>]]:AM:INTernal:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**AM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**AM:INTernal:FREQuency?** [<*lim_query*>]

Description

Sets or queries the frequency of the AM modulating waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	2 mHz to 1 MHz	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source ([:SOURce[<n>]]:AM:SOURce).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might return +1.500000000000000E+02, indicating that the frequency is 150 Hz.

Examples

```
:SOURce1:AM:INTernal:FREQuency 150 /*Sets the frequency of the AM
modulating waveform to 150 Hz for CH1.*/
:SOURce1:AM:INTernal:FREQuency? /*Queries the frequency of the AM
modulating waveform for CH1. The query returns +1.500000000000000E
+02.*/
```

3.12.1.4   [:SOURce[<n>]]:AM:INTernal:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**AM:INTernal:FUNCtion** <*function*>

[:**SOURce**[<*n*>]]:**AM:INTernal:FUNCtion?**

Description

Sets or queries the AM modulating waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<function>	Discrete	{SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|ARB}	SINusoid

Remarks

- AM supports the following internal modulating waveforms:

    - **SINusoid:** Sine wave.

    - **SQUare:** Square with 50% duty cycle.

    - **TRIangle:** Triangle with 50% symmetry.

    - **RAMP:** UpRamp with 100% symmetry.

    - **NRAMp:** DnRamp with 0% symmetry.

    - **NOISe:** white gaussian noise.

    - **ARB:** arbitrary waveform.

- This command is only available for internal modulation source (*[:SOURce[<n>]]:AM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns SIN, SQU, TRI, RAMP, NRAM, NOIS, or ARB.

Examples

```
:SOURce1:AM:INTernal:FUNCtion SQUare /*Sets the AM modulating
waveform to Square for CH1.*/
:SOURce1:AM:INTernal:FUNCtion? /*Queries the AM modulating
waveform for CH1. The query returns SQU.*/
```

3.12.1.5 [:SOURce[<n>]]:AM:INTernal:FUNCtion:ARBitrary

Syntax

`[:SOURce[<n>]]:AM:INTernal:FUNCtion:ARBitrary <arb>`

`[:SOURce[<n>]]:AM:INTernal:FUNCtion:ARBitrary?`

Description

Sets or queries the modulating waveform (Arb) type of AM for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	SINC

Remarks

- The parameter <arb> is used to set the built-in waveform type. The range is {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE| PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED| BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE| CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE| NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP| SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM| CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2| TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A| ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A| ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET| ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE| LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA| WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO| CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH| SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON| ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO| ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN| BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING| HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN| ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11| ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2| ARCHAV|ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE| POSFWRSINE|NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01| 2NDOIR02|2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5| ISO167502VIT|ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE| SEVENTONE|EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP|

LOWERSEMICIRCLE|DISTORTION|GAUSSDERIV|GAUSSHERMITE1|
GAUSSHERMITE2|GAUSSHERMITE3|GAUSSHERMITE4|GABOR1|GABOR3|
LEGENDRE3|LEGENDRE4|LEGENDRE5|LEGENDRE6|LEGENDRE7|LEGENDRE8|
LEGENDRE9|LEGENDRE10|LAGUERRE2|LAGUERRE3|LAGUERRE4|LAGUERRE5|
LAGUERRE6|LAGUERRE7|LAGUERRE8|LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|
CHEBYSHEV5|CHEBYSHEV6|CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|
CHEBYSHEV10|WEIERSTRASS|AIRYAI|AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|
GAMMAINV|COSHC|SINHC|TANHC|TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|
PRBS16|PRBS20|PRBS21|PRBS23}

- When the modulating waveform (*[:SOURce[<n>]]:AM:INTernal:FUNCtion*) is set to Arb, you can use this command to select the Arb type as the modulating waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the Arb type, for example, SINC.

Examples

```
:SOURce1:AM:INTernal:FUNCtion:ARBitrary SINC /*Sets the Arb type
of the AM modulating waveform to SINC for CH1.*/
:SOURce1:AM:INTernal:FUNCtion:ARBitrary? /*Queries the Arb type of
the AM modulating waveform for CH1. The query returns SINC.*/
```

3.12.1.6 [:SOURce[<n>]]:AM:SOURce

Syntax

[:**SOURce**[<*n*>]]:**AM**:**SOURce** <*source*>

[:**SOURce**[<*n*>]]:**AM**:**SOURce?**

Description

Sets or queries the AM modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation.

- **INTernal:** internal modulation source. When the internal modulation source is selected, you can send *[:SOURce[<n>]]:AM:INTernal:FUNCtion* to select the internal modulating waveforms.

- **EXTernal:** external modulation source. When the external modulation source is selected, the generator receives the external modulating signal from the front-panel **[MOD IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:AM:SOURce INTernal /*Sets the AM modulation source to
internal modulation source for CH1.*/
:SOURce1:AM:SOURce? /*Queries the AM modulation source for CH1.
The query returns INT.*/
```

3.12.1.7   [:SOURce[<n>]]:AM:STATe

Syntax

[:**SOURce**[<*n*>]]:**AM:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**AM:STATe?**

Description

Sets or queries the on/off status of the AM modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for AM.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:AM:STATe ON /*Enables the AM modulation function for
CH1.*/
:SOURce1:AM:STATe? /*Queries the on/off status of the AM
modulation function for CH1. The query returns 1.*/
```

3.12.2 [:SOURce[<n>]]:APPLy

3.12.2.1 [:SOURce[<n>]]:APPLy?

Syntax

[:**SOURce**[<*n*>]]:**APPLy?**

Description

Queries the waveform parameters for the specified channel.

Parameter

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

Remarks

•   When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
    output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

•   The table below shows the channel waveform types and the corresponding
    returned waveform names.

Waveform Parameters	Remarks	Waveform Parameters	Remarks
SIN	Sine	ARB	Arb, Advanced-Arb
SQU	Square	SEQ	Advanced-Sequence
RAMP	Ramp	IQ	Advanced-IQ
PULS	Pulse	PRBS	Advanced-PRBS
NOIS	Noise	MPUL	Advanced-Multi-pulse
DC	DC	MTON	Advanced-Multi-tone
HARM	Harmonic	PATT	Advanced-Pattern

Return Format

The query returns a string enclosed by double quotation marks. It consists of 5 parts separated by commas. The return format is related to the current waveform.

- For basic waveform, the return format is "Continuous waveform name,frequency,amplitude range,offset,phase" (expressed in scientific notation and the default units are Hz, Vpp, Vdc and ° respectively; the absent item is fixed to 0). In Burst mode, the returned value is fixed to 0. For example, the query might return "SIN,+5.000000000000000E+03,+3.0000000000000E+00,-3.0000000000000E+00,+4.0000000000000E+00", indicating that the current waveform is Sine wave, the frequency is 5 kHz, the amplitude range is 3 Vpp, the offset is -3 Vdc, and the start phase is 4°.

- The query returns the amplitude range in the current unit (Vpp/Vrms/dBm).

- The return format of the Advanced waveform is related to the waveform type. The waveform parameters are expressed in scientific notation and the absent item is fixed to 0.

  - Arb/Sequence/Multi-tone/Multi-pulse: "waveform name,sample rate,amplitude range,offset,0", and the default units are Sa/s, Vpp, Vdc and ° respectively.

  - PRBS: "waveform name,bit rate,amplitude range,offset,0", and the default units are bps, Vpp, Vdc and ° respectively.

  - IQ: "waveform name,symbol rate,power,0,0", and the default units are Sa/s, dBm, Vdc, and ° respectively.

  - Pattern: "waveform name,bit rate,amplitude range,offset,0", and the default units are bps, Vpp, Vdc and ° respectively.

Examples

```
:SOURce1:APPLy? /*Queries the waveform parameters for CH1. The
query returns "SIN,+5.000000000000000E+03,+3.0000000000000E
+00,-3.0000000000000E+00,+4.0000000000000E+00".*/
```

3.12.2.2 [:SOURce[<n>]]:APPLy:ARBitrary

Syntax

[:**SOURce**[<*n*>]]:**APPLy:ARBitrary** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|<*lim_set*>}[,{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output an arbitrary waveform with the specified frequency, amplitude range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance and frequency/period settings; for AMP output, refer to *Table 3.62 AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting; for HBW output, refer to *Table 3.63 HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting. For SND output, the range of <offset> is limited by the impedance, frequency/period, and amplitude range/high level settings; for AMP output, the range of <offset> is limited by the frequency/period and amplitude range settings; for HBW output, the range of <offset> is from -200 mVdc to 200 mVdc.

- For <amplitude>, if the sent parameter has a unit, set the Arb amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the Arb amplitude range in Vpp.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:ARBitrary 100,1,2,1 /*Sets CH1 to output an
arbitrary waveform with 100 Hz frequency, 1 Vpp amplitude range, 2
Vdc offset, and 1° start phase.*/
```

3.12.2.3   [:SOURce[<n>]]:APPLy:DC

Syntax

[:**SOURce**[<*n*>]]:**APPLy:DC** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|<*lim_set*>}[,
{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a DC with a specified offset.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4|5|6|7|8}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	-
<amplitude>	Real	Refer to *Remarks*	-
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	Refer to *Remarks*	-

Remarks

- The DC output is only available for SND output. It is not available for differential outputs (AMP/HBW).

- <frequency>, <phase>, and <amplitude> are not applicable to DC. However, a placeholder must be specified for them.

- The range of <offset> is limited by the "Impedance" setting (*:OUTPut[<n>]:LOAD*).

- Executing the **:APPLy** series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

None.

Examples

```
:SOURce1:APPLy:DC 100,5,1,90 /*Sets CH1 to output a DC with 1 Vdc
offset.*/
```

3.12.2.4   [:SOURce[<n>]]:APPLy:NOISe

Syntax

[:**SOURce**[<*n*>]]:**APPLy:NOISe** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|<*lim_set*>}[,
{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output noise with the specified amplitude range and offset.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	-
<amplitude>	Real	Refer to *Remarks*	2 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	Refer to *Remarks*	-

Remarks

- <frequency> and <phase> are not applicable to noise. However, a placeholder must be specified for them.

- For SND output, the <amplitude> of noise is related to the impedance setting: 2 mVpp to 2 Vpp (HighZ), 1 mVpp to 1 Vpp (Load). For AMP output, the <amplitude> of noise is from 2 mVpp to 2 Vpp. For HBW output, the <amplitude> of noise ranges from 400 mVpp to 2 Vpp.

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:NOISe 100,1,0.5,90 /*Sets CH1 to output noise with
1 Vpp amplitude range and 0.5 Vdc offset.*/
```

3.12.2.5   [:SOURce[<n>]]:APPLy:PULSe

Syntax

[:**SOURce**[<*n*>]]:**APPLy:PULSe** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|<*lim_set*>}[,
{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a pulse with the specified frequency, amplitude
range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance and frequency/period settings; for AMP output, refer to *Table 3.62 AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting; for HBW output, refer to *Table 3.63 HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting. For SND output, the range of <offset> is limited by the impedance, frequency/period, and amplitude range/high level settings; for AMP output, the range of <offset> is limited by the frequency/period and amplitude range settings; for HBW output, the range of <offset> is from -200 mVdc to 200 mVdc.

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command.

> If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:PULSe 100,3,2,1 /*Sets CH1 to output a pulse with
100 Hz frequency, 3 Vpp amplitude range, 2 Vdc offset, and 1°
start phase.*/
```

3.12.2.6   [:SOURce[<n>]]:APPLy:RAMP

Syntax

[:**SOURce**[<*n*>]]:**APPLy:RAMP** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|<*lim_set*>}[, {<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a ramp (with the maximum symmetry available at the current frequency) with the specified frequency, amplitude range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance and frequency/period settings; for AMP output, refer to *Table 3.62*

AMP Output Amplitude Range (Load) for the range of <amplitude>, which is limited by the frequency/period setting; for HBW output, refer to Table 3.63 HBW Output Amplitude Range (Load) for the range of <amplitude>, which is limited by the frequency/period setting. For SND output, the range of <offset> is limited by the impedance, frequency/period, and amplitude range/high level settings; for AMP output, the range of <offset> is limited by the frequency/period and amplitude range settings; for HBW output, the range of <offset> is from -200 mVdc to 200 mVdc.

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing this command will overwrite the current symmetry setting (*[:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry*), and set the symmetry to the maximum value available at the current frequency for the ramp.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:RAMP 100,1,2,3 /*Sets CH1 to output a ramp with 100
Hz frequency, 1 Vpp amplitude range, 2 Vdc offset, and 3° start
phase.*/
```

3.12.2.7   [:SOURce[<n>]]:APPLy:SINusoid

Syntax

[:**SOURce**[<*n*>]]:**APPLy:SINusoid** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|
<*lim_set*>}[,{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a sine wave with the specified frequency, amplitude range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-

Name	Type	Range	Default
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance and frequency/period settings; for AMP output, refer to *Table 3.62 AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting; for HBW output, refer to *Table 3.63 HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting. For SND output, the range of <offset> is limited by the impedance, frequency/period, and amplitude range/high level settings; for AMP output, the range of <offset> is limited by the frequency/period and amplitude range settings; for HBW output, the range of <offset> is from -200 mVdc to 200 mVdc.

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:SINusoid 100,3,2,1 /*Sets CH1 to output a sine wave
with 100 Hz frequency, 3 Vpp amplitude range, 2 Vdc offset, and 1°
start phase.*/
```

3.12.2.8   [:SOURce[<n>]]:APPLy:SQUare

Syntax

[**:SOURce**[<*n*>]]**:APPLy:SQUare** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|
<*lim_set*>}[,{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a square wave (50% duty cycle) with the specified frequency, amplitude range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance and frequency/period settings; for AMP output, refer to *Table 3.62 AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting; for HBW output, refer to *Table 3.63 HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting. For SND output, the range of <offset> is limited by the impedance, frequency/period, and amplitude range/high level settings; for AMP output, the range of <offset> is limited by the frequency/period and amplitude range settings; for HBW output, the range of <offset> is from -200 mVdc to 200 mVdc.

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing this command will set the transition time of square wave to 800 ps and turn off the fast transition function. This command will overwrite the current duty cycle setting (*[:SOURce[<n>]]:FUNCtion:SQUare:DCYCle*) and set 50% duty cycle for square wave.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:SQUare 100,5,0.5,3 /*Sets CH1 to output a square
wave with 100 Hz frequency, 5 Vpp amplitude range, 0.5 Vdc offset,
and 3° start phase.*/
```

3.12.2.9 [:SOURce[<n>]]:APPLy:TRIangle

Syntax

[:**SOURce**[<*n*>]]:**APPLy:TRIangle** [{<*frequency*>|<*lim_set*>}[,{<*amplitude*>|
<*lim_set*>}[,{<*offset*>|<*lim_set*>}[,{<*phase*>|<*lim_set*>}]]]]

Description

Sets the specified channel to output a triangle wave (50% symmetry) with the
specified frequency, amplitude range, offset, and phase.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<lim_set>	Discrete	{DEFault|MINimum|MAXimum}	-
<frequency>	Real	Refer to *Remarks*	1 kHz
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<offset>	Real	Refer to *Remarks*	0 Vdc
<phase>	Real	-360° to 360°	0°

Remarks

- The range of <frequency> is related to the instrument model (*Table 3.59 Range
  of Continuous Waveform Frequency*). For SND output, refer to *Table 3.61 SND
  Output Amplitude Range* for the range of <amplitude>, which is limited by the
  impedance and frequency/period settings; for AMP output, refer to *Table 3.62
  AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is
  limited by the frequency/period setting; for HBW output, refer to *Table 3.63
  HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is
  limited by the frequency/period setting. For SND output, the range of <offset>
  is limited by the impedance, frequency/period, and amplitude range/high level
  settings; for AMP output, the range of <offset> is limited by the frequency/
  period and amplitude range settings; for HBW output, the range of <offset> is
  from -200 mVdc to 200 mVdc.

- Triangle wave is a special case of ramp. It is equivalent to a ramp with 50% symmetry (*[:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry*).

- For <amplitude>, if the sent parameter has a unit, set the waveform amplitude range in that unit. If the unit is invalid, the instrument will ignore this command. If the parameter does not have a unit, set the waveform amplitude range in the current unit.

- Executing the `:APPLy` series of commands automatically sets the channel output mode to Continuous.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:APPLy:TRIangle 100,1,2,3 /*Sets CH1 to output a triangle
wave with 100 Hz frequency, 1 Vpp amplitude range, 2 Vdc offset,
and 3° start phase.*/
```

3.12.3 [:SOURce[<n>]]:ASKey

[:SOURce[<n>]]:ASKey commands are used to set and query ASK parameters such as the modulation amplitude, modulation rate, modulation polarity, modulation source, and the on/off status of the ASK modulation function.

3.12.3.1 [:SOURce[<n>]]:ASKey:AMPLitude

Syntax

[:**SOURce**[<*n*>]]:**ASKey:AMPLitude** {<*amplitude*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**ASKey:AMPLitude?** [<*lim_query*>]

Description

Sets or queries the ASK modulation amplitude for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<amplitude>	Real	Refer to *Remarks*	1 Vpp
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- In ASK modulation, the instrument shift its output amplitude between two preset values (called the carrier amplitude and the modulation amplitude).

- The range of <amplitude> is consistent with the amplitude range of current basic waveforms.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the ASK modulation amplitude in scientific notation. For example, the query might return +1.000000000000000E+00, indicating that the modulation amplitude is 1 Vpp.

Examples

```
:SOURce1:ASKey:AMPLitude 1 /*Sets the ASK modulation amplitude to
1 Vpp for CH1.*/
:SOURce1:ASKey:AMPLitude? /*Queries the ASK modulation amplitude
for CH1. The query returns +1.000000000000000E+00.*/
```

3.12.3.2 [:SOURce[<n>]]:ASKey:INTernal:RATE

Syntax

[:**SOURce**[<*n*>]]:**ASKey:INTernal:RATE** {<*rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**ASKey:INTernal:RATE?** [<*lim*>]

Description

Sets or queries the ASK modulation rate for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	2 mHz to 1 MHz	100 Hz
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source (*[:SOURce[<n>]]:ASKey:SOURce*).

- ASK rate is the rate at which the output amplitude "shifts" between the carrier amplitude (*[:SOURce[<n>]]:VOLTage*) and modulation amplitude (*[:SOURce[<n>]]:ASKey:AMPLitude*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the ASK rate in scientific notation. For example, the query might return +1.500000000000000E+02, indicating that the ASK rate is 150 Hz.

Examples

```
:SOURce1:ASKey:INTernal:RATE 150 /*Sets the ASK rate to 150 Hz for
CH1.*/
:SOURce1:ASKey:INTernal:RATE? /*Queries the ASK rate for CH1. The
query returns +1.500000000000000E+02.*/
```

3.12.3.3   [:SOURce[<n>]]:ASKey:POLarity

Syntax

[:**SOURce**[<*n*>]]:**ASKey:POLarity** <*polarity*>

[:**SOURce**[<*n*>]]:**ASKey:POLarity?**

Description

Sets or queries the ASK modulation polarity for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- The ASK modulation polarity can be set to the following:

    - **POSitive:** positive polarity.

    - **NEGative:** negative polarity.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns POS or NEG.

Examples

```
:SOURce1:ASKey:POLarity NEGative /*Sets the ASK modulation
polarity to negative for CH1.*/
:SOURce1:ASKey:POLarity? /*Queries the ASK modulation polarity for
CH1. The query returns NEG.*/
```

3.12.3.4 [:SOURce[<n>]]:ASKey:PORT

Syntax

[:SOURce[<*n*>]]:ASKey:PORT <*port*>

[:SOURce[<*n*>]]:ASKey:PORT?

Description

Sets or queries the ASK external modulation port for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<port>	Discrete	{FRONt|REAR}	FRONt

Remarks

- When the modulation source of ASK modulation is set to external source, you can set the following input terminals:

  - **FRONt:** front port. The instrument receives the external modulation signal from the front-panel **[Mod In]** connector.

  - **REAR:** rear port. The instrument receives the external modulation signal from the rear-panel **[AUX IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns FRON or REAR.

Examples

```
:SOURce1:ASKey:PORT FRONt /*Sets the ASK external modulation port
to front port for CH1.*/
:SOURce1:ASKey:PORT? /*Queries the ASK external modulation port
for CH1. The query returns FRON.*/
```

3.12.3.5 [:SOURce[<n>]]:ASKey:SOURce

Syntax

[:SOURce[<*n*>]]:ASKey:SOURce <*source*>

[:SOURce[<*n*>]]:ASKey:SOURce?

Description

Sets or queries the ASK modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation source.

    - **INTernal:** internal modulation source. The modulating waveform is a square waveform with 50% duty cycle.

    - **EXTernal:** when the external modulation source is selected, the generator receives the external modulating signal from the rear-panel **[AUX IN]** connector or the corresponding front-panel **[Mod IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:ASKey:SOURce INTernal /*Sets the ASK modulation source to
internal modulation source for CH1.*/
:SOURce1:ASKey:SOURce? /*Queries the ASK modulation source for
CH1. The query returns INT.*/
```

3.12.3.6   [:SOURce[<n>]]:ASKey:STATe

Syntax

[:**SOURce**[<*n*>]]:**ASKey:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**ASKey:STATe?**

Description

Sets or queries the on/off status of the ASK modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for ASK.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:ASKey:STATe ON /*Enables the ASK modulation function for
CH1.*/
:SOURce1:ASKey:STATe? /*Queries the on/off status of the ASK
modulation function for CH1. The query returns 1.*/
```

3.12.4 [:SOURce[<n>]]:BURSt

[:SOURce[<n>]]:BURSt commands are used to set the burst parameters such as burst type, gate polarity, burst count, start phase, and internal trigger period.

3.12.4.1 [:SOURce[<n>]]:BURSt:GATE:POLarity

Syntax

[:SOURce[<*n*>]]:BURSt:GATE:POLarity <*polarity*>

[:SOURce[<*n*>]]:BURSt:GATE:POLarity?

Description

Sets or queries the gate polarity of the burst waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{NORMal|INVerted}	NORMal

Remarks

- The gate polarity is only available for the gated burst mode (*[:SOURce[<n>]]:BURSt:MODE*). The generator controls the burst output based on the external signal levels (gated signals) at the rear-panel **[AUX IN]** connector of the corresponding channel.

- The gate polarity can be set to the following:

  - **NORMal:** positive polarity. When the external signal level is high (low), the gate signal is true (false).

  - **INVerted:** negative polarity. When the external signal level is low (high), the gate signal is true (false).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NORM or INV.

Examples

```
:SOURce1:BURSt:GATE:POLarity NORMal /*Sets the gate polarity of
the burst waveform to positive for CH1.*/
:SOURce1:BURSt:GATE:POLarity? /*Queries the gate polarity of the
burst waveform for CH1. The query returns NORM.*/
```

3.12.4.2   [:SOURce[<n>]]:BURSt:INTernal:PERiod

Syntax

[:**SOURce**[<*n*>]]:**BURSt:INTernal:PERiod**{<*seconds*>|<*lim*>}

[:**SOURce**[<*n*>]]:**BURSt:INTernal:PERiod?** [<*lim*>]

Description

Sets or queries the burst period of internally-triggered N-Cycle bursts for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	4 μs to 8000 s	10 ms
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- Burst period is only available for internally triggered N-Cycle burst mode.

- For the relations among the burst period, basic waveform period, and burst count, the following formula should be satisfied:

  Burst Period ≥ ⌈(Burst Count x Waveform Period) ÷ 6.4 ns⌉ x 6.4 ns + 4 μs[1]

- If the burst period is too short, the generator will increase it automatically to ensure the output of the specified number of cycles.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

TIP

[1]: ⌈x⌉ indicates that x is rounded up.

Return Format

The query returns the burst period in scientific notation. For example, the query might return +1.000000000000000E-01, indicating that the period is 0.1 s.

Examples

```
:SOURce1:BURSt:INTernal:PERiod 0.1 /*Sets the burst period of
internally-triggered N-Cycle bursts to 0.1 s for CH1.*/
:SOURce1:BURSt:INTernal:PERiod? /*Queries the burst period of
internally-triggered N-Cycle bursts for CH1. The query returns
+1.000000000000000E-01.*/
```

3.12.4.3 [:SOURce[<n>]]:BURSt:MODE

Syntax

[:SOURce[<*n*>]]:BURSt:MODE <*mode*>

[:SOURce[<*n*>]]:BURSt:MODE?

Description

Sets or queries the burst type for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<mode>	Discrete	{TRIGgered|GATed}	TRIGgered

Remarks

- When the output mode of the specified channel is set to Burst, you can use this command to set the burst type.

  - **TRIGgered:** N-Cycle burst. The generator outputs a waveform with the specified number of cycles (burst count) when it receives the trigger signal. You can use *[:SOURce[<n>]]:BURSt:NCYCles* to set the burst count.

- **GATed:** Gated burst. The generator controls the waveform output based on the external signal levels at the rear-panel **[AUX IN]** connector. You can use *[:SOURce[<n>]]:BURSt:GATE:POLarity* to select the signal's polarity.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns TRIG or GAT.

Examples

```
:SOURce1:BURSt:MODE GATed /*Sets the burst type to Gated for CH1.*/
:SOURce1:BURSt:MODE? /*Queries the burst type for CH1. The query
returns GAT.*/
```

3.12.4.4 [:SOURce[<n>]]:BURSt:NCYCles

Syntax

[:**SOURce**[<*n*>]]:**BURSt:NCYCles** {<*cycles*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**BURSt:NCYCles?** [<*lim_query*>]

Description

Sets or queries the number of cycles (burst count) of the N-Cycle bursts for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<cycles>	Integer	1 to 1,000,000	1
<lim_set>	Discrete	{INFinity|MINimum|MAXimum}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- In N-Cycle Burst mode (*[:SOURce[<n>]]:BURSt:MODE*), the instrument outputs a waveform for a specified number of cycles (1 to 1,000,000) when the trigger signal is received. You can also set the burst count to "Infinite" (INFinity).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the burst count in scientific notation. For example, the query might return +5.000000000000000E+02, indicating that the burst count is 500.

Examples

```
:SOURce1:BURSt:NCYCles 500 /*Sets the burst count of the N-Cycle
bursts to 500.*/
:SOURce1:BURSt:NCYCles? /*Queries the burst count of the N-Cycle
bursts for CH1. The query returns +5.000000000000000E+02.*/
```

3.12.4.5   [:SOURce[<n>]]:BURSt:PHASe

Syntax

[:**SOURce**[<*n*>]]:**BURSt:PHASe** {<*phase*>|<*lim*>}

[:**SOURce**[<*n*>]]:**BURSt:PHASe?** [<*lim*>]

Description

Sets or queries the start phase of the burst waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<phase>	Real	-360° to 360°	0°
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the start phase in scientific notation. For example, the query might return +1.000000000000000E+01, indicating that the start phase is 10°.

Examples

```
:SOURce1:BURSt:PHASe 10 /*Sets the start phase of the burst
waveform to 10° for CH1.*/
:SOURce1:BURSt:PHASe? /*Queries the start phase of the burst
waveform for CH1. The query returns +1.000000000000000E+01.*/
```

3.12.4.6   [:SOURce[<n>]]:BURSt:STATe

Syntax

[:**SOURce**[<*n*>]]:**BURSt:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**BURSt:STATe?**

Description

Sets or queries the on/off status of the burst mode for the specified channel.

Parameter

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

Remarks

• If the Modulation, Advanced, or Sweep function is currently enabled, the Modulation, Advanced, or Sweep function will be disabled automatically when the Burst function is enabled.

• The Burst mode cannot be enabled when the fundamental frequency is less than or equal to 125 µHz.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:BURSt:STATe ON /*Enables the burst mode for CH1.*/
:SOURce1:BURSt:STATe? /*Queries whether the burst mode is enabled
for CH1. The query returns 1.*/
```

3.12.5   [:SOURce[<n>]]:FM

[:**SOURce**[<**n**>]]:**FM** commands are used to set and query the FM parameters such as the frequency deviation, modulating waveform frequency, modulation source, modulating waveform, and the on/off status of the FM modulation.

3.12.5.1   [:SOURce[<n>]]:FM[:DEViation]

Syntax

[:**SOURce**[<*n*>]]:**FM**[:**DEViation**] {<*deviation*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FM**[:**DEViation**]? [<*lim_query*>]

Description

Sets or queries the FM frequency deviation for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<deviation>	Real	Refer to *Remarks*	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- Frequency deviation represents the peak variation in frequency of the modulated waveform from the carrier frequency. The minimum frequency deviation is 0 Hz and the maximum value is limited by the frequency setting value (*[:SOURce[<n>]]:FREQuency*) and the carrier frequency upper limit:
  - Frequency Deviation ≤ Current Carrier Frequency Value - 1 µHz.
  - Frequency Deviation ≤ Carrier Frequency Upper Limit - Carrier Frequency Value.

- When an external modulation source (*[:SOURce[<n>]]:FM:SOURce*) is selected, the frequency deviation is controlled by the signal from the front-panel **[MOD IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the frequency deviation in scientific notation. For example, the query might return +1.000000000000000E+02, indicating that the frequency deviation is 100 Hz.

Examples

```
:SOURce1:FM:DEViation 100 /*Sets the FM frequency deviation to 100
Hz for CH1.*/
:SOURce1:FM:DEViation? /*Queries the FM frequency deviation for
CH1. The query returns +1.000000000000000E+02.*/
```

3.12.5.2   [:SOURce[<n>]]:FM:INTernal:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**FM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FM:INTernal:FREQuency?** [<*lim_query*>]

Description

Sets or queries the FM modulation frequency for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	2 mHz to 1 MHz	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source (*[:SOURce[<n>]]:FM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might return +1.500000000000000E+02, indicating that the frequency is 150 Hz.

Examples

```
:SOURce1:FM:INTernal:FREQuency 150 /*Sets the frequency of the FM
modulating waveform to 150 Hz for CH1.*/
:SOURce1:FM:INTernal:FREQuency? /*Queries the frequency of the FM
modulating waveform for CH1. The query returns +1.500000000000000E
+02.*/
```

3.12.5.3 [:SOURce[<n>]]:FM:INTernal:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**FM:INTernal:FUNCtion** <*function*>

[:**SOURce**[<*n*>]]:**FM:INTernal:FUNCtion?**

Description

Sets or queries the FM modulating waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<function>	Discrete	{SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|ARB}	SINusoid

Remarks

- FM supports the following internal modulating waveforms:

  - **SINusoid:** Sine wave.

  - **SQUare:** Square with 50% duty cycle.

  - **TRIangle:** Triangle with 50% symmetry.

  - **RAMP:** UpRamp with 100% symmetry.

  - **NRAMp:** DnRamp with 0% symmetry.

  - **NOISe:** white gaussian noise.

  - **ARB:** arbitrary waveform.

- This command is only available for internal modulation source (*[:SOURce[<n>]]:FM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns SIN, SQU, TRI, RAMP, NRAM, NOIS, or ARB.

Examples

```
:SOURce1:FM:INTernal:FUNCtion SQUare /*Sets the FM modulating
waveform to Square for CH1.*/
:SOURce1:FM:INTernal:FUNCtion? /*Queries the FM modulating
waveform for CH1. The query returns SQU.*/
```

3.12.5.4   [:SOURce[<n>]]:FM:INTernal:FUNCtion:ARBitrary

Syntax

[:**SOURce**[<*n*>]]:**FM:INTernal:FUNCtion:ARBitrary** <*arb*>

[:**SOURce**[<*n*>]]:**FM:INTernal:FUNCtion:ARBitrary?**

Description

Sets or queries the modulating waveform (Arb) type of FM for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	SINC

Remarks

- The parameter <arb> is used to set the built-in waveform type. The range is {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE| PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED| BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE| CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE| NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP| SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM| CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2| TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A| ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A| ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET| ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE| LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA| WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO| CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH| SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON| ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO| ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN| BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING| HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN| ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11| ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2| ARCHAV|ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE| POSFWRSINE|NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01| 2NDOIR02|2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5| ISO167502VIT|ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE| SEVENTONE|EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP| LOWERSEMICIRCLE|DISTORTION|GAUSSDERIV|GAUSSHERMITE1| GAUSSHERMITE2|GAUSSHERMITE3|GAUSSHERMITE4|GABOR1|GABOR3| LEGENDRE3|LEGENDRE4|LEGENDRE5|LEGENDRE6|LEGENDRE7|LEGENDRE8| LEGENDRE9|LEGENDRE10|LAGUERRE2|LAGUERRE3|LAGUERRE4|LAGUERRE5| LAGUERRE6|LAGUERRE7|LAGUERRE8|LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4| CHEBYSHEV5|CHEBYSHEV6|CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9| CHEBYSHEV10|WEIERSTRASS|AIRYAI|AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5| GAMMAINV|COSHC|SINHC|TANHC|TICK|CLAUSEN|PRBS9|PRBS11|PRBS15| PRBS16|PRBS20|PRBS21|PRBS23}

- When the modulating waveform (*[:SOURce[<n>]]:FM:INTernal:FUNCtion*) is set to Arb, you can use this command to select the Arb type as the modulating waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the Arb type, for example, SINC.

Examples

```
:SOURce1:FM:INTernal:FUNCtion:ARBitrary SINC /*Sets the Arb type
of the FM modulating waveform to SINC for CH1.*/
:SOURce1:FM:INTernal:FUNCtion:ARBitrary? /*Queries the Arb type of
the FM modulating waveform for CH1. The query returns SINC.*/
```

3.12.5.5   [:SOURce[<n>]]:FM:SOURce

Syntax

[:SOURce[<*n*>]]:FM:SOURce <*source*>

[:SOURce[<*n*>]]:FM:SOURce?

Description

Sets or queries the FM modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation source.

    - **INTernal:** internal modulation source. When the internal modulation source is selected, you can use *[:SOURce[<n>]]:FM:INTernal:FUNCtion* to select the internal modulating waveforms.

    - **EXTernal:** when the external modulation source is selected, the generator receives the external modulating signal from the corresponding front-panel **[Mod In]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:FM:SOURce INTernal /*Sets the FM modulation source to
internal modulation source for CH1.*/
:SOURce1:FM:SOURce? /*Queries the FM modulation source for CH1.
The query returns INT.*/
```

3.12.5.6 [:SOURce[<n>]]:FM:STATe

Syntax

[:**SOURce**[<*n*>]]:**FM:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FM:STATe?**

Description

Sets or queries the on/off status of the FM modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for FM.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 1 or 0.

Examples

```
:SOURce1:FM:STATe ON /*Enables the FM modulation function for
CH1.*/
:SOURce1:FM:STATe? /*Queries the on/off status of the FM
modulation function for CH1. The query returns 1.*/
```

3.12.6 [:SOURce[<n>]]:FREQuency

[:SOURce[<n>]]:FREQuency commands are used to set the instrument's output frequency and the channel coupling mode.

3.12.6.1 [:SOURce[<n>]]:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FREQuency?** [<*lim_query*>]

Description

Sets or queries the frequency of the continuous waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	1 kHz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The available frequency range varies for different waveforms. For this, refer to *Table 3.59 Range of Continuous Waveform Frequency* .

- When the wave type of the specified channel is changed, the instrument still uses the frequency if the frequency is valid. Otherwise, the instrument automatically sets the frequency as the upper limit or lower limit for the new wave type.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might return +1.000000000000000E+06, indicating that the frequency is 1 MHz.

Examples

```
:SOURce1:FREQuency 1000000 /*Sets the frequency of the continuous
waveform to 1 MHz for CH1.*/
:SOURce1:FREQuency? /*Queries the frequency of the continuous
waveform for CH1. The query returns +1.000000000000000E+06.*/
```

3.12.6.2 [:SOURce[<n>]]:FREQuency:CENTer

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:CENTer** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FREQuency:CENTer?** [<*lim_query*>]

Description

Sets or queries the center frequency of the sweep mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	550 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- You can set the sweep boundaries using center frequency and frequency span (*[:SOURce[<n>]]:FREQuency:SPAN*). Different sweep waveforms have different center frequency and frequency span ranges. Also, the center frequency and frequency span affect each other.

- Center Frequency = (Start Frequency + Stop Frequency)/2. Frequency Span = Stop Frequency - Start Frequency.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the center frequency in scientific notation. For example, the query might return +5.000000000000000E+03, indicating that the center frequency is 5 kHz.

Examples

```
:SOURce1:FREQuency:CENTer 5000 /*Sets the center frequency of the
sweep mode to 5 kHz for CH1.*/
:SOURce1:FREQuency:CENTer? /*Queries the center frequency of the
sweep mode for CH1. The query returns +5.000000000000000E+03.*/
```

3.12.6.3 [:SOURce[<n>]]:FREQuency:COUPle:MODE

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:MODE** <*mode*>

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:MODE?**

Description

Sets or queries the type of the frequency coupling mode for the specified channel.

Parameter

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

Name	Type	Range	Default
<mode>	Discrete	{OFFSet|RATio}	OFFSet

Remarks

- The frequency coupling mode can be set to the following:

  - **OFFSet:** frequency offset mode. You can use *[:SOURce[<n>]]:FREQuency:COUPle:OFFSet* to set the frequency offset of the coupled channel.

  - **RATio:** frequency ratio mode. You can use *[:SOURce[<n>]]:FREQuency:COUPle:RATio* to set the frequency ratio of the coupled channel.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns OFFS or RAT.

Examples

```
:SOURce1:FREQuency:COUPle:MODE OFFSet /*Sets the type of the
frequency coupling mode to frequency offset for CH1.*/
:SOURce1:FREQuency:COUPle:MODE? /*Queries the type of the
frequency coupling mode for CH1. The query returns OFFS.*/
```

3.12.6.4 [:SOURce[<n>]]:FREQuency:COUPle:OFFSet

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:OFFSet** <*offset*>

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:OFFSet?**

Description

Sets or queries the frequency offset of the frequency coupling for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<offset>	Real	Refer to *Remarks*	0

Remarks

- When modifying the offset, if the channel parameters exceed the limits after coupling calculation, the generator will automatically adjust the waveform

parameters of the benchmark channel to avoid parameter overlimit. If the adjusted waveform parameters will still exceed the limit, then this offset is not allowed.

- The range of the frequency offset is limited by the waveform type and instrument model.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency offset in scientific notation. For example, the query might return +1.000000000000000E-02, indicating that the frequency offset is 10 mHz.

Examples

```
:SOURce1:FREQuency:COUPle:OFFSet 0.01 /*Sets the frequency offset
of the frequency coupling to 10 mHz for CH1.*/
:SOURce1:FREQuency:COUPle:OFFSet? /*Queries the frequency offset
of the frequency coupling for CH1. The query returns
+1.000000000000000E-02.*/
```

3.12.6.5 [:SOURce[<n>]]:FREQuency:COUPle:RATio

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:RATio** <*ratio*>

[:**SOURce**[<*n*>]]:**FREQuency:COUPle:RATio?**

Description

Sets or queries the frequency ratio of the frequency coupling for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<ratio>	Real	0.001 to 1000	1

Remarks

- When modifying the ratio, if the channel parameters exceed the limits after coupling calculation, the generator will automatically adjust the waveform parameters of the benchmark channel to avoid parameter overlimit. If the adjusted waveform parameters will still exceed the limit, then this ratio is not allowed.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency ratio in scientific notation. For example, the query might return 2.000000000000000E+00, indicating that the frequency ratio is 2.

Examples

```
:SOURce1:FREQuency:COUPle:RATio 2 /*Sets the frequency ratio of
the frequency coupling to 2 for CH1.*/
:SOURce1:FREQuency:COUPle:RATio? /*Queries the frequency ratio of
the frequency coupling for CH1. The query returns
2.000000000000000E+00.*/
```

3.12.6.6 [:SOURce[<n>]]:FREQuency:COUPle[:STATe]

Syntax

[:**SOURce**[<*n*>]]:**FREQuency**:**COUPle**[:**STATe**] <*bool*>

[:**SOURce**[<*n*>]]:**FREQuency**:**COUPle**[:**STATe**]?

Description

Sets or queries the on/off status of the frequency coupling function for the specified channel.

Parameter

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

Remarks

- When the Coupling function is enabled, if parameter overlimit occurs due to waveform switching or parameter adjustments, the system automatically turns off the corresponding coupling switch. When the Coupling function is disabled, it cannot be enabled if the coupling parameter exceeds the limit.

- The Coupling function of a channel can be enabled only when the channel is added to the Bundled Channels (*:SYNChro:BUNDle*) and is not used as the benchmark channel (*:SYNChro:BENChmark*).

- The frequency coupling function is available only when the output modes of the benchmark channel and the target channel are set to Continuous and the output waveform is set to Sine, Square, or Ramp.

- When the Track function is enabled, the Coupling function of the channel is disabled. After the Coupling function is enabled, the channel cannot be used as the target channel for the channel copy function.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FREQuency:COUPle:STATe ON /*Enables the frequency
coupling function for CH1.*/
:SOURce1:FREQuency:COUPle:STATe? /*Queries the on/off status of
the frequency coupling function for CH1. The query returns 1.*/
```

3.12.6.7   [:SOURce[<n>]]:FREQuency:SPAN

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:SPAN** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FREQuency:SPAN?** [<*lim_query*>]

Description

Sets or queries the frequency span of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	900 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- You can set the sweep boundaries using the center frequency (*[:SOURce[<n>]]:FREQuency:CENTer*) and frequency span. Different sweep waveforms have different center frequency and frequency span ranges. Also, the center frequency and frequency span affect each other. Define the maximum start/stop frequency as F_{max} and the minimum start/stop frequency as F_{min}. $F_m = (F_{max} - F_{min})/2$. The frequency span is affected by the center frequency: when Center Frequency $\leq F_m$, the Frequency Span is ± 2 x (Center Frequency-F_{min}); when Center Frequency > F_m, the Frequency Span is ± 2 x (F_{max} - Center Frequency).

- Center Frequency = (Start Frequency + Stop Frequency)/2. Frequency Span = Stop Frequency - Start Frequency.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency span in scientific notation. For example, the query might return +8.000000000000000E+02, indicating that the frequency span is 800 Hz.

Examples

```
:SOURce1:FREQuency:SPAN 800 /*Sets the frequency span of the sweep
function to 800 Hz for CH1.*/
:SOURce1:FREQuency:SPAN? /*Queries the frequency span of the sweep
function for CH1. The query returns +8.000000000000000E+02.*/
```

3.12.6.8   [:SOURce[<n>]]:FREQuency:STARt

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:STARt** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FREQuency:STARt?** [<*lim_query*>]

Description

Sets or queries the start frequency of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The start frequency and stop frequency (*[:SOURce[<n>]]:FREQuency:STOP*) set the sweep's upper and lower frequency bounds. The sweep begins at the start frequency, sweeps to the stop frequency, and then resets back to the start frequency. When the start frequency is less than the stop frequency, the generator sweeps up in frequency; when is start frequency is greater than the stop frequency, the generator sweeps down in frequency. When the start frequency is equal to the stop frequency, the generator sweeps in a fixed frequency.

- Center Frequency = (Start Frequency + Stop Frequency)/2. Frequency Span = Stop Frequency - Start Frequency.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the start frequency in scientific notation. For example, the query might return +1.000000000000000E+02, indicating that the start frequency is 100 Hz.

Examples

```
:SOURce1:FREQuency:STARt 100 /*Sets the start frequency of the
sweep function to 100 Hz for CH1.*/
:SOURce1:FREQuency:STARt? /*Queries the start frequency of the
sweep function for CH1. The query returns +1.000000000000000E+02.*/
```

3.12.6.9 [:SOURce[<n>]]:FREQuency:STOP

Syntax

[:**SOURce**[<*n*>]]:**FREQuency:STOP** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FREQuency:STOP?** [<*lim_query*>]

Description

Sets or queries the stop frequency of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	1 kHz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The start frequency (*[:SOURce[<n>]]:FREQuency:STARt*) and stop frequency set the sweep's upper and lower frequency bounds. The sweep begins at the start frequency, sweeps to the stop frequency, and then resets back to the start frequency. When the start frequency is less than the stop frequency, the generator sweeps up in frequency; when is start frequency is greater than the stop frequency, the generator sweeps down in frequency. When the start frequency is equal to the stop frequency, the generator sweeps in a fixed frequency.

- Center Frequency = (Start Frequency + Stop Frequency)/2. Frequency Span = Stop Frequency - Start Frequency.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the stop frequency in scientific notation. For example, the query might return +9.000000000000000E+02, indicating that the stop frequency is 900 Hz.

Examples

```
:SOURce1:FREQuency:STOP 900 /*Sets the stop frequency of the sweep
function to 900 Hz for CH1.*/
:SOURce1:FREQuency:STOP? /*Queries the stop frequency of the sweep
function for CH1. The query returns +9.000000000000000E+02.*/
```

3.12.7 [:SOURce[<n>]]:FSKey

[:SOURce[<n>]]:FSKey commands are used to set and query FSK parameters such as the FSK hopping frequency, modulation rate, modulation polarity, modulation source, and the on/off status of the FSK modulation function.

3.12.7.1 [:SOURce[<n>]]:FSKey:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**FSKey**:**FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FSKey**:**FREQuency?** [<*lim_query*>]

Description

Sets or queries the FSK hop frequency for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	10 kHz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- In FSK modulation, the generator "shift" its output frequency between the carrier frequency (*[:SOURce[<n>]]:FREQuency*) and hop frequency.

- The range of the hop frequency <frequency> is consistent with the range of the carrier frequency.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the hop frequency in scientific notation. For example, the query might return +5.000000000000000E+03, indicating that the hop frequency is 5 kHz.

Examples

```
:SOURce1:FSKey:FREQuency 5000 /*Sets the FSK hop frequency to 5
kHz for CH1.*/
:SOURce1:FSKey:FREQuency? /*Queries the FSK hop frequency for CH1.
The query returns +5.000000000000000E+03.*/
```

3.12.7.2 [:SOURce[<n>]]:FSKey:INTernal:RATE

Syntax

[:**SOURce**[<*n*>]]:**FSKey:INTernal:RATE** {<*rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FSKey:INTernal:RATE?** [<*lim*>]

Description

Sets or queries the FSK modulation rate for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	2 mHz to 1 MHz	100 Hz
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source (*[:SOURce[<n>]]:FSKey:SOURce*). FSK rate is the rate at which the output frequency "shifts" between the carrier frequency (*[:SOURce[<n>]]:FREQuency*) and hop frequency (*[:SOURce[<n>]]:FSKey:FREQuency*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the FSK rate in scientific notation. For example, the query might return +1.500000000000000E+02, indicating that the FSK rate is 150 Hz.

Examples

```
:SOURce1:FSKey:INTernal:RATE 150 /*Sets the FSK rate to 150 Hz for
CH1.*/
:SOURce1:FSKey:INTernal:RATE? /*Queries the FSK rate for CH1. The
query returns +1.500000000000000E+02.*/
```

3.12.7.3 [:SOURce[<n>]]:FSKey:POLarity

Syntax

[:**SOURce**[<*n*>]]:**FSKey:POLarity** <*polarity*>

[:**SOURce**[<*n*>]]:**FSKey:POLarity?**

Description

Sets or queries the FSK modulation polarity for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- The FSK modulation polarity can be set to the following:

  - **POSitive:** positive polarity.

  - **NEGative:** negative polarity.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns POS or NEG.

Examples

```
:SOURce1:FSKey:POLarity NEGative /*Sets the FSK modulation
polarity to negative for CH1.*/
:SOURce1:FSKey:POLarity? /*Queries the FSK modulation polarity for
CH1. The query returns NEG.*/
```

3.12.7.4 [:SOURce[<n>]]:FSKey:PORT

Syntax

[:**SOURce**[<*n*>]]:**FSKey:PORT** <*port*>

[:**SOURce**[<*n*>]]:**FSKey:PORT?**

Description

Sets or queries the FSK external modulation port for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<port>	Discrete	{FRONt|REAR}	FRONt

Remarks

- When the modulation source of FSK modulation is set to external source, you can set the following input terminals:

    - **FRONt:** front port. The instrument receives the external modulation signal from the front-panel **[Mod In]** connector.

    - **REAR:** rear port. The instrument receives the external modulation signal from the rear-panel **[AUX IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns FRON or REAR.

Examples

```
:SOURce1:FSKey:PORT FRONt /*Sets the FSK external modulation port
to front port for CH1.*/
:SOURce1:FSKey:PORT? /*Queries the FSK external modulation port
for CH1. The query returns FRON.*/
```

3.12.7.5   [:SOURce[<n>]]:FSKey:SOURce

Syntax

[:**SOURce**[<*n*>]]:**FSKey**:**SOURce** <*source*>

[:**SOURce**[<*n*>]]:**FSKey**:**SOURce?**

Description

Sets or queries the FSK modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation source.

  - **INTernal:** internal modulation source. When the internal modulation source is selected, the modulating waveform is a square waveform with 50% duty cycle.

  - **EXTernal:** when the external modulation source is selected, the generator receives the external modulating signal from the rear-panel **[AUX IN]** connector or the corresponding front-panel **[Mod IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:FSKey:SOURce INTernal /*Sets the FSK modulation source to
internal modulation source for CH1.*/
:SOURce1:FSKey:SOURce? /*Queries the FSK modulation source for
CH1. The query returns INT.*/
```

3.12.7.6 [:SOURce[<n>]]:FSKey:STATe

Syntax

[:**SOURce**[<*n*>]]:**FSKey:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FSKey:STATe?**

Description

Sets or queries the on/off status of the FSK modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for FSK.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FSKey:STATe ON /*Enables the FSK modulation function for
CH1.*/
:SOURce1:FSKey:STATe? /*Queries the on/off status of the FSK
modulation function for CH1. The query returns 1.*/
```

3.12.8   [:SOURce[<n>]]:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion** <*shape*>

[:**SOURce**[<*n*>]]:**FUNCtion?**

Description

Sets or queries the continuous wave type for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<shape>	Discrete	{SINusoid|SQUare|RAMP|PULSe|NOISe|ARB|HARMonic|DC}	-

Remarks

- The parameter <shape> can be set to SINusoid, SQUare, RAMP, PULSe, NOISe, HARMonic, DC (only for SND), or ARB.

- When the specified channel is in the Advanced mode, this command is not valid.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the waveform name, for example, SQU.

Examples

```
:SOURce1:FUNCtion SQUare /*Sets the waveform type to Square for
CH1.*/
```

```
:SOURce1:FUNCtion? /*Queries the waveform type for CH1. The query
returns SQU.*/
```

3.12.9　[:SOURce[<n>]]:FUNCtion:ADVance:ARB

[:SOURce[<n>]]:FUNCtion:ADVance:ARB commands are used to set or query the Arb sample rate and filter, and to load the Arb file in the Advanced mode.

3.12.9.1　[:SOURce[<n>]]:FUNCtion:ADVance:ARB:EDGE

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:EDGE <*edge*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:EDGE?

Description

Sets or queries the edge time of the Arb (Advanced) for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<edge>	Real	Refer to *Remarks*	2 ns

Remarks

- When the sample rate is less than 400 MSa/s, <edge> ranges from 2 ns to 0.8*(1/Sample Rate) and is not greater than 1 μs. When the sample rate is greater than or equal to 400 MSa/s, it is fixed to 0.8*(1/Sample Rate). The resolution of the edge time is 100 ps.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the edge time in scientific notation. For example, the query might return +1.00000000000000E-08, indicating that the edge time is 10 ns.

Examples

```
:SOURce1:FUNCtion:ADVance:ARB:EDGE 1E-8 /*Sets the edge time of
the Arb (Advanced) to 10 ns for CH1.*/
:SOURce1:FUNCtion:ADVance:ARB:EDGE? /*Queries the edge time of the
Arb (Advanced) for CH1. The query returns +1.00000000000000E-08.*/
```

3.12.9.2　[:SOURce[<n>]]:FUNCtion:ADVance:ARB:FILTer

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:FILTer <*type*>

[:SOURce[<n>]]:FUNCtion:ADVance:ARB:FILTer?

Description

Sets or queries the Arb filter mode in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{INSert|NORMal|STEP|EDGeadjust}	NORMal

Remarks

- The following four filter modes are available for the Arb mode in the Advanced mode:

    - **NORMal:** It has wide and flat frequency response as well as short edge time, but the step response produces a large overshoot.

    - **STEP:** It has more ideal step response, narrow bandwidth, longer rise/fall time, and longer edge time.

    - **EDGeadjust:** It allows you to define the edge time to create bursts with arbitrary edge time.

    - **INSert:** It guarantees the output of signals with no distortion at all.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns NORM, STEP, EDG, or INS.

Examples

```
:SOURce1:FUNCtion:ADVance:ARB:FILTer STEP /*Sets the Arb filter
mode to Step in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:ARB:FILTer? /*Queries the Arb filter
mode in the Advanced mode for CH1. The query returns STEP.*/
```

3.12.9.3 [:SOURce[<n>]]:FUNCtion:ADVance:ARB:LOAD

Syntax

[:SOURce[<n>]]:FUNCtion:ADVance:ARB:LOAD {<file_name>|<arb>}
[,<separator>,<datatype>]

Description

Loads the Arb file in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<file_name>	ASCII string	Valid directory	-
<arb>	Discrete	Refer to *Remarks*	-
<separator>	Discrete	{ENTer|COMMa|SEMicolon}	-
<datatype>	Discrete	{NORMal|VOLtage}	-

Remarks

- The parameter <file_name> specifies the name of the file under the specified directory, for example, INT:/sinc.arb.

- The parameter <arb> is used to select the built-in Arb type. The range is {SINusoid|SQUare|RAMP|NOISe|ABSSINE|ABSSINEHALF|AMPALT|ATTALT| GAUSSPULSE|NEGRAMP|NPULSE|PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD| STAIRUP|TRAPEZIA|BANDLIMITED|BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1| CHEBYSHEV2|COMBIN|CPULSE|CWPULSE|DAMPEDOSC|DUALTONE|GAMMA| GATEVIBR|LFMPULSE|MCNOISE|NIMHDISCHARGE|PAHCUR|QUAKE|RADAR| RIPPLE|ROUNDHALF|STEPRESP|SWINGOSC|TV|VOICE|THREEAM|THREEFM| THREEPFM|THREEPM|THREEPWM|CARDIAC|EOG|EEG|EMG|PULSILOGRAM| RESSPEED|LFPULSE|TENS1|TENS2|TENS3|IGNITION|ISO167502SP|ISO167502VR| ISO76372TP1|ISO76372TP2A|ISO76372TP3A|ISO76372TP2B|ISO76372TP3B| ISO76372TP4|ISO76372TP5A|ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY| CAUCHY|CUBIC|DIRICHLET|ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS| HAVERSINE|LAGUERRE|LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ| MAXWELL|RAYLEIGH|VERSIERA|WEIBULL|X2DATA|COSH|COSINT|COT| COTHCON|COTHPRO|CSCCON|CSCPRO|CSCHCON|CSCHPRO|RECIPCON| RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|SININT|SQRT|TAN|TANH|ACOS| ACOSH|ACOTCON|ACOTPRO|ACOTHCON|ACOTHPRO|ACSCCON|ACSCPRO| ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|ASECH|ASIN|ASINH|ATAN|ATANH| BARLETT|BARTHANN|BLACKMAN|BLACKMANH|BOHMANWIN|BOXCAR| CHEBWIN|FLATTOPWIN|HAMMING|HANNING|KAISER|NUTTALLWIN| PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|ROUNDPM|ECG1|ECG2|ECG3| ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|ECG12|ECG13|ECG14|ECG15| MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|ARCHAV|ARCHCV|ACOT| NEGHALFSINE|POSHWRSINE|NEGHWRSINE|POSFWRSINE|NEGFWRSINE| 2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|2NDOIR02|2NDOIR07| DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|ISO167502VIT|ISO167502VRT| THREETONE|FOURTONE|FIVETONE|SIXTONE|SEVENTONE|EIGHTTONE| ISO167502LD1|ISO167502LD2|X3|POSRAMP|LOWERSEMICIRCLE|DISTORTION| GAUSSDERIV|GAUSSHERMITE1|GAUSSHERMITE2|GAUSSHERMITE3|

GAUSSHERMITE4|GABOR1|GABOR3|LEGENDRE3|LEGENDRE4|LEGENDRE5|
LEGENDRE6|LEGENDRE7|LEGENDRE8|LEGENDRE9|LEGENDRE10|LAGUERRE2|
LAGUERRE3|LAGUERRE4|LAGUERRE5|LAGUERRE6|LAGUERRE7|LAGUERRE8|
LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|CHEBYSHEV5|CHEBYSHEV6|
CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|CHEBYSHEV10|WEIERSTRASS|AIRYAI|
AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|GAMMAINV|COSHC|SINHC|TANHC|
TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|PRBS16|PRBS20|PRBS21|PRBS23}.

- Available Arb file types are *.arb, *.csv, and *.txt.

  - *.arb files are data files that store binary values.

  - *.csv files are voltage data stored in plain text, floating type.

  - *.txt files are plaintext voltage data (floating) or wave point data (-32768 to
    +32767) files separated by separators. Only one data type and separator
    can be used in the same file.

- When loading Arb files, the parameter <separator> specifies the type of
  separator of the data in the *.txt file: ENTer (Enter), COMMa (","), and SEMicolon
  (";").

- When loading Arb files, the parameter <datatype> sets the data type of *.txt
  file: NORMal (wave point data, integer, -32768 to +32767), VOLtage (voltage
  data, floating).

- For *.txt files, you must specify the separator <separator> and the data type
  <datatype>; For *.arb and *.csv files, the two parameters are not valid.

- The available waveform length is related to the file type and output type. For
  *.arb files, in SND output, the available length is from 32 pts to 128 Mpts (256
  Mpts optional); in AMP/HBW output, the available length is from 32 pts to 256
  Mpts (512 Mpts optional). For *.txt files, the available length is from 32 pts to 8
  Mpts. For *.csv files, the available length is from 32 pts to 1 Mpts.

- This command is valid only when the output mode is set to "Advanced" and the
  sub-mode is set to "Arb" for the specified channel.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:ARB:LOAD INT:/sinc.arb /*Loads the Arb
file named sinc.arb for CH1.*/
```

3.12.9.4 [:SOURce[<n>]]:FUNCtion:ADVance:ARB:SRATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:SRATe <*sample_rate*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:SRATe?

Description

Sets or queries the Arb sample rate in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<sample_rate>	Real	1 μSa/s to 1.25 GSa/s	1 MSa/s

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the sample rate in scientific notation. For example, the query might return +3.00000000000000E+03, indicating that the sample rate is 3 kSa/s.

Examples

```
:SOURce1:FUNCtion:ADVance:ARB:SRATe 3000 /*Sets the Arb sample
rate to 3 kSa/s in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:ARB:SRATe? /*Queries the Arb sample rate
in the Advanced mode for CH1. The query returns +3.00000000000000E
+03.*/
```

3.12.9.5 [:SOURce[<n>]]:FUNCtion:ADVance:ARB:STATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:STATe <*bool*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:ARB:STATe?

Description

Sets or queries the on/off status of the Arb function in the Advanced mode for the specified channel.

Parameter

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

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:ARB:STATe 1 /*Enables the Advanced Arb
function for CH1*/
:SOURce1:FUNCtion:ADVance:ARB:STATe? /*Queries the on/off status
of Advanced Arb function for CH1. The query returns 1.*/
```

3.12.10 [:SOURce[<n>]]:FUNCtion:ADVance:IQ

[:SOURce[<n>]]:FUNCtion:ADVance:IQ commands are used to set or query the IQ waveform parameters in the Advanced mode. The IQ modulation function is only available for SND and HBW outputs.

TIP

When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

3.12.10.1 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:APPLy

Syntax

[:SOURce[<n>]]:FUNCtion:ADVance:IQ:APPLy

Description

Applies IQ waveform settings to the specified channel.

Parameter

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

Remarks

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:APPLy /*Applies IQ waveform settings
to CH1.*/
```

3.12.10.2 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:POWer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:POWer** {<*value*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:POWer?** [<*lim*>]

Description

Sets or queries the output power of the IQ wave.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<value>	Real	Refer to *Remarks*	0 dBm
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- For SND output, the range of <value> is from -56 dBm to 23.9 dBm, and the actual maximum/minimum value is related to the center frequency (*[:SOURce[<n>]]:FUNCtion:ADVance:IQ:SIGNal:CENTer*); for HBW output, the range of <value> is from -3.9 dBm to 10.0 dBm.

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel

models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the output power in scientific notation. For example, the query might return +3.000000000000000E+00, indicating that the power is 3 dBm.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:POWer 3 /*Sets the output power of
the IQ wave to 3 dBm.*/
:SOURce1:FUNCtion:ADVance:IQ:POWer? /*Queries the output power of
the IQ wave. The query returns +3.000000000000000E+00.*/
```

3.12.10.3 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SIGNal:CENTer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:CENTer** {<*frequency*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:CENTer?** [<*lim*>]

Description

Sets or queries the center frequency of the IQ wave in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	0 to 500 MHz	100 MHz
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

• When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the center frequency in scientific notation. For example, the query might return +1.000000000000000E+07, indicating that the center frequency is 10 MHz.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:CENTer 10000000 /*Sets the
center frequency of the IQ wave to 10 MHz for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:CENTer? /*Queries the center
frequency of the IQ wave for CH1. The query returns
+1.000000000000000E+07.*/
```

3.12.10.4 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SIGNal:CTYPe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SIGNal:CTYPe <*type*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SIGNal:CTYPe?

Description

Sets or queries the data type of the IQ waveform in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{ALL1|ALL0|PRBS9|PRBS11| PRBS15|PRBS16|PRBS20|PRBS21| PRBS23}	ALL1

Remarks

- The following data types are available:

    - **ALL1:** a sequence in which all bits are 1.

    - **ALL0:** a sequence in which all bits are 0.

    - **PRBSn:** set the type to PRBS9, PRBS11, PRBS15, PRBS16, PRBS20, PRBS21, or PRBS23.

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns ALL1, ALL0, PRBS9, PRBS11, PRBS15, PRBS16, PRBS20, PRBS21, or PRBS23.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:CTYPe ALL0 /*Sets the data
type of the IQ waveform in the Advanced mode to ALL0 for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:CTYPe? /*Queries the data type
of the IQ waveform in the Advanced mode for CH1. The query returns
ALL0.*/
```

3.12.10.5   [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SIGNal:LENGth

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:LENGth** {<*length*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:LENGth?** [<*lim*>]

Description

Sets or queries the data length of the IQ waveform in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<length>	Real	10 to 20 M	10 k
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.
- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the data length in scientific notation. For example, the query might return +5.000000000000000E+03, indicating that the data length of the IQ waveform is 5000.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:LENGth 5000 /*Sets the data
length of the IQ waveform in the Advanced mode to 5000 for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:LENGth? /*Queries the data
length of the IQ waveform in the Advanced mode for CH1. The query
returns +5.000000000000000E+03.*/
```

3.12.10.6 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SIGNal:RATE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:RATE** {<*rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:SIGNal:RATE?** [<*lim*>]

Description

Sets or queries the symbol rate of the IQ wave in the Advanced mode for the
specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	100 Sa/s to 100 MSa/s	1 MSa/s
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- When the output type is single-ended, IQ modulation requires the resources of
  two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is
  allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ
  modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel
  models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2
  enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the symbol rate in scientific notation. For example, the query
might return +5.000000000000000E+03, indicating that the symbol rate of the IQ
waveform is 5 kSa/s.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:RATE 5000 /*Sets the symbol
rate of the IQ wave to 5 kSa/s for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SIGNal:RATE? /*Queries the symbol
rate of the IQ wave for CH1. The query returns +5.000000000000000E
+03.*/
```

3.12.10.7 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:ALPHa

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:ALPHa {<*alpha*>|<*lim*>}

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:ALPHa? [<*lim*>]

Description

Sets or queries the filter's roll-off factor of the IQ wave in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<alpha>	Real	0.05 to 1	0.25
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- The command is valid only when the filter type
  ([:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:FILTer) is set to cosine filter (COSine) and root-raised cosine filter (ROOT).

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the roll-off factor in scientific notation. For example, the query might return +5.000000000000000E-01, indicating that the roll-off factor is 0.5.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SOURce:ALPHa 0.5 /*Sets the filter's
roll-off factor of the IQ wave to 0.5 for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SOURce:ALPHa? /*Queries the filter's
roll-off factor of the IQ wave for CH1. The query returns
+5.000000000000000E-01.*/
```

3.12.10.8 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:CTYPe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:CTYPe <*type*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:CTYPe?

Description

Sets or queries the encoding type of the IQ waveform in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{OFF|DIFF|DGRay|GRAY}	OFF

Remarks

- The following encoding types are available:

  - **OFF:** no coding

  - **DIFF:** Differential coding

  - **DGRay:** Differential + Gray coding

  - **GRAY:** Gray coding

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns OFF, DIFF, DGR, or GRAY.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SOURce:CTYPe DIFF /*Sets the encoding
type of the IQ waveform to Differential for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SOURce:CTYPe? /*Queries the encoding
type of the IQ waveform for CH1. The query returns DIFF.*/
```

3.12.10.9   [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:FILTer

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:FILTer <*filter*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:FILTer?

Description

Sets or queries the filter type of the IQ wave in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<filter>	Discrete	{RECTangular|COSine|ROOT}	-

Remarks

- The following filter types are available:

    - **RECTangular:** rectangular filter

    - **COSine:** cosine filter

    - **ROOT:** root-raised cosine filter

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns RECT, COS, or ROOT.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SOURce:FILTer RECTangular /*Sets the
filter type of the IQ wave to rectangular for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SOURce:FILTer? /*Queries the filter
type of the IQ wave for CH1. The query returns RECT.*/
```

3.12.10.10 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:OVER

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:OVER {<*over*>|<*lim*>}

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:OVER? [<*lim*>]

Description

Sets or queries the oversampling of the IQ wave in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<over>	Integer	1 to 16	4
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the oversampling in scientific notation. For example, the query might return +8.000000000000000E+00, indicating that the oversampling is 8.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SOURce:OVER 8 /*Sets the oversampling
of the IQ wave to 8 for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SOURce:OVER? /*Queries the
oversampling of the IQ wave for CH1. The query returns
+8.000000000000000E+00.*/
```

3.12.10.11 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:SOURce:TYPE

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:TYPE <*type*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:IQ:SOURce:TYPE?

Description

Sets or queries the modulation type of the IQ wave in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{BPSK|QPSK|8PSK|16QAM|32QAM|64QAM|128QAM|256QAM}	BPSK

Remarks

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the modulation type, for example, QPSK.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:SOURce:TYPE QPSK /*Sets the
modulation type of the IQ wave to QPSK for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:SOURce:TYPE? /*Queries the modulation
type of the IQ wave for CH1. The query returns QPSK.*/
```

3.12.10.12 [:SOURce[<n>]]:FUNCtion:ADVance:IQ:STATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:IQ:STATe?**

Description

Sets or queries the on/off status of the IQ modulation in the Advanced mode for the specified channel.

Parameter

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

Remarks

- The IQ modulation function is only available for SND and HBW outputs.

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When the output type is single-ended, IQ modulation requires the resources of two channels. Therefore, for 4-channel models, only CH1/CH2/CH3/CH4 is allowed to enable IQ modulation, and when CH1/CH2/CH3/CH4 enables IQ modulation, its corresponding CH5/CH6/CH7/CH8 is disabled; for 2-channel models, only CH1/CH2 is allowed to enable IQ modulation, and when CH1/CH2 enables IQ modulation, its corresponding CH3/CH4 is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:IQ:STATe ON /*Enables the IQ modulation
in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:IQ:STATe? /*Queries the on/off status of
the IQ modulation in the Advanced mode for CH1. The query returns
1.*/
```

3.12.11 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse

[:SOURce[<n>]]:FUNCtion:ADVance:MPULse commands are used to set or query the Multi-pulse waveform parameters in the Advanced mode. .

3.12.11.1 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:APPLy

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:APPLy

Description

Applies the Multipulse settings to the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:APPLy /*Applies the Multipulse
settings to CH1.*/
```

3.12.11.2   [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:DELay

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:DELay** <*delay*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:DELay?**

Description

Sets or queries the pulse delay of the Multi-pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<delay>	Real	5 µs to 1 s	500 ms

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the pulse delay in scientific notation. For example, the query might return +1.00000000000000E-05, indicating that the pulse delay is 10 µs.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:DELay 1E-5 /*Sets the pulse delay
of the Multi-pulse waveform to 10 µs for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:DELay? /*Queries the pulse delay
```

```
of the Multi-pulse waveform for CH1. The query returns
+1.00000000000000E-05.*/
```

3.12.11.3 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:EDGE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:EDGE** <*time*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:EDGE?**

Description

Sets or queries the edge time of the Multi-pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	2 ns to 1 μs	2 ns

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the edge time in scientific notation. For example, the query might return +1.00000000000000E-08, indicating that the edge time is 10 ns.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:EDGE 1E-8 /*Sets the edge time of
the Multi-pulse waveform to 10 ns for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:EDGE? /*Queries the edge time of
the Multi-pulse waveform for CH1. The query returns
+1.00000000000000E-08.*/
```

3.12.11.4 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:HWIDth

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:HWIDth** <*num*>,<*width*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:HWIDth?** <*num*>

Description

Sets or queries the high level duration of the specified pulse for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 30	-
<width>	Real	20 ns to 150 µs	5 µs

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the high level duration in scientific notation. For example, the query might return +5.000000000000000E-06, indicating that the duration is 5 µs.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:HWIDth 2,5E-6 /*Sets the high
level duration of the 2nd pulse to 5 µs for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:HWIDth? 2 /*Queries the high
level duration of the 2nd pulse for CH1. The query returns
+5.000000000000000E-06.*/
```

3.12.11.5 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:HWIDth:ALL?

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:HWIDth:ALL?

Description

Queries the high level durations of all pulses for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the high level durations of all pulses separated by comma. For example, the query might return
+1.000000000000000E-06,+2.000000000000000E-06,+3.000000000000000E-06,+4.0

00000000000000E-06,+5.000000000000000E-06, indicating that the high level durations of 5 pulses are 1 μs, 2 μs, 3 μs, 4 μs, and 5 μs.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:HWIDth:ALL? /*Queries the high
level durations of all pulses for CH1. The query might return
+1.000000000000000E-06,+2.000000000000000E-06,+3.000000000000000E-0
6,+4.000000000000000E-06,+5.000000000000000E-06.*/
```

3.12.11.6   [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:IDLE

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:IDLE <*type*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:IDLE?

Description

Sets or queries the idle level of the Multi-pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{FPT|TOP|CENTer|BOTTom}	FPT

Remarks

- The idle level of the Multi-pulse waveform can be set to the following:

    - **FPT:** Select the level at the first point of the waveform as the idle level.

    - **TOP:** Select the level at the top of the waveform as the idle level.

    - **CENTer:** Select the level at the center of the waveform as the idle level.

    - **BOTTom:** Select the level at the bottom of the waveform as the idle level.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns FPT, TOP, CENT, or BOTT.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:IDLE TOP /*Sets the idle level of
the Multi-pulse waveform to the level at the top of the waveform
for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:IDLE? /*Queries the idle level of
the Multi-pulse waveform for CH1. The query returns TOP.*/
```

3.12.11.7 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:LWIDth

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:LWIDth** <*num*>,<*width*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:LWIDth?** <*num*>

Description

Sets or queries the low level duration of the specified pulse for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 30	-
<width>	Integer	20 ns to 150 μs	5 μs

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the low level duration in scientific notation. For example, the query might return +5.000000000000000E-06, indicating that the duration is 5 μs.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:LWIDth 2,5E-6 /*Sets the low
level duration of the 2nd pulse to 5 μs for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:LWIDth? 2 /*Queries the low level
duration of the 2nd pulse for CH1. The query returns
+5.000000000000000E-06.*/
```

3.12.11.8 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:LWIDth:ALL?

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:LWIDth:ALL?**

Description

Queries the low level durations of all pulses for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the low level durations of all pulses separated by comma. For example, the query might return
+1.000000000000000E-06,+2.000000000000000E-06,+3.000000000000000E-06,+4.0 00000000000000E-06,+5.000000000000000E-06, indicating that the low level durations of 5 pulses are 1 μs, 2 μs, 3 μs, 4 μs, and 5 μs.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:LWIDth:ALL? /*Queries the low
level durations of all pulses for CH1. The query might return
+1.000000000000000E-06,+2.000000000000000E-06,+3.000000000000000E-0
6,+4.000000000000000E-06,+5.000000000000000E-06.*/
```

3.12.11.9   [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:NUMBer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:NUMBer** <*num*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:NUMBer?**

Description

Sets or queries the number of pulses of the Multi-pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	2 to 30	2

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the number of pulses of the Multi-pulse waveform.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:NUMBer 5 /*Sets the number of
pulses of the Multi-pulse waveform to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:NUMBer? /*Queries the number of
pulses of the Multi-pulse waveform for CH1. The query returns 5.*/
```

EN

3.12.11.10 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:STATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:STATe <*bool*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:STATe?

Description

Sets or queries the on/off status of the Multi-pulse function in the Advanced mode for the specified channel.

Parameter

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:STATe ON /*Enables the Multi-
pulse function in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:STATe? /*Queries the on/off
status of the Multi-pulse function in the Advanced mode for CH1.
The query returns 1.*/
```

3.12.11.11 [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:TRIGger:SOURce

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:TRIGger:SOURce <*source*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:MPULse:TRIGger:SOURce?

Description

Sets or queries the trigger mode of the Multi-pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
\<n\>	Discrete	{1|2|3|4}	1
\<source\>	Discrete	{OFF|TIMer|EXTernal|MANual}	OFF

Remarks

- The following trigger modes are available for the Multi-pulse waveform:

    - **OFF:** trigger off.

    - **TIMer:** timer trigger. Use
      [:SOURce[\<n\>]]:FUNCtion:ADVance:MPULse:TRIGger:TIMer to set the
      interval of the trigger signal.

    - **EXTernal:** external trigger. Use
      [:SOURce[\<n\>]]:FUNCtion:ADVance:MPULse:TRIGger:TTYPe to set the
      external trigger type.

    - **MANual:** manual trigger.

- When [:SOURce[\<n\>]] or [\<n\>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns OFF, TIM, EXT, or MAN.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:SOURce MANual /*Sets the
trigger mode of the Multi-pulse waveform to manual trigger for
CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:SOURce? /*Queries the
trigger mode of the Multi-pulse waveform for CH1. The query
returns MAN.*/
```

3.12.11.12 [:SOURce[\<n\>]]:FUNCtion:ADVance:MPULse:TRIGger:TIMer

Syntax

[:**SOURce**[\<*n*\>]]:**FUNCtion:ADVance:MPULse:TRIGger:TIMer** \<*time*\>

[:**SOURce**[\<*n*\>]]:**FUNCtion:ADVance:MPULse:TRIGger:TIMer?**

Description

Sets or queries the internal trigger timer of the Multi-pulse waveform for the
specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	5 µs to 8 ks	-

Remarks

- When the trigger source
  (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:TRIGger:SOURce*) of the Multi-pulse is set to timer, this command is valid.

- The actual minimum value of <time> is limited by the delay time
  (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:DELay*) and the high
  (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:HWIDth:ALL?*) and low
  (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:LWIDth:ALL?*) pulse width sum:
  Timer ≥ Trigger Delay + High Pulse Width Sum + Low Pulse Width Sum.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the internal trigger timer in scientific notation. For example, the
query might return +4.500000000000000E-03, indicating that the timer is 4.5 ms.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:TIMer 0.0045 /*Sets the
trigger timer of the Multi-pulse waveform to 4.5 ms for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:TIMer? /*Queries the
trigger timer of the Multi-pulse waveform for CH1. The query
returns +4.500000000000000E-03.*/
```

3.12.11.13   [:SOURce[<n>]]:FUNCtion:ADVance:MPULse:TRIGger:TTYPe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:TRIGger:TTYPe** <*ttype*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MPULse:TRIGger:TTYPe?**

Description

Sets or queries the external trigger type of the Multi-pulse waveform for the
specified channel.

Parameter

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

Name	Type	Range	Default
<ttype>	Discrete	{LEADing|TRAiling}	LEADing

Remarks

- When the trigger source
  (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:TRIGger:SOURce*) of the Multi-
  pulse is set to external trigger, you can use this command to set the external
  trigger type.

- The following external trigger types are available:

  - **LEADing:** external leading edge trigger

  - **TRAiling:** external trailing edge trigger

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns LEAD or TRA.

Examples

```
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:TTYPe LEADing /*Sets the
external trigger type of the Multi-pulse waveform to leading edge
trigger for CH1.*/
:SOURce1:FUNCtion:ADVance:MPULse:TRIGger:TTYPe? /*Queries the
external trigger type of the Multi-pulse waveform for CH1. The
query returns LEAD.*/
```

3.12.12 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe

[:SOURce[<n>]]:FUNCtion:ADVance:MTONe commands are used to set or query
the Multi-tone waveform parameters in the Advanced mode.

3.12.12.1 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:APPLy

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:APPLy

Description

Applies the Multi-tone settings to the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:APPLy /*Applies the Multi-tone
settings to CH1.*/
```

3.12.12.2   [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:LOW

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:LOW** {<*frequency*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:LOW?** [<*lim*>]

Description

Sets or queries the start frequency of the Multi-tone function in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	1 MHz
<lim>	Discrete	{MINimum|MAXimum|DEFault}	-

Remarks

- The parameter <frequency> ranges from 1 kHz to 499.999 MHz. Start Frequency, Spacing, and Tone Count are constrained. Start Frequency + Spacing*(Tone Count - 1) ≤ 500 MHz. Their values cannot exceed the range.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the start frequency in scientific notation. For example, the query might return +2.00000000000000E+06, indicating that the start frequency is 2 MHz.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:LOW 2000000 /*Sets the start
frequency of the Multi-tone function to 2 MHz for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:LOW? /*Queries the start frequency
```

```
of the Multi-tone function for CH1. The query returns
+2.00000000000000E+06.*/
```

3.12.12.3 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:NUMBer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:NUMBer** <*num*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:NUMBer?**

Description

Sets or queries the number of tones (Tone Count) of the Multi-tone waveform in the
Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	2 to 16	2

Remarks

- Start Frequency, Spacing, and Tone Count are constrained. Start Frequency +
  Spacing*(Tone Count - 1) ≤ 500 MHz. Their values cannot exceed the range.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns an integer, for example, 6.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:NUMBer 6 /*Sets the Tone Count to
6 of the Multi-tone waveform for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:NUMBer? /*Queries the Tone Count
of the Multi-tone waveform for CH1. The query returns 6.*/
```

3.12.12.4 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:SPACing

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:SPACing** <*frequency*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:MTONe:SPACing?**

Description

Sets or queries the spacing between tones (Spacing) of the Multi-tone waveform in
the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	1 MHz

Remarks

- The parameter <frequency> ranges from 1 kHz to 499.999 MHz. Start Frequency, Spacing, and Tone Count are constrained. Start Frequency + Spacing*(Tone Count - 1) ≤ 500 MHz. Their values cannot exceed the range.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the spacing in scientific notation. For example, the query might return +2.000000000000000E+06, indicating that the spacing is 2 MHz.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:SPACing 2000000 /*Sets the spacing
between tones (Spacing) of the Multi-tone waveform to 2 MHz for
CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:SPACing? /*Queries the spacing
between tones (Spacing) of the Multi-tone waveform for CH1. The
query returns +2.000000000000000E+06.*/
```

3.12.12.5 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:SRATe?

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:SRATe?

Description

Queries the sample rate of the Multi-tone waveform in the Advanced mode for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the sample rate in scientific notation. For example, the query might return 1.250000E+09, indicating that the sample rate is 1.25 GSa/s.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:SRATe? /*Queries the sample rate
of the Multi-tone waveform for CH1. The query returns 1.250000E
+09.*/
```

3.12.12.6   [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:STATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:STATe <*bool*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:STATe?

Description

Sets or queries the on/off status of the Multi-tone function in the Advanced mode for the specified channel.

Parameter

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:STATe ON /*Enables the Multi-tone
function in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:STATe? /*Queries the on/off state
of the Multi-tone function for CH1. The query returns 1.*/
```

3.12.12.7 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:PHASe

Syntax

`[:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:PHASe <m>,{<phase>|<lim>}`

`[:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:PHASe? <m>[,<lim>]`

Description

Sets or queries the phase of the Multi-tone waveform in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<m>	Integer	1 to 16	-
<phase>	Real	0° to 360°	0°
<lim>	Discrete	{MINimum|MAXimum|DEFault}	-

Remarks

- <m> specifies the tone number of the Multi-tone waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the tone phase in scientific notation. For example, the query might return +2.000000000000000E+01, indicating that the tone phase is 20°.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:TONE:PHASe 1,20 /*Sets the phase
of tone 1 to 20° for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:TONE:PHASe? 1 /*Queries the phase
of tone 1 for CH1. The query returns +2.000000000000000E+01.*/
```

3.12.12.8 [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:POWer

Syntax

`[:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:POWer <m>,{<power>|<lim>}`

`[:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:POWer? <m>[,<lim>]`

Description

Sets or queries the gain of the specified tone of the Multi-tone waveform in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 16	-
<power>	Real	-20 dB to 0 dB	-
<lim>	Discrete	{MINimum|MAXimum|DEFault}	-

Remarks

- <m> specifies the tone number of the Multi-tone waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the gain of the specified tone in scientific notation. For example, the query might return -2.00E+00, indicating that the gain is -2 dB.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:TONE:POWer 1,-2 /*Sets the gain of
tone 1 of the Multi-tone waveform to -2 dB for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:TONE:POWer? 1 /*Queries the gain
of tone 1 of the Multi-tone waveform for CH1. The query returns
-2.00E+00.*/
```

3.12.12.9   [:SOURce[<n>]]:FUNCtion:ADVance:MTONe:TONE:STATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:TONE:STATe <*m*>,<*bool*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:MTONe:TONE:STATe? <*m*>

Description

Sets or queries the on/off status of the specified tone of the Multi-tone waveform in the Advanced mode for the specified channel.

Parameter

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

Name	Type	Range	Default
<m>	Integer	1 to 16	-
<bool>	Bool	{0|1|OFF|ON}	1|ON

Remarks

- <m> specifies the tone number of the Multi-tone waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:MTONe:TONE:STATe 1,ON /*Enables the tone
1 of the Multi-tone waveform for CH1.*/
:SOURce1:FUNCtion:ADVance:MTONe:TONE:STATe? 1 /*Queries the on/off
status of tone 1 for CH1. The query returns 1.*/
```

3.12.13 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern

[:SOURce[<n>]]:FUNCtion:ADVance:PATTern commands are used to set or query the Pattern parameters in the Advanced mode.

3.12.13.1 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:APPLy

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:APPLy

Description

Applies the pattern generator settings to the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:APPLy /*Applies the pattern
generator settings to CH1.*/
```

3.12.13.2   [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:B4B5:STATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B4B5:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B4B5:STATe?**

Description

Sets or queries whether the 4b/5b encoding of the pattern generator is enabled.

Parameter

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

Remarks

- The 4b/5b encoding can be enabled only when the data format of the input pattern or the imported file is set to hexadecimal.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:B4B5:STATe ON /*Enables the
4b/5b encoding of the pattern generator for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:B4B5:STATe? /*Queries whether
the 4b/5b encoding of the pattern generator is enabled for CH1.
The query returns 1.*/
```

3.12.13.3   [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:B8B10:STATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B8B10:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B8B10:STATe?**

Description

Sets or queries whether the 8b/10b encoding of the pattern generator is enabled.

Parameter

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

Remarks

- The 8b/10b encoding can be enabled only when the data format of the input pattern or the imported file is set to KD symbol.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:B8B10:STATe ON /*Enables the
8b/10b encoding of the pattern generator for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:B8B10:STATe? /*Queries whether
the 8b/10b encoding of the pattern generator is enabled for CH1.
The query returns 1.*/
```

3.12.13.4 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:B8B10:DISParity

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B8B10:DISParity** <*disparity*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:B8B10:DISParity?**

Description

Sets or queries the disparity of the 8b/10b encoding of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<disparity>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- Disparity is the difference between the number of 1 bits and 0 bits of the first code value after encoding. Available options include POSitive (more 0 bits than 1 bits or equal number of 1 bits and 0 bits) and NEGative (more 1 bits than 0 bits or equal number of 1 bits and 0 bits).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns POS or NEG.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:B8B10:DISParity NEGative /*Sets
the disparity of the 8b/10b encoding of the pattern generator to
NEGative for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:B8B10:DISParity? /*Queries the
disparity of the 8b/10b encoding of the pattern generator for CH1.
The query returns NEG.*/
```

3.12.13.5 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:RATE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:RATE** <*rate*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:RATE?**

Description

Sets or queries the bit rate of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	1 µbps to 300 Mbps	9.6 kbps

Description

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output
type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the bit rate in scientific notation. For example, the query might
return 9.600000E+03, indicating that the baud rate is 9.6 kbps.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:RATE 9600 /*Sets the bit rate of
the pattern generator to 9.6 kbps for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:RATE? /*Queries the bit rate of
the pattern generator for CH1. The query returns 9.600000E+03.*/
```

3.12.13.6 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:DATA

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:DATA <*type*>,<*data*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:DATA?

Description

Sets or queries the code pattern of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{BIN|HEX|KDCode}	BIN
<data>	ASCII string	Refer to *Remarks*	-

Remarks

- When the input data type (*[:SOURce[<n>]]:FUNCtion:ADVance:PATTern:SOURce*) of the pattern generator is set to "Pattern", use this command to set the code pattern.

- The data type (<type>) can be set to binary (BIN), hexadecimal (HEX), or KD symbol (KDCode).

- The format of the input data <data> should match the selected data type. The maximum length of <data> is related to the data type. The maximum length is 4000 characters for binary data and 1000 characters for hexadecimal data and KD symbol.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the code pattern of the pattern generator, for example, 10101010.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:DATA BIN,10101010 /*Sets the
code pattern of the pattern generator to 10101010 for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:DATA? /*Queries the code pattern
of the pattern generator for CH1. The query returns 10101010.*/
```

3.12.13.7 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:DATA:TYPE?

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:DATA:TYPE?

Description

Queries the input data type of the pattern generator for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns BIN, HEX, or SYMB.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:DATA:TYPE? /*Queries the data
type of the pattern generator for CH1. The query returns BIN.*/
```

3.12.13.8   [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:ENCode:TYPE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:ENCode:TYPE** <*type*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:ENCode:TYPE?**

Description

Sets or queries the encoding type of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{NRZ|RZ|MANChester}	NRZ

Remarks

• The encoding type can be set to Non-Return-to-Zero (NRZ), Return-to-Zero (RZ), or Manchester (MANChester).

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NRZ, RZ, or MANC.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:ENCode:TYPE RZ /*Sets the
encoding type of the pattern generator to RZ for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:ENCode:TYPE? /*Queries the
encoding type of the pattern generator for CH1. The query returns
RZ.*/
```

3.12.13.9 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:FILE:PATH

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:FILE:PATH** <*path*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:FILE:PATH?**

Description

Sets or queries the file path of the file imported to the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<path>	ASCII string	Valid file path	-

Remarks

- When the input data type (*[:SOURce[<n>]]:FUNCtion:ADVance:PATTern:SOURce*) is set to "File", use this command to set the file path of the imported file.

- The parameter <path> is a valid file path, for example, INT:/data.txt.

- This instrument only supports symbol files of *.txt format.

    - For binary files, the data should start with b, for example, b1100101010. The data length is limited to 64M characters.

    - For hexadecimal files, the data should start with h, for example, h123ABE5. The data length is limited to 12M characters.

    - For KD symbol files, the data should start with s and be separated by comma, for example, sD1.3,D2.3. The data length is limited to 12M characters.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the file path, for example, INT:/data.txt.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:FILE:PATH INT:/data.txt /*Sets
the file path the file imported to the pattern generator to INT:/
data.txt for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:FILE:PATH? /*Queries the file
path the file imported to the pattern generator. The query returns
INT:/data.txt.*/
```

3.12.13.10   [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:SOURce

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:SOURce <*source*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:PATTern:SOURce?

Description

Sets or queries the input data type of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{PATTern|FILE}	PATTern

Remarks

- The following data source of the pattern generator is available:

  - **PATTern:** user-defined value. You can use [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:DATA to set the value and data type.

  - **FILE:** imported file. You can use [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:FILE:PATH to set the path of the imported code file and the file data type.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns PATT or FILE.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:SOURce PATT /*Sets the input
data type of the pattern generator to user-defined code file for
CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:SOURce? /*Queries the input data
type of the pattern generator for CH1. The query returns PATT.*/
```

3.12.13.11 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:STATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:STATe?**

Description

Sets or queries the on/off status of the pattern generator in the Advanced mode for the specified channel.

Parameter

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:STATe ON /*Enables the pattern
generator in the Advanced mode for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:STATe? /*Queries the on/off
state of the pattern generator in the Advanced mode. The query
returns 1.*/
```

3.12.13.12 [:SOURce[<n>]]:FUNCtion:ADVance:PATTern:VOLTage:TYPE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:VOLTage:TYPE** <*type*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PATTern:VOLTage:TYPE?**

Description

Sets or queries the amplitude format of the pattern generator for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{TTL|CMOS5.0|CMOS3.3|CMOS2.5|CMOS1.8|ECL|PECL}	-

Remarks

- In addition to using this command to set the preset amplitude of the pattern output, you can also use *[:SOURce[<n>]]:VOLTage* to self-define the amplitude. For self-defined amplitude, when querying the amplitude format of the pattern generator, the query returns USER.

- For HBW output, the amplitude format is fixed to USER. It is not allowed to use this command to set the amplitude format.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns TTL, CMOS5.0, CMOS3.3, CMOS2.5, CMOS1.8, ECL, PECL, or USER.

Examples

```
:SOURce1:FUNCtion:ADVance:PATTern:VOLTage:TYPE TTL /*Sets the
amplitude format of the pattern generator to TTL for CH1.*/
:SOURce1:FUNCtion:ADVance:PATTern:VOLTage:TYPE? /*Queries the
amplitude format of the pattern generator for CH1. The query
returns TTL.*/
```

3.12.14 [:SOURce[<n>]]:FUNCtion:ADVance:PRBS

[:SOURce[<n>]]:FUNCtion:ADVance:PRBS commands are used to set or query the PRBS parameters in the Advanced mode.

3.12.14.1 [:SOURce[<n>]]:FUNCtion:ADVance:PRBS:EDGE

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PRBS:EDGE <*edge*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:PRBS:EDGE?

Description

Sets or queries the PRBS edge time in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<edge>	Real	2 ns to 1 µs	2 ns

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the edge time in scientific notation. For example, the query might return +5.00000000000000E-09, indicating that the edge time is 5 ns.

Examples

```
:SOURce1:FUNCtion:ADVance:PRBS:EDGE 5E-9 /*Sets the PRBS edge time
to 5 ns for CH1.*/
:SOURce1:FUNCtion:ADVance:PRBS:EDGE? /*Queries the PRBS edge time
for CH1. The query returns +5.00000000000000E-09.*/
```

3.12.14.2   [:SOURce[<n>]]:FUNCtion:ADVance:PRBS:RATE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PRBS:RATE** {<*rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:PRBS:RATE?** [<*lim*>]

Description

Sets or queries the PRBS bit rate in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	1 µbps to 300 Mbps	1 Mbps
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the PRBS bit rate in scientific notation. For example, the query might return +3.000000000000000E+03, indicating that the PRBS bit rate is 3 kbps.

Examples

```
:SOURce1:FUNCtion:ADVance:PRBS:RATE 3000 /*Sets the PRBS bit rate
to 3 kbps for CH1.*/
:SOURce1:FUNCtion:ADVance:PRBS:RATE? /*Queries the PRBS bit rate
for CH1. The query returns +3.000000000000000E+03.*/
```

3.12.14.3 [:SOURce[<n>]]:FUNCtion:ADVance:PRBS:TYPE

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:PRBS:TYPE <*type*>

[:SOURce[<*n*>]]:FUNCtion:ADVance:PRBS:TYPE?

Description

Sets or queries the PRBS type in the Advanced mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	Refer to *Remarks*	PRBS3

Remarks

- The setting range of PRBS is from PRBS3 to PRBS32. The sequence length of PRBSn is 2^n-1.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the PRBS type, for example, PRBS5.

Examples

```
:SOURce1:FUNCtion:ADVance:PRBS:TYPE PRBS5 /*Sets the PRBS type to
PRBS5 for CH1.*/
:SOURce1:FUNCtion:ADVance:PRBS:TYPE? /*Queries the PRBS type for
CH1. The query returns PRBS5.*/
```

3.12.14.4 [:SOURce[<n>]]:FUNCtion:PRBS:STATe

Syntax

[:SOURce[<*n*>]]:FUNCtion:PRBS:STATe <*bool*>

[:SOURce[<*n*>]]:FUNCtion:PRBS:STATe?

Description

Sets or queries the on/off status of the PRBS function in the Advanced mode for the specified channel.

Parameter

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:PRBS:STATe ON /*Enables the PRBS function in the
Advanced mode for CH1.*/
:SOURce1:FUNCtion:PRBS:STATe? /*Queries the on/off status of the
PRBS function in the Advanced mode for CH1. The query returns 1.*/
```

3.12.15 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence

[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence commands are used to set or query the Sequence parameters in the Advanced mode.

3.12.15.1 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ADD

Syntax

[:SOURce[<*n*>]]:FUNCtion:ADVance:SEQuence:ADD

Description

Adds a new step (at the end) for the sequence of the specified channel.

Parameter

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

Remarks

- A sequence supports a maximum of 512 steps.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ADD /*Adds a new step for the
sequence of CH1.*/
```

3.12.15.2 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:APPLy

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:APPLy**

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:APPLy?**

Description

Applies the step parameters of the sequence to the specified channel.

Queries whether the modifications are applied to the sequence parameters for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:APPLy /*Applies the step
parameters to the sequence for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:APPLy? /*Queries whether the
step parameters are applied to the sequence for CH1. The query
returns 1.*/
```

3.12.15.3 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:CLEar

Syntax

`[:SOURce[<n>]]:ADVance:FUNCtion:SEQuence:CLEar`

Description

Clears all step data of the sequence for the specified channel and restores the sequence to its default state.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:CLEar /*Clears the step data of
the sequence for CH1.*/
```

3.12.15.4 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:COUNt?

Syntax

`[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:COUNt?`

Description

Queries the number of steps in the sequence for the specified channel.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns an integer, for example, 25.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:COUNt? /*Queries the number of
steps in the sequence for CH1. The query returns 25.*/
```

3.12.15.5   [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:DELete

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:DELete** [<*index*>]

Description

Deletes the specified step of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<index>	Integer	1 to 512	-

Remarks

- When [<index>] is omitted, it is interpreted as the last step of the sequence.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:DELete 3 /*Deletes the third
step of the sequence waveform for CH1.*/
```

3.12.15.6   [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:EDGE

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:EDGE** <*edge*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:EDGE?**

Description

Sets or queries the edge time of the Sequence waveform for the specified channel.

Parameter

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

Name	Type	Range	Default
<edge>	Real	Refer to *Remarks*	2 ns

Remarks

- When the sample rate is less than 400 MSa/s, <edge> ranges from 2 ns to 0.8*(1/Sample Rate) and is not greater than 1 μs. When the sample rate is greater than or equal to 400 MSa/s, it is fixed to 0.8*(1/Sample Rate). The resolution of the edge time is 100 ps.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the edge time in scientific notation. For example, the query might return +1.000000000000000E-08, indicating that the edge time is 10 ns.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:EDGE 1E-8 /*Sets the edge time
of the Sequence waveform to 10 ns for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:EDGE? /*Queries the edge time
of the Sequence waveform for CH1. The query returns
+1.000000000000000E-08.*/
```

3.12.15.7   [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:FILTer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:FILTer** <*filter*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:FILTer?**

Description

Sets or queries the filter mode of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<filter>	Discrete	{INSert|NORMal|STEP|EDGeadjust}	NORMal

Remarks

- The following four filter modes are available for the Sequence mode:

    - **NORMal:** It has wide and flat frequency response as well as short edge time, but the step response produces a large overshoot.

- **STEP:** It has more ideal step response, narrow bandwidth, longer rise/fall time, and longer edge time.

- **EDGeadjust:** It allows you to define the edge time to create bursts with arbitrary edge time.

- **INSert:** It guarantees the output of signals with no distortion at all.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NORM, STEP, EDG, or INS.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:FILTer STEP /*Sets the filter
mode of the sequence waveform to step for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:FILTer? /*Queries the filter
mode of the sequence waveform for CH1. The query returns STEP.*/
```

3.12.15.8   [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:INSert

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:INSert** <*index*>

Description

Inserts a step to the specified position of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<index>	Integer	1 to 512	-

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:INSert 3 /*Inserts a step to
the position 3 of the sequence for CH1.*/
```

3.12.15.9 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:EVENt

Syntax

`[:SOURce<n>]]:FUNCtion:ADVance:SEQuence:ITEM:EVENt <num>,<event>`

`[:SOURce<n>]]:FUNCtion:ADVance:SEQuence:ITEM:EVENt? <num>`

Description

Sets or queries whether an event jump is active for the specified sequence step and the trigger source for the jump to occur for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<event>	Discrete	{OFF|TRIGger|MANual|TIMer}	OFF

Remarks

- This command defines whether an event jump is active for the step and the trigger source for the jump to occur. If a trigger signal for the event jump is received, the sequence uses the Event Jump To definition to jump to a specified step.

  - **OFF:** An event jump is not active for the step. The sequence uses the Go To definition after finishing this step (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:GOTO*).

  - **TRIGger:** An event jump occurs when an external trigger signal with the specified edge (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TTYPe*) is received during the playout of the current step.

  - **MANual:** An event jump occurs when a manual trigger signal is received during the playout of the current step.

  - **TIMer:** An event jump occurs when an internal trigger signal is received during the playout of the current step. The internal trigger interval is specified by *[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TIMer*.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns OFF, TRIG, TIM, or MAN.

Examples

```
:SOURce1:FUNCtion:SEQuence:LIST:EVENt 2,TRIG /*Sets the event jump
trigger source to external trigger signal for step 2 of CH1.*/
:SOURce1:FUNCtion:SEQuence:LIST:EVENt? 2 /*Queries the event jump
trigger source for step 2 of CH1. The query returns TRIG.*/
```

3.12.15.10 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:GOTO

Syntax

[:SOURce<*n*>]]:FUNCtion:ADVance:SEQuence:ITEM:GOTO <*num*>,{<*goto*>|<*sn*>}

[:SOURce<*n*>]]:FUNCtion:ADVance:SEQuence:ITEM:GOTO <*num*>

Description

Sets or queries the target step for the GO TO jump of the sequence at the specified step.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<goto>	Discrete	{NEXT|FIRSt|LAST|END}	-
<sn>	Integer	Existing step number	-

Remarks

This command is used to set the target step in the sequence to go to and play after the current step executes the total number of complete waveform cycles. The default is NEXT.

- **<sn>** defines the specified step to go to.

- **NEXT** enables the sequence to go to the next step.

- **FIRSt** enables the sequence to go to the first step.

- **LAST** enables the sequence to go to the last step.

- **END** indicates the end of the sequence after the current step has finished playing its waveform.

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NEXT, FIRS, LAST, END, or an integer.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:GOTO 2,LAST /*Enables the
sequence of CH1 to go to the last step after executing step 2.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:GOTO? 2 /*Queries the
target step to go to for the sequence of CH1 after executing step
2. The query returns LAST.*/
```

3.12.15.11 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:JUMP

Syntax

[:SOURce<*n*>]]:FUNCtion:ADVance:SEQuence:ITEM:JUMP <*num*>,{<*jump*>|<*sn*>}

[:SOURce<*n*>]]:FUNCtion:ADVance:SEQuence:ITEM:JUMP? <*num*>

Description

Sets or queries the step that the sequence of the specified channel will jump to on a trigger event.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<jump>	Discrete	{NEXT|FIRSt|LAST}	-
<sn>	Integer	Existing step number	-

Remarks

- This command sets the target step that the sequence will jump to when a trigger signal is received during the execution of the current step. You can select the NEXT, FIRSt, or LAST step to jump to. You can also use <sn> to self-define the step number.

- This command is valid only when an event jump (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:EVENt*) is active for the specified step.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns NEXT, FIRS, LAST, or an integer.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:JUMP 2,5 /*Enables the
sequence of CH1 to jump to step 5 after executing step 2 on a
trigger event.*/
```

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:JUMP? 2 /*Queries the
target step that the sequence of CH1 will jump to after executing
step 2 on a trigger event. The query returns 5.*/
```

3.12.15.12 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:LENGth?

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:ITEM:LENGth?** {<*num*>|<*all*>}

Description

Queries the length of the specified step of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<all>	Discrete	{ALL}	-

Remarks

- You can use <num> to query the length of the specified step and use <all> to query the length of all steps.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

For a specified step, the query returns an integer; for all the steps (ALL), the query might return multiple integers (representing the lengths of the sequence steps) separated by ",".

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:LENGth? 1 /*Queries the
length of step 1 for CH1. The query returns 100.*/
```

3.12.15.13 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:PERiod

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:ITEM:PERiod** <*num*>,{<*value*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:ITEM:PERiod?** {<*num*>|<all>}

Description

Sets or queries the loop of the specified step of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<value>	Integer	1 to 256	1
<lim_set>	Discrete	{MINimum|MAXimum}	-
<all>	Discrete	{ALL}	-

Remarks

- <num> specifies the step number of the sequence and <value> specifies the loop of the specified step.

- MINimum|MAXimum specifies the minimum/maximum value. ALL indicates querying all the steps of the sequence waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

For a specified step, the query returns an integer; for all the steps (ALL), the query might return multiple integers (representing the loops of the sequence steps) separated by ",".

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 1,10 /*Sets the
loop of step 1 of the sequence waveform to 10 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod? 1 /*Queries the
loop of step 1 of the sequence waveform for CH1. The query returns
10.*/
```

3.12.15.14 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:WAIT

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:ITEM:WAIT** <*num*>,<*wait*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:ITEM:WAIT?** <*num*>

Description

Sets or queries the trigger signal that the specified sequence step waits for before playing the waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<wait>	Discrete	{OFF|TRIGger|MANual|TIMer}	OFF

Remarks

- You can use <wait> to define the trigger signal required for the specified step of the sequence to start playing the waveform.

    - **OFF:** Waiting for trigger is disabled. The waveform plays immediately without waiting for trigger.

    - **TRIGger:** The specified step does not start playing the waveform until an external trigger signal is received. The external trigger type is specified by *[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TTYPe*.

    - **MANual:** The specified step does not start playing the waveform until a manual trigger signal is received.

    - **TIMer:** The specified step does not start playing the waveform until an internal trigger signal is received. The internal trigger interval is specified by *[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TIMer*.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns OFF, TRIG, TIM, or MAN.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:WAIT 2,TRIG /*Sets the
waiting for trigger type to external trigger for step 2 of CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:WAIT? 2 /*Queries the
waiting for trigger type for step 2 of CH1. The query returns
TRIG.*/
```

3.12.15.15 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:WAVE

Syntax

[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:WAVE *<num>*,{*<file_path>*| *<wavename>*}[,*<separator>*,*<datatype>*]

`[:SOURce[<`*n*`>]]:FUNCtion:ADVance:SEQuence:ITEM:WAVE? {<`*num*`>|<`*lim*`>}`

Description

Sets or queries the waveform (built-in waveform or stored waveform) of the specified step of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<num>	Integer	1 to 512	-
<file_path>	ASCII string	Valid Waveform Name	-
<wavename>	Discrete	Refer to *Remarks*	-
<separator>	Discrete	{ENTer|COMMa|SEMicolon}	-
<datatype>	Discrete	{NORM|VOL}	-
<lim>	Discrete	{ALL}	-

Remarks

- The parameter <file_path> is the valid Arb file name, for example, INT:/ Arb_1.arb. In differential output type, the data length range should meet the following requirements: 32 pts ≤ Arb Data Length ≤ 256 Mpts (512 Mpts optional), and the step total points of the current sequence cannot exceed 256 Mpts (512 Mpts optional); in single-ended output type, the data length range should meet the following requirements: 32 pts ≤ Arb Data Length ≤ 128 Mpts (256 Mpts optional), and the step total points of the current sequence cannot exceed 128 Mpts (256 Mpts optional).

- The parameter <wavename> specifies the built-in waveform name. The range is {SINusoid|SQUare|RAMP|NOISe|ABSSINE|ABSSINEHALF|AMPALT|ATTALT| GAUSSPULSE|NEGRAMP|NPULSE|PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD| STAIRUP|TRAPEZIA|BANDLIMITED|BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1| CHEBYSHEV2|COMBIN|CPULSE|CWPULSE|DAMPEDOSC|DUALTONE|GAMMA| GATEVIBR|LFMPULSE|MCNOISE|NIMHDISCHARGE|PAHCUR|QUAKE|RADAR| RIPPLE|ROUNDHALF|STEPRESP|SWINGOSC|TV|VOICE|THREEAM|THREEFM| THREEPFM|THREEPM|THREEPWM|CARDIAC|EOG|EEG|EMG|PULSILOGRAM| RESSPEED|LFPULSE|TENS1|TENS2|TENS3|IGNITION|ISO167502SP|ISO167502VR| ISO76372TP1|ISO76372TP2A|ISO76372TP3A|ISO76372TP2B|ISO76372TP3B| ISO76372TP4|ISO76372TP5A|ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY| CAUCHY|CUBIC|DIRICHLET|ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS| HAVERSINE|LAGUERRE|LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ| MAXWELL|RAYLEIGH|VERSIERA|WEIBULL|X2DATA|COSH|COSINT|COT|

COTHCON|COTHPRO|CSCCON|CSCPRO|CSCHCON|CSCHPRO|RECIPCON|
RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|SININT|SQRT|TAN|TANH|ACOS|
ACOSH|ACOTCON|ACOTPRO|ACOTHCON|ACOTHPRO|ACSCCON|ACSCPRO|
ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|ASECH|ASIN|ASINH|ATAN|ATANH|
BARLETT|BARTHANN|BLACKMAN|BLACKMANH|BOHMANWIN|BOXCAR|
CHEBWIN|FLATTOPWIN|HAMMING|HANNING|KAISER|NUTTALLWIN|
PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|ROUNDPM|ECG1|ECG2|ECG3|
ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|ECG12|ECG13|ECG14|ECG15|
MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|ARCHAV|ARCHCV|ACOT|
NEGHALFSINE|POSHWRSINE|NEGHWRSINE|POSFWRSINE|NEGFWRSINE|
2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|2NDOIR02|2NDOIR07|
DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|ISO167502VIT|ISO167502VRT|
THREETONE|FOURTONE|FIVETONE|SIXTONE|SEVENTONE|EIGHTTONE|
ISO167502LD1|ISO167502LD2|X3|POSRAMP|LOWERSEMICIRCLE|DISTORTION|
GAUSSDERIV|GAUSSHERMITE1|GAUSSHERMITE2|GAUSSHERMITE3|
GAUSSHERMITE4|GABOR1|GABOR3|LEGENDRE3|LEGENDRE4|LEGENDRE5|
LEGENDRE6|LEGENDRE7|LEGENDRE8|LEGENDRE9|LEGENDRE10|LAGUERRE2|
LAGUERRE3|LAGUERRE4|LAGUERRE5|LAGUERRE6|LAGUERRE7|LAGUERRE8|
LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|CHEBYSHEV5|CHEBYSHEV6|
CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|CHEBYSHEV10|WEIERSTRASS|AIRYAI|
AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|GAMMAINV|COSHC|SINHC|TANHC|
TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|PRBS16|PRBS20|PRBS21|PRBS23}.

- Available file types are *.arb, *.csv, and *.txt.

  - *.arb files are data files that store binary values.

  - *.csv files are voltage data stored in plain text, floating type.

  - *.txt files are plaintext voltage data (floating) or wave point data (-32768 to +32767) files separated by separators. Only one data type and separator can be used in the same file.

- The parameter <separator> specifies the type of separator of the data in the *.txt file: ENTer (Enter), COMMa (","), and SEMicolon (";").

- The parameter <datatype> sets the data type of the *.txt file: NORM (wave point data, integer, -32768 to +32767), VOL (voltage data, floating).

- For *.txt files, you must specify the separator <separator> and the data type <datatype>; For *.arb and *.csv files, the two parameters are not valid.

- ALL indicates querying the waveform types of all steps.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

For a specified step, the query returns the built-in waveform type or the file name of
the stored waveform; for all the steps (ALL), the query might return the waveform
types or file names of multiple steps.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:WAVE 1,SQUare /*Sets the
waveform type of step 1 of the sequence waveform to Square for
CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:WAVE? 1 /*Queries the
waveform type of step 1 of the sequence waveform for CH1. The
query returns SQU.*/
```

3.12.15.16 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:SRATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:SRATe** {<*sample_rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:SRATe?** [<*lim*>]

Description

Sets or queries the sample rate of the sequence waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<sample_rate>	Real	1 µSa/s to 1.25 GSa/s	1 MSa/s
<lim>	Discrete	{MAXimum|MINimum}	-

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output
type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the sample rate. For example, the query might return
+3.00000000000000E+03, indicating the sample rate is 3 kSa/s.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:SRATe 3000 /*Sets the sample
rate of the sequence waveform to 3 kSa/s for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:SRATe? /*Queries the sample
rate of the sequence waveform for CH1. The query returns
+3.00000000000000E+03.*/
```

3.12.15.17 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:STATe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:STATe?**

Description

Sets or queries the on/off status of the Sequence function in the Advanced mode for the specified channel.

Parameter

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

Remarks

- Enabling or disabling any of the Arb (Advanced), Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, or IQ output modes will enable or disable the Advanced mode automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:STATe ON /*Enables the Sequence
function for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:STATe? /*Queries the on/off
status of the Sequence function for CH1. The query returns 1.*/
```

3.12.15.18 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TIMer

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:TIMer** <*timer*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:TIMer?**

Description

Sets or queries the internal trigger interval of the sequence for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<timer>	Real	4 µs to 8000 s	1 s

Remarks

- This command is valid only when the Wait trigger source (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:WAIT*) or Event trigger source (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:ITEM:EVENt*) of the sequence step is set to Timer.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the internal trigger interval in scientific notation. For example, the query might return 1.00000000000000E-04, indicating that the trigger interval is 100 µs.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:TIMer 1E-4 /*Sets the internal
trigger interval of the sequence to 100 µs for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:TIMer? /*Queries the internal
trigger interval of the sequence for CH1. The query returns
1.00000000000000E-04.*/
```

3.12.15.19 [:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:TTYPe

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:TTYPe** <*type*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance:SEQuence:TTYPe?**

Description

Sets or queries the external trigger type of the Sequence mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{LEADing|TRAiling}	LEADing

Remarks

- The following external trigger types is available for the Sequence mode:

    - **LEADing** sets the external trigger type to leading edge.

    - **TRAiling** sets the external trigger type to trailing edge.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns LEAD or TRA.

Examples

```
:SOURce1:FUNCtion:ADVance:SEQuence:TTYPe LEADing /*Sets the
external trigger type to leading edge for CH1 Sequence mode.*/
:SOURce1:FUNCtion:ADVance:SEQuence:TTYPe? /*Queries the external
trigger type for CH1 Sequence mode. The query returns LEAD.*/
```

3.12.16 [:SOURce[<n>]]:FUNCtion:ADVance[:STATe]

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance**[:**STATe**] <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:ADVance**[:**STATe**]?

Description

Sets or queries the on/off status of the Advanced mode.

Parameter

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

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:ADVance:STATe ON /*Enables the Advanced mode for
CH1.*/
:SOURce1:FUNCtion:ADVance:STATe? /*Queries whether the Advanced
mode of CH1 is enabled. The query returns 1.*/
```

3.12.17 [:SOURce[<n>]]:FUNCtion:ARBitrary

Syntax

`[:SOURce[<n>]]:FUNCtion:ARBitrary <arb>`

`[:SOURce[<n>]]:FUNCtion:ARBitrary?`

Description

Sets the arbitrary waveform for the specified channel.

Queries the internal arbitrary waveform type or the external arbitrary waveform name for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	-

Remarks

- When the continuous wave type (*[:SOURce[<n>]]:FUNCtion*) is set to Arb for the specified channel, you can use this command to set the Arb type.

- This command is only available for the built-in Arb waveform. To load the stored waveforms, use *:MMEMory:LOAD:DATA*.

- The parameter <arb> is used to set the built-in Arb type. The range is {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE|PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED|BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE|CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE|NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP|SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM|CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2|TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A|ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A|ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET|ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE|LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA|WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO|CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON|ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN|BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING|HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|

ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|
ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|ARCHAV|
ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE|POSFWRSINE|
NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|2NDOIR02|
2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|ISO167502VIT|
ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE|SEVENTONE|
EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP|LOWERSEMICIRCLE|
DISTORTION|GAUSSDERIV|GAUSSHERMITE1|GAUSSHERMITE2|GAUSSHERMITE3|
GAUSSHERMITE4|GABOR1|GABOR3|LEGENDRE3|LEGENDRE4|LEGENDRE5|
LEGENDRE6|LEGENDRE7|LEGENDRE8|LEGENDRE9|LEGENDRE10|LAGUERRE2|
LAGUERRE3|LAGUERRE4|LAGUERRE5|LAGUERRE6|LAGUERRE7|LAGUERRE8|
LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|CHEBYSHEV5|CHEBYSHEV6|
CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|CHEBYSHEV10|WEIERSTRASS|AIRYAI|
AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|GAMMAINV|COSHC|SINHC|TANHC|
TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|PRBS16|PRBS20|PRBS21|PRBS23}.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

When the Arb type is set to built-in Arb waveform for the specified channel, it returns
the waveform name; when the specified channel loads the Arb file, it returns the
waveform file name.

Examples

```
:SOURce1:FUNCtion:ARBitrary ABSSINE /*Sets the Arb type to ABSSINE
for CH1.*/
:SOURce1:FUNCtion:ARBitrary? /*Queries the Arb type for CH1. The
query returns ABSSINE.*/
```

3.12.18 [:SOURce[<n>]]:FUNCtion:PULSe

[:SOURce[<n>]]:FUNCtion:PULSe commands are used to set or query the period,
leading/trailing edge time, pulse width, and duty cycle of the pulse waveform.

3.12.18.1 [:SOURce[<n>]]:FUNCtion:PULSe:DCYCle

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:DCYCle** {<*percent*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:DCYCle?** [<*lim_query*>]

Description

Sets or queries the pulse duty cycle for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<percent>	Real	0.01% to 99.99%	50%
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The pulse duty cycle is defined as the percentage of the pulse width (*[:SOURce[<n>]]:FUNCtion:PULSe:WIDTh*) to the pulse period (*[:SOURce[<n>]]:FUNCtion:PULSe:PERiod*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the pulse duty cycle in scientific notation. For example, the query might return +4.500000000000000E+01, indicating that the pulse duty cycle is 45%.

Examples

```
:SOURce1:FUNCtion:PULSe:DCYCle 45 /*Sets the pulse duty cycle to
45% for CH1.*/
:SOURce1:FUNCtion:PULSe:DCYCle? /*Queries the pulse duty cycle for
CH1. The query returns +4.500000000000000E+01.*/
```

3.12.18.2   [:SOURce[<n>]]:FUNCtion:PULSe:PERiod

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:PERiod** {<*seconds*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:PERiod?** [<*lim_query*>]

Description

Sets or queries the period of the pulse waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	Refer to *Remarks*	1 ms
<lim_set>	Discrete	{MAXimum|MINimum|DEFault}	-

Name	Type	Range	Default
<lim_query>	Discrete	{MAXimum|MINimum}	-

Remarks

- As the period and frequency (*[:SOURce[<n>]]:FREQuency*) specify the same parameter, the recently executed command will overwrite another command.

- For the period range of the pulse waveform, refer to *Table 3.60 Range of Continuous Waveform Period* .

- When the waveform type of the specified channel changes, if the period is valid under the new waveform type, the instrument still uses the period; If the period is not valid under the new waveform type, a prompt message is displayed and the instrument automatically sets the period to the upper limit or lower limit of the new waveform type .

- The instrument will automatically adjust the edge time and pulse width according to the period setting to meet the specified period.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the pulse period in scientific notation. For example, the query might return +1.000000000000000E-01, indicating that the pulse period is 0.1 s.

Examples

```
:SOURce1:FUNCtion:PULSe:PERiod 0.1 /*Sets the pulse period to 0.1
s for CH1.*/
:SOURce1:FUNCtion:PULSe:PERiod? /*Queries the pulse period for
CH1. The query returns +1.000000000000000E-01.*/
```

3.12.18.3 [:SOURce[<n>]]:FUNCtion:PULSe:TRANsition:LEADing

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:TRANsition:LEADing** {<*seconds*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:TRANsition:LEADing?** [<*lim_query*>]

Description

Sets or queries the leading edge time of the pulse for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	1.4 ns to 1 s	1.4 ns

Name	Type	Range	Default
<lim_set>	Discrete	{MAXimum|MINimum|DEFault}	-
<lim_query>	Discrete	{MAXimum|MINimum}	-

Remarks

- The leading (rising) edge time is the time it takes for the pulse level to go from 10% to 90%.

- The range of the leading edge time is limited by the current waveform frequency and pulse width. When the set value exceeds the limits, the instrument will adjust the edge time automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the leading edge time in scientific notation. For example, the query might return +3.500000000000000E-08, indicating that the leading edge time is 35 ns.

Examples

```
:SOURce1:FUNCtion:PULSe:TRANsition:LEADing 0.000000035 /*Sets the
leading edge time of the pulse to 35 ns for CH1.*/
:SOURce1:FUNCtion:PULSe:TRANsition:LEADing? /*Queries the leading
edge time of the pulse for CH1. The query returns
+3.500000000000000E-08.*/
```

3.12.18.4 [:SOURce[<n>]]:FUNCtion:PULSe:TRANsition:TRAiling

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:TRANsition:TRAiling** {<*seconds*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:TRANsition:TRAiling?** [<*lim_query*>]

Description

Sets or queries the trailing edge time of the pulse for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	1.4 ns to 1 s	1.4 ns
<lim_set>	Discrete	{MAXimum|MINimum|DEFault}	-
<lim_query>	Discrete	{MAXimum|MINimum}	-

Remarks

- The trailing (falling) edge time is the time it takes for the pulse level to go from 90% to 10%.

- The range of the trailing edge time is limited by the current waveform frequency, pulse width, and leading edge time. When the set value exceeds the limits, the instrument will adjust the edge time automatically.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the trailing edge time in scientific notation. For example, the query might return +3.500000000000000E-08, indicating that the trailing edge time is 35 ns.

Examples

```
:SOURce1:FUNCtion:PULSe:TRANsition:TRAiling 0.000000035 /*Sets the
trailing edge time of the pulse to 35 ns for CH1.*/
:SOURce1:FUNCtion:PULSe:TRANsition:TRAiling? /*Queries the
trailing edge time of the pulse for CH1. The query returns
+3.500000000000000E-08.*/
```

3.12.18.5   [:SOURce[<n>]]:FUNCtion:PULSe:WIDTh

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:WIDTh** {<*seconds*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:PULSe:WIDTh?** [<*lim_query*>]

Description

Sets or queries the pulse width for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	4.2 ns to 999.9999999563443 ks	500 µs
<lim_set>	Discrete	{MAXimum|MINimum|DEFault}	-
<lim_query>	Discrete	{MAXimum|MINimum}	-

Remarks

- Pulse width is the time from the 50% of a pulse's rising edge to the 50% of the next falling edge.

- The pulse width is limited by the period setting value, the minimum edge time, and the minimum pulse width (Wmin: 4.2 ns).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the pulse width in scientific notation. For example, the query might return +1.000000000000000E-02, indicating that the pulse width is 10 ms (0.01 s).

Examples

```
:SOURce1:FUNCtion:PULSe:WIDTh 0.01 /*Sets the pulse width to 10 ms
(0.01s) for CH1.*/
:SOURce1:FUNCtion:PULSe:WIDTh? /*Queries the pulse width for CH1.
The query returns +1.000000000000000E-02.*/
```

3.12.19 [:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:RAMP:SYMMetry** {<*symmetry*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:RAMP:SYMMetry?** [<*lim_query*>]

Description

Sets or queries the ramp symmetry for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	0.1% to 99.9%	50%
<lim_set>	Discrete	{MAXimum|MINimum|DEFault}	-
<lim_query>	Discrete	{MAXimum|MINimum}	-

Remarks

- Symmetry is defined as the percentage of the amount of time Ramp wave is rising in the period.

- Sending [:SOURce[<n>]]:APPLy:RAMP overwrites the current symmetry setting and sets the symmetry to 99.9%.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the symmetry in scientific notation. For example, the query might return +5.500000000000000E+01, indicating that the ramp symmetry is 55%.

Examples

```
:SOURce1:FUNCtion:RAMP:SYMMetry 55 /*Sets the ramp symmetry to 55%
for CH1.*/
:SOURce1:FUNCtion:RAMP:SYMMetry? /*Queries the ramp symmetry for
CH1. The query returns +5.500000000000000E+01.*/
```

3.12.20 [:SOURce[<n>]]:FUNCtion:SQUare

[:SOURce[<n>]]:FUNCtion:SQUare commands are used to set or query the period, fast transition on/off, transition time, and duty cycle of the square wave.

3.12.20.1 [:SOURce[<n>]]:FUNCtion:SQUare:DCYCle

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:DCYCle** {<*percent*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:DCYCle?** [<*lim_query*>]

Description

Sets or queries the duty cycle of square wave for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<percent>	Real	0.01% to 99.99%	50%
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- Duty cycle represents the amount of time per period that the square wave is at a high level.

- When the fast transition function (*[:SOURce[<n>]]:FUNCtion:SQUare:TRANsition[:STATe]*) is enabled, the duty cycle is fixed to 50% and cannot be modified.

- Sending *[:SOURce[<n>]]:APPLy:SQUare* overwrites the current duty cycle setting and sets the duty cycle to 50%.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the square duty cycle in scientific notation. For example, the query might return +4.500000000000000E+01, indicating that the square duty cycle is 45%.

Examples

```
:SOURce1:FUNCtion:SQUare:DCYCle 45 /*Sets the square duty cycle to
45% for CH1.*/
:SOURce1:FUNCtion:SQUare:DCYCle? /*Queries the square duty cycle
for CH1. The query returns +4.500000000000000E+01.*/
```

3.12.20.2 [:SOURce[<n>]]:FUNCtion:SQUare:PERiod

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:PERiod** {<*seconds*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:PERiod?** [<*lim_query*>]

Description

Sets or queries the square period for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<seconds>	Real	Refer to *Remarks*	1 ms
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- When the wave type of the specified channel is changed, the instrument still uses the period if the period is valid. Otherwise, the instrument automatically sets the period as the lower limit for the new wave type.

- For the square period setting range, refer to *Table 3.60 Range of Continuous Waveform Period* .

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the square period in scientific notation. For example, the query might return +1.000000000000000E+00, indicating that the square period is 1 s.

Examples

```
:SOURce1:FUNCtion:SQUare:PERiod 1 /*Sets the square period to 1 s
for CH1.*/
:SOURce1:FUNCtion:SQUare:PERiod? /*Queries the square period for
CH1. The query returns +1.000000000000000E+00.*/
```

3.12.20.3 [:SOURce[<n>]]:FUNCtion:SQUare:TRANsition[:STATe]

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:TRANsition**[:**STATe**] <*bool*>

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:TRANsition**[:**STATe**]?

Description

Sets or queries the fast transition on/off status of square wave for the specified channel.

Parameter

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

Remarks

- After the fast transition function is enabled, you can use [:SOURce[<n>]]:FUNCtion:SQUare:TRANsition:TIME to set the transition time of square wave.

- After the fast transition function is enabled, the square duty cycle is fixed to 50% and cannot be modified.

- After the fast transition function is disabled, the maximum frequency limit of the square wave is 120 MHz.

- The fast transition function is automatically disabled when Burst, Sweep, or Modulation is enabled.

- When the output type is set to AMP, the fast transition function is disabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:FUNCtion:SQUare:TRANsition:STATe ON /*Enables the fast
transition function for CH1.*/
:SOURce1:FUNCtion:SQUare:TRANsition:STATe? /*Queries whether the
fast transition function is enabled for CH1. The query returns 1.*/
```

3.12.20.4   [:SOURce[<n>]]:FUNCtion:SQUare:TRANsition:TIME

Syntax

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:TRANsition:TIME** {<*time*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**FUNCtion:SQUare:TRANsition:TIME?** [<*lim_query*>]

Description

Sets or queries the transition time of square wave for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	Refer to *Remarks*	800 ps
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- When the fast transition function is enabled for the specified channel, you can set the transition time for square wave. For SND output, the transition time ranges from 800 ps to 1 ns. For HBW output, it ranges from 350 ps to 1 ns.

- For AMP output, the fast transition/transition time function is disabled. The transition time is fixed to 1.4 ns and cannot be modified.

- The fast transition function
(*[:SOURce[<n>]]:FUNCtion:SQUare:TRANsition[:STATe]*) is automatically disabled when Burst, Sweep, or Modulation is enabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the transition time in scientific notation. For example, the query might return +8.000000000000000E-10, indicating that the transition time is 800 ps.

Examples

```
:SOURce1:FUNCtion:SQUare:TRANsition:TIME 8E-10 /*Sets the
transition time of square wave to 800 ps for CH1.*/
```

```
:SOURce1:FUNCtion:SQUare:TRANsition:TIME? /*Queries the transition
time of square wave for CH1. The query returns
+8.000000000000000E-10.*/
```

3.12.21 [:SOURce[<n>]]:HARMonic

[:SOURce[<n>]]:HARMonic commands are used to set and query harmonic parameters.

3.12.21.1 [:SOURce[<n>]]:HARMonic:COMBine

Syntax

[:SOURce[<*n*>]]:HARMonic:COMBine <*user*>

[:SOURce[<*n*>]]:HARMonic:COMBine?

Description

Sets or queries the combine harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<user>	ASCII string	Refer to *Remarks*	X0000000000000000000

Remarks

- The parameter <user> ranges from X0000000000000000000 to X1111111111111111111. The 20-bit binary data represent the output states of the 20 orders of harmonics. The leftmost bit represents the fundamental waveform; it is a fixed X and cannot be modified. The remaining 19 bits correspond to the 2nd order of harmonic to the 20th order of harmonic from left to right. 1/0 indicates enabling/disabling the corresponding order harmonic output. For example, set the 20-bit binary data to X0010001000000000000, indicating the output of the fundamental waveform, the 4th order of harmonic, and 8th order of harmonic.

- The max. fundamental frequency (F_{fund}) is limited by the max. harmonic order (N) and harmonic frequency upper limit (F_{max}): $F_{fund} = (2 \times F_{max} \div N)$. Changing the max. harmonic order may modify the fundamental frequency. For the harmonic frequency upper limit (F_{max}) of different models, refer to *Table 3.59 Range of Continuous Waveform Frequency* .

- This setup command is valid only when the harmonic type (*[:SOURce[<n>]]:HARMonic[:TYPE]*) is set to Combine (COMBine).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns a string between X0000000000000000000 and
X1111111111111111111. For example, the query might return
X0010001000000000000.

Examples

```
:SOURce1:HARMonic:COMBine X0010001000000000000 /*Sets CH1 to
output the fundamental waveform, the 4th order of harmonic, and
8th order of harmonic.*/
:SOURce1:HARMonic:COMBine? /*Queries the harmonic output for CH1.
The query returns X0010001000000000000.*/
```

3.12.21.2   [:SOURce[<n>]]:HARMonic:COMBine:AMPLitude

Syntax

[:**SOURce**[<*n*>]]:**HARMonic:COMBine:AMPLitude** <*sn*>,{<*amplitude*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**HARMonic:COMBine:AMPLitude?** {<*sn*>|<*all*>}[,<*lim_query*>]

Description

Sets or queries the amplitude range of the specified harmonic component in the
combine harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<sn>	Integer	2 to 20	-
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<all>	Discrete	{ALL}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- In single-ended output, the lower/upper limit of the amplitude range of the
  specified channel is limited by the impedance (*:OUTPut[<n>]:LOAD*), frequency/
  period, and offset settings. For details, refer to *Table 3.61 SND Output
  Amplitude Range* . In differential output, the AMP amplitude range (refer to
  Table 3.62 AMP Output Amplitude Range (Load)) is limited by the frequency/
  period and offset settings. The HBW amplitude range (refer to *Table 3.63 HBW
  Output Amplitude Range (Load)*) is limited by the frequency/period setting.

- You can use <all> to query the amplitude ranges of all harmonics.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

If querying the specified harmonic, the query returns the amplitude range of the specified order of combine harmonic, for example, +1.000000000000000E+00. If querying the amplitudes of all orders of the harmonic (ALL), the query returns all amplitude ranges separated by commas.

Examples

```
:SOURce1:HARMonic:COMBine:AMPLitude 5,1 /*Sets the amplitude range
of the fifth order harmonic to 1 Vpp for CH1.*/
:SOURce1:HARMonic:COMBine:AMPLitude? 5 /*Queries the amplitude
range of the fifth order harmonic for CH1. The query returns
+1.000000000000000E+00.*/
```

3.12.21.3 [:SOURce[<n>]]:HARMonic:COMBine:PHASe

Syntax

[:**SOURce**[<*n*>]]:**HARMonic:COMBine:PHASe** <*sn*>,{<*phase*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**HARMonic:COMBine:PHASe?** {<*sn*>|<*all*>}[,<*lim_query*>]

Description

Sets or queries the phase of the harmonic component in the combine harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<sn>	Integer	2 to 20	-
<phase>	Real	0° to 360°	0°
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<all>	Discrete	{ALL}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- You can use <all> to query the phases of all orders of the harmonic.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

When querying the specified harmonic component, the query returns the phase of the specified order, for example, +1.000000000000000E+01. When query all the harmonics (ALL), the query returns the phases of all harmonics separated by ",'.

Examples

```
:SOURce1:HARMonic:COMBine:PHASe 5,10 /*Sets the phase of the fifth
order harmonic to 10° for CH1.*/
:SOURce1:HARMonic:COMBine:PHASe? 5 /*Queries the phase of the
fifth order harmonic for CH1. The query returns +1.000000000000000E
+01.*/
```

3.12.21.4   [:SOURce[<n>]]:HARMonic:ORDer

Syntax

[:**SOURce**[<*n*>]]:**HARMonic:ORDer** {<*value*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**HARMonic:ORDer?** [<*lim_query*>]

Description

Sets or queries the harmonic order of the order harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<value>	Integer	2 to 20	2
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The max. fundamental frequency (F_{fund}) is limited by the harmonic order (N) and max. harmonic frequency (F_{max}): $F_{fund} = (2 \times F_{max} \div N)$. Changing the harmonic order may modify the fundamental frequency. For the max. harmonic frequency (F_{max}) of different models, refer to *Table 3.59 Range of Continuous Waveform Frequency* .

- When the harmonic type (*[:SOURce[<n>]]:HARMonic[:TYPE]*) is set to order, you can use this command to set the output harmonic component.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the harmonic order in scientific notation. For example, the query might return +1.000000000000000E+01, indicating that the harmonic order is 10.

Examples

```
:SOURce1:HARMonic:ORDer 10 /*Sets the harmonic order of the order
harmonic to 10 for CH1.*/
:SOURce1:HARMonic:ORDer? /*Queries the harmonic order of the order
harmonic for CH1. The query returns +1.000000000000000E+01.*/
```

3.12.21.5 [:SOURce[<n>]]:HARMonic:ORDer:AMPLitude

Syntax

[:**SOURce**[<*n*>]]:**HARMonic:ORDer:AMPLitude** {<*amplitude*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**HARMonic:ORDer:AMPLitude?** [<*lim_query*>]

Description

Sets or queries the amplitude range of the harmonic component in the order harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

*   In single-ended output, the lower/upper limit of the amplitude range of the specified channel is limited by the impedance (*:OUTPut[<n>]:LOAD*), frequency/ period, and offset settings. For details, refer to *Table 3.61 SND Output Amplitude Range* . In differential output, the AMP amplitude range (refer to *Table 3.62 AMP Output Amplitude Range (Load)*) is limited by the frequency/ period and offset settings. The HBW amplitude range (refer to *Table 3.63 HBW Output Amplitude Range (Load)*) is limited by the frequency/period setting.

*   You can use *[:SOURce[<n>]]:HARMonic:ORDer* to set or query the harmonic component for the order harmonic.

*   When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the harmonic amplitude range in scientific notation. For example, the query might return +1.000000000000000E+00, indicating that the harmonic amplitude range is 1 Vpp.

Examples

```
:SOURce1:HARMonic:ORDer:AMPLitude 1 /*Sets the amplitude range of
the current harmonic component of the order harmonic to 1 Vpp for
CH1.*/
:SOURce1:HARMonic:ORDer:AMPLitude? /*Queries the amplitude range
of the current harmonic component of the order harmonic for CH1.
The query returns +1.000000000000000E+00.*/
```

3.12.21.6   [:SOURce[<n>]]:HARMonic:ORDer:PHASe

Syntax

[:**SOURce**[<*n*>]]:**HARMonic:ORDer:PHASe** {<*phase*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**HARMonic:ORDer:PHASe?** [<*lim_query*>]

Description

Sets or queries the phase of the harmonic component in the order harmonic for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<phase>	Real	0° to 360°	0°
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

*   You can use *[:SOURce[<n>]]:HARMonic:ORDer* to set or query the harmonic component for the order harmonic.
*   When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the phase in scientific notation. For example, the query might return +1.000000000000000E+01, indicating that the harmonic phase is 10°.

Examples

```
:SOURce1:HARMonic:ORDer:PHASe 10 /*Sets the phase of the current
harmonic component in the order harmonic to 10° for CH1.*/
:SOURce1:HARMonic:ORDer:PHASe? /*Queries the phase of the current
harmonic component in the order harmonic for CH1. The query
returns +1.000000000000000E+01.*/
```

3.12.21.7 [:SOURce[<n>]]:HARMonic[:TYPE]

Syntax

[:SOURce[<*n*>]]:HARMonic[:TYPE] <*type*>

[:SOURce[<*n*>]]:HARMonic[:TYPE]?

Description

Sets or queries the harmonic type for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{ORDer|COMBine}	ORDer

Remarks

- The harmonic type can be set to the following:
  - **ORDer:** order harmonic which outputs the fundamental wave and a single harmonic component (*[:SOURce[<n>]]:HARMonic:ORDer*).
  - **COMBine:** combine harmonic which outputs harmonics with multiple harmonic components. You can self-define the orders of harmonic (*[:SOURce[<n>]]:HARMonic:COMBine*). The maximum order is 20.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns ORD or COMB.

Examples

```
:SOURce1:HARMonic:TYPE ORDer /*Sets the harmonic type to order
harmonic for CH1.*/
:SOURce1:HARMonic:TYPE? /*Queries the harmonic type for CH1. The
query returns ORD.*/
```

3.12.22 [:SOURce[<n>]]:MARKer:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**MARKer:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**MARKer:FREQuency?** [<*lim_query*>]

Description

Sets or queries the mark frequency for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	Refer to *Remarks*	550 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

• The parameter <frequency> is limited by the sweep "Start Frequency"
  (*[:SOURce[<n>]]:FREQuency:STARt*) and "Stop Frequency"
  (*[:SOURce[<n>]]:FREQuency:STOP*). It must lie between the start frequency and
  stop frequency.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1.

Return Format

The query returns the frequency in scientific notation. For example, the query might
return +5.000000000000000E+02, indicating that the frequency is 500 Hz.

Examples

```
:SOURce1:MARKer:FREQuency 500 /*Sets the mark frequency to 500 Hz
for CH1.*/
:SOURce1:MARKer:FREQuency? /*Queries the mark frequency for CH1.
The query returns +5.000000000000000E+02.*/
```

3.12.23 [:SOURce[<n>]]:PARameter:COPY

Syntax

[:**SOURce**[<*n*>]]:**PARameter:COPY** <*ch*>

Description

Copies the parameters of the specified channel <n> to the target channel <ch>.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<ch>	Discrete	{CH1|CH2|CH3|CH4}	-

Remarks

- <n> specifies the source channel and <ch> specifies the target channel. Sending this command copies the parameters of the source channel to the target channel. The two channels cannot be set to the same channel.

- If a channel is set as the benchmark channel of the Bundled Channels or has channel track or coupling function enabled, it cannot be used as the target channel for the channel copy function. If a channel's output mode is set to Advanced or the channel track function is enabled, it cannot be used as the source channel for the channel copy function.

- Some parameters such as the channel on/off status are not included in the available copy states. For available parameters for the copy function, please refer to the User Guide.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8} and the range of <ch> is {CH1\|CH2\|CH3\|CH4\|CH5\|CH6\|CH7\|CH8}.

Return Format

None.

Examples

```
:SOURce1:PARameter:COPY CH2 /*Copies the parameters of CH1 to CH2.*/
```

3.12.24 [:SOURce[<n>]]:PERiod[:FIXed]

Syntax

[:**SOURce**[<*n*>]]:**PERiod**[:**FIXed**] {<*period*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**PERiod**[:**FIXed**]? [<*lim_query*>]

Description

Sets or queries the period of the continuous wave for the specified channel.

Parameter

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

Name	Type	Range	Default
\<period\>	Real	Refer to *Remarks*	1 ms
\<lim_set\>	Discrete	{MINimum|MAXimum|DEFault}	-
\<lim_query\>	Discrete	{MINimum|MAXimum}	-

Remarks

- The period and frequency are reciprocal to each other. For the ranges of period available for different models and waveforms, refer to *Table 3.60 Range of Continuous Waveform Period* .

- When the waveform type of the specified channel changes, if the period is valid under the new waveform type, the instrument still uses the period; If the period is not valid under the new waveform type, the instrument automatically sets the period to the lower limit of the new waveform type.

- When [:SOURce[\<n\>]] or [\<n\>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the period in scientific notation. For example, the query might return +1.000000000000000E-01, indicating that the period is 0.1 s.

Examples

```
:SOURce1:PERiod:FIXed 0.1 /*Sets the period of the continuous wave
to 0.1 s for CH1.*/
:SOURce1:PERiod:FIXed? /*Queries the period of the continuous wave
for CH1. The query returns +1.000000000000000E-01.*/
```

3.12.25 [:SOURce[\<n\>]]:PHASe

[:SOURce[\<n\>]]:PHASe commands are used to set and query the start phase of the channel waveform (basic waveform and Arb), perform align phase, and set the phase coupling.

3.12.25.1 [:SOURce[\<n\>]]:PHASe

Syntax

[**:SOURce**[\<*n*\>]]**:PHASe** {\<*phase*\>|\<*lim_set*\>}

[**:SOURce**[\<*n*\>]]**:PHASe?** [\<*lim_query*\>]

Description

Sets or queries the start phase of the waveform (basic waveform and Arb) for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<phase>	Real	-360° to 360°	0°
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the start phase in scientific notation. For example, the query might return +5.000000000000000E+01, indicating that the start phase is 50°.

Examples

```
:SOURce1:PHASe 50 /*Sets the waveform start phase to 50° for CH1.*/
:SOURce1:PHASe? /*Queries the waveform start phase for CH1. The
query returns +5.000000000000000E+01.*/
```

3.12.25.2   [:SOURce[<n>]]:PHASe:COUPle:MODE

Syntax

[:SOURce[<*n*>]]:PHASe:COUPle:MODE <*mode*>

[:SOURce[<*n*>]]:PHASe:COUPle:MODE?

Description

Sets or queries phase coupling mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<mode>	Discrete	{OFFSet|RATio}	OFFSet

Remarks

- The phase coupling mode can be set to the following:

  - **OFFSet:** phase offset mode. You can use
    [:SOURce[<n>]]:PHASe:COUPle:OFFSet to set the phase offset of the coupled channel.

- - **RATio:** phase ratio mode. You can use
    [:SOURce[<n>]]:PHASe:COUPle:RATio to set the phase ratio of the coupled
    channel.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns OFFS or RAT.

Examples

```
:SOURce1:PHASe:COUPle:MODE OFFSet /*Sets the type of the phase
coupling mode to offset for CH1.*/
:SOURce1:PHASe:COUPle:MODE? /*Queries the type of the phase
coupling mode for CH1. The query returns OFFS.*/
```

3.12.25.3   [:SOURce[<n>]]:PHASe:COUPle:OFFSet

Syntax

[:**SOURce**[<*n*>]]:**PHASe:COUPle:OFFSet** <*offset*>

[:**SOURce**[<*n*>]]:**PHASe:COUPle:OFFSet?**

Description

Sets or queries the phase offset of the phase coupling for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<offset>	Real	-720° to 720°	0°

Remarks

- When modifying the offset, if the channel parameters exceed the limits after
  coupling calculation, the generator will automatically adjust the waveform
  parameters of the benchmark channel to avoid parameter overlimit. If the
  adjusted waveform parameters will still exceed the limit, then this offset is not
  allowed.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the phase offset in scientific notation. For example, the query
might return +1.000000000000000E+02, indicating that the phase offset is 100°.

Examples

```
:SOURce1:PHASe:COUPle:OFFSet 100 /*Sets the phase offset of the
phase coupling to 100° for CH1.*/
:SOURce1:PHASe:COUPle:OFFSet? /*Queries the phase offset of the
phase coupling for CH1. The query returns +1.000000000000000E+02.*/
```

3.12.25.4   [:SOURce[<n>]]:PHASe:COUPle:RATio

Syntax

[:**SOURce**[<*n*>]]:**PHASe:COUPle:RATio** <*ratio*>

[:**SOURce**[<*n*>]]:**PHASe:COUPle:RATio?**

Description

Sets or queries the phase ratio of the phase coupling for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<ratio>	Real	0.01 to 100	1

Remarks

- When modifying the ratio, if the channel parameters exceed the limits after coupling calculation, the generator will automatically adjust the waveform parameters of the benchmark channel to avoid parameter overlimit. If the adjusted waveform parameters will still exceed the limit, then this ratio is not allowed.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the phase ratio in scientific notation. For example, the query might return +2.000000000000000E+00, indicating that the ratio is 2.

Examples

```
:SOURce1:PHASe:COUPle:RATio 2 /*Sets the phase ratio of the phase
coupling to 2 for CH1.*/
:SOURce1:PHASe:COUPle:RATio? /*Queries the phase ratio of the
phase coupling for CH1. The query returns +2.000000000000000E+00.*/
```

3.12.25.5   [:SOURce[<n>]]:PHASe:COUPle[:STATe]

Syntax

[:**SOURce**[<*n*>]]:**PHASe:COUPle**[:**STATe**] <*bool*>

[:SOURce[<*n*>]]:PHASe:COUPle[:STATe]?

Description

Sets or queries the on/off status of the phase coupling function for the specified channel.

Parameter

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

Remarks

*   When the Coupling function is enabled, if parameter overlimit occurs due to waveform switching or parameter adjustments, the system automatically turns off the corresponding coupling switch. When the Coupling function is disabled, it cannot be enabled if the coupling parameter exceeds the limit.

*   The Coupling function of a channel can be enabled only when the channel is added to the Bundled Channels (*:SYNChro:BUNDle*) and is not used as the benchmark channel (*:SYNChro:BENChmark*).

*   The phase coupling function is available only when the output modes of the benchmark channel and the target channel are set to Continuous and the output waveform is set to Sine, Square, or Ramp.

*   When the Track function is enabled, the Coupling function of the channel is disabled. After the Coupling function is enabled, the channel cannot be used as the target channel for the channel copy function.

*   When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:PHASe:COUPle:STATe ON /*Enables the phase coupling
function for CH1.*/
:SOURce1:PHASe:COUPle:STATe? /*Queries the on/off status of the
phase coupling function for CH1. The query returns 1.*/
```

3.12.25.6   [:SOURce[<n>]]:PHASe:SYNChronize

Syntax

[:SOURce[<*n*>]]:PHASe:SYNChronize

Description

Performs the align phase operation once.

Parameter

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

Remarks

- The align phase operation takes effect for all channels that have been added to the Bundled Channels. The align phase function is not available for channels which select external/manual trigger or external modulation. If any channel of the Bundled Channels has the state mentioned above and is enabled, then the align phase operation will be invalid.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

None.

Examples

```
:SOURce1:PHASe:SYNChronize /*Performs the align phase operation
once.*/
```

3.12.26 [:SOURce[<n>]]:PM

[:SOURce[<n>]]:PM commands are used to set and query the PM parameters such as the phase deviation, modulating waveform frequency, modulation source, modulating waveform, and the on/off status of the PM modulation.

3.12.26.1 [:SOURce[<n>]]:PM:DEViation

Syntax

[:**SOURce**[<*n*>]]:**PM:DEViation** {<*deviation*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**PM:DEViation?** [<*lim_query*>]

Description

Sets or queries the PM phase deviation for the specified channel.

Parameter

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

Name	Type	Range	Default
<deviation>	Real	0° to 360°	90°
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The phase deviation represents the variation in phase of the modulated waveform from the carrier waveform.

- When an external modulation source (*[:SOURce[<n>]]:PM:SOURce*) is selected, the phase deviation is controlled by the signal level on the front-panel **[Mod In]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the PM phase deviation in scientific notation. For example, the query might return +5.000000000000000E+01, indicating that the phase deviation is 50°.

Examples

```
:SOURce1:PM:DEViation 50 /*Sets the PM phase deviation to 50° for
CH1.*/
:SOURce1:PM:DEViation? /*Queries the PM phase deviation for CH1.
The query returns +5.000000000000000E+01.*/
```

3.12.26.2   [:SOURce[<n>]]:PM:INTernal:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**PM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**PM:INTernal:FREQuency?** [<*lim_query*>]

Description

Sets or queries the PM modulation frequency for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	2 mHz to 1 MHz	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-

Name	Type	Range	Default
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source
  (*[:SOURce[<n>]]:PM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might
return +1.500000000000000E+02, indicating that the frequency is 150 Hz.

Examples

```
:SOURce1:PM:INTernal:FREQuency 150 /*Sets the frequency of the PM
modulating waveform to 150 Hz for CH1.*/
:SOURce1:PM:INTernal:FREQuency? /*Queries the frequency of the PM
modulating waveform for CH1. The query returns +1.500000000000000E
+02.*/
```

3.12.26.3 [:SOURce[<n>]]:PM:INTernal:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**PM:INTernal:FUNCtion** <*function*>

[:**SOURce**[<*n*>]]:**PM:INTernal:FUNCtion?**

Description

Sets or queries the PM modulating waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<function>	Discrete	{SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|ARB}	SINusoid

Remarks

- PM supports the following internal modulating waveforms:

    - **SINusoid:** Sine wave.

    - **SQUare:** Square with 50% duty cycle.

    - **TRIangle:** Triangle with 50% symmetry.

- **RAMP:** UpRamp with 100% symmetry.

- **NRAMp:** DnRamp with 0% symmetry.

- **NOISe:** white gaussian noise.

- **ARB:** arbitrary waveform.

- This command is only available for internal modulation source
  (*[:SOURce[<n>]]:PM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns SIN, SQU, TRI, RAMP, NRAM, NOIS, or ARB.

Examples

```
:SOURce1:PM:INTernal:FUNCtion SQUare /*Sets the PM modulating
waveform to Square for CH1.*/
:SOURce1:PM:INTernal:FUNCtion? /*Queries the PM modulating
waveform for CH1. The query returns SQU.*/
```

3.12.26.4   [:SOURce[<n>]]:PM:INTernal:FUNCtion:ARBitrary

Syntax

[:**SOURce**[<*n*>]]:**PM:INTernal:FUNCtion:ARBitrary** <*arb*>

[:**SOURce**[<*n*>]]:**PM:INTernal:FUNCtion:ARBitrary?**

Description

Sets or queries the modulating waveform (Arb) type of PM for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	SINC

Remarks

- The parameter <arb> is used to set the built-in waveform type. The range is
  {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE|
  PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED|
  BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE|
  CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE|
  NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP|
  SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM|

CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2|
TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A|
ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A|
ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET|
ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE|
LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA|
WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO|
CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|
SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON|
ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|
ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN|
BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING|
HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|
ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|
ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|
ARCHAV|ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE|
POSFWRSINE|NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|
2NDOIR02|2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|
ISO167502VIT|ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE|
SEVENTONE|EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP|
LOWERSEMICIRCLE|DISTORTION|GAUSSDERIV|GAUSSHERMITE1|
GAUSSHERMITE2|GAUSSHERMITE3|GAUSSHERMITE4|GABOR1|GABOR3|
LEGENDRE3|LEGENDRE4|LEGENDRE5|LEGENDRE6|LEGENDRE7|LEGENDRE8|
LEGENDRE9|LEGENDRE10|LAGUERRE2|LAGUERRE3|LAGUERRE4|LAGUERRE5|
LAGUERRE6|LAGUERRE7|LAGUERRE8|LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|
CHEBYSHEV5|CHEBYSHEV6|CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|
CHEBYSHEV10|WEIERSTRASS|AIRYAI|AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|
GAMMAINV|COSHC|SINHC|TANHC|TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|
PRBS16|PRBS20|PRBS21|PRBS23}

- When the modulating waveform (*[:SOURce[<n>]]:PM:INTernal:FUNCtion*) is set to Arb, you can use this command to select the Arb type as the modulating waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the Arb type, for example, SINC.

Examples

```
:SOURce1:PM:INTernal:FUNCtion:ARBitrary SINC /*Sets the Arb type
of the PM modulating waveform to SINC for CH1.*/
:SOURce1:PM:INTernal:FUNCtion:ARBitrary? /*Queries the Arb type of
the PM modulating waveform for CH1. The query returns SINC.*/
```

3.12.26.5   [:SOURce[<n>]]:PM:SOURce

Syntax

[:**SOURce**[<*n*>]]:**PM**:**SOURce** <*source*>

[:**SOURce**[<*n*>]]:**PM**:**SOURce?**

Description

Sets or queries the PM modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation source.

    - **INTernal:** internal modulation source. After the internal modulation source is selected, you can send *[:SOURce[<n>]]:PM:INTernal:FUNCtion* to select the modulating waveforms.

    - **EXTernal:** external modulation source. After the external modulation source is selected, the generator receives the external modulating signal from the front-panel **[Mod In]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:PM:SOURce INTernal /*Sets the PM modulation source to
internal modulation source for CH1.*/
:SOURce1:PM:SOURce? /*Queries the PM modulation source for CH1.
The query returns INT.*/
```

3.12.26.6   [:SOURce[<n>]]:PM:STATe

Syntax

[:**SOURce**[<*n*>]]:**PM**:**STATe** <*bool*>

[:**SOURce**[<*n*>]]:**PM**:**STATe?**

Description

Sets or queries the on/off status of the PM modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for PM.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:PM:STATe ON /*Enables the PM modulation function for
CH1.*/
:SOURce1:PM:STATe? /*Queries the on/off status of the PM
modulation function for CH1. The query returns 1.*/
```

3.12.27 [:SOURce[<n>]]:PSKey

[:SOURce[<n>]]:PSKey commands are used to set and query PSK parameters such as the PSK rate, modulation phase, modulation polarity, modulation source, and the on/off status of the PSK modulation function.

3.12.27.1 [:SOURce[<n>]]:PSKey:INTernal:RATE

Syntax

[:**SOURce**[<*n*>]]:**PSKey:INTernal:RATE** {<*rate*>|<*lim*>}

[:**SOURce**[<*n*>]]:**PSKey:INTernal:RATE?** [<*lim*>]

Description

Sets or queries the PSK modulation rate for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<rate>	Real	2 mHz to 1 MHz	100 Hz
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is only available for internal modulation source (*[:SOURce[<n>]]:PSKey:SOURce*). PSK rate is the rate at which the output phase "shifts" between the carrier phase (*[:SOURce[<n>]]:PHASe*) and modulation phase (*[:SOURce[<n>]]:PSKey:PHASe*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the PSK rate in scientific notation. For example, the query might return +1.500000000000000E+02, indicating that the PSK rate is 150 Hz.

Examples

```
:SOURce1:PSKey:INTernal:RATE 150 /*Sets the PSK rate to 150 Hz for
CH1.*/
:SOURce1:PSKey:INTernal:RATE? /*Queries the PSK rate for CH1. The
query returns +1.500000000000000E+02.*/
```

3.12.27.2 [:SOURce[<n>]]:PSKey:PHASe

Syntax

[:**SOURce**[<*n*>]]:**PSKey:PHASe** {<*phase*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**PSKey:PHASe?** [<*lim_query*>]

Description

Sets or queries the PSK modulation phase for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<phase>	Real	0° to 360°	180°
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-

Name	Type	Range	Default
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- In PSK modulation, the generator "shift" its output phase between two preset phases, carrier phase (*[:SOURce[<n>]]:PHASe*) and modulation phase.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the PSK phase in scientific notation. For example, the query might return +9.000000000000000E+01, indicating that the PSK phase is 90°.

Examples

```
:SOURce1:PSKey:PHASe 90 /*Sets the PSK modulation phase to 90° for
CH1.*/
:SOURce1:PSKey:PHASe? /*Queries the PSK modulation phase for CH1.
The query returns +9.000000000000000E+01.*/
```

3.12.27.3 [:SOURce[<n>]]:PSKey:POLarity

Syntax

[:**SOURce**[<*n*>]]:**PSKey:POLarity** <*polarity*>

[:**SOURce**[<*n*>]]:**PSKey:POLarity?**

Description

Sets or queries the PSK modulation polarity for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<polarity>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- The PSK modulation polarity can be set to the following:

    - **POSitive:** positive polarity.

    - **NEGative:** negative polarity.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns POS or NEG.

Examples

```
:SOURce1:PSKey:POLarity NEGative /*Sets the PSK modulation
polarity to negative for CH1.*/
:SOURce1:PSKey:POLarity? /*Queries the PSK modulation polarity for
CH1. The query returns NEG.*/
```

3.12.27.4   [:SOURce[<n>]]:PSKey:PORT

Syntax

[:**SOURce**[<*n*>]]:**PSKey:PORT** <*port*>

[:**SOURce**[<*n*>]]:**PSKey:PORT?**

Description

Sets or queries the PSK external modulation port for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<port>	Discrete	{FRONt|REAR}	FRONt

Remarks

- When the modulation source of PSK modulation is set to external source, you can set the following input terminals:

  - **FRONt:** front port. The instrument receives the external modulation signal from the front-panel **[Mod In]** connector.

  - **REAR:** rear port. The instrument receives the external modulation signal from the rear-panel **[AUX IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns FRON or REAR.

Examples

```
:SOURce1:PSKey:PORT FRONt /*Sets the PSK external modulation port
to front port for CH1.*/
:SOURce1:PSKey:PORT? /*Queries the PSK external modulation port
for CH1. The query returns FRON.*/
```

3.12.27.5 [:SOURce[<n>]]:PSKey:SOURce

Syntax

[:**SOURce**[<*n*>]]:**PSKey:SOURce** <*source*>

[:**SOURce**[<*n*>]]:**PSKey:SOURce?**

Description

Sets or queries the PSK modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation source.

    - **INTernal:** internal modulation source. When the internal modulation source is selected, the modulating waveform is a square waveform with 50% duty cycle.

    - **EXTernal:** external modulation source. When the external modulation source is selected, the generator receives the external modulating signal from the front-panel **[Mod In]** connector or the rear-panel **[AUX IN]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:PSKey:SOURce INTernal /*Sets the PSK modulation source to
internal modulation source for CH1.*/
:SOURce1:PSKey:SOURce? /*Queries the PSK modulation source for
CH1. The query returns INT.*/
```

3.12.27.6 [:SOURce[<n>]]:PSKey:STATe

Syntax

[:**SOURce**[<*n*>]]:**PSKey:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**PSKey:STATe?**

Description

Sets or queries the on/off status of the PSK modulation function for the specified channel.

Parameter

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

Remarks

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- The harmonic, noise, DC, and pulse cannot be modulated for PSK.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:PSKey:STATe ON /*Enables the PSK modulation function for
CH1.*/
:SOURce1:PSKey:STATe? /*Queries the on/off status of the PSK
modulation function for CH1. The query returns 1.*/
```

3.12.28 [:SOURce[<n>]]:PWM

[:SOURce[<n>]]:PWM commands are used to set and query the PWM parameters such as the duty cycle deviation, width deviation, modulating waveform frequency, modulation source, modulating waveform, and the on/off status of the PWM modulation.

3.12.28.1 [:SOURce[<n>]]:PWM:DEViation

Syntax

[:SOURce[<n>]]:PWM:DEViation {<*deviation*>|<*lim_set*>}

[:SOURce[<n>]]:PWM:DEViation? [<*lim_query*>]

Description

Sets or queries the PWM width deviation for the specified channel.

Parameter

Name	Type	Range	Default
\<n>	Discrete	{1|2|3|4}	1
\<deviation>	Real	Refer to *Remarks*	50 µs
\<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
\<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The width deviation is limited by the pulse width, the minimum pulse width, and the edge time.

- When [:SOURce[\<n>]] or [\<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the PWM width deviation in scientific notation. For example, the query might return +1.000000000000000E-04, indicating that the width deviation is 100 µs (0.0001 s).

Examples

```
:SOURce1:PWM:DEViation 0.0001 /*Sets the PWM width deviation to
100 µs (0.0001 s) for CH1.*/
:SOURce1:PWM:DEViation? /*Queries the PWM width deviation for CH1.
The query returns +1.000000000000000E-04.*/
```

3.12.28.2 [:SOURce[\<n>]]:PWM:DEViation:DCYCle

Syntax

[:SOURce[\<*n*>]]:**PWM:DEViation:DCYCle** {<*percent*>|<*lim_set*>}

[:SOURce[\<*n*>]]:**PWM:DEViation:DCYCle?** [<*lim_query*>]

Description

Sets or queries the PWM duty cycle deviation for the specified channel.

Parameter

Name	Type	Range	Default
\<n>	Discrete	{1|2|3|4}	1
\<percent>	Real	Refer to *Remarks*	5%
\<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-

Name	Type	Range	Default
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

* The duty cycle deviation is limited by the duty cycle, the minimum duty cycle, and the edge time.

* When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the PWM duty cycle deviation in scientific notation. For example, the query might return +1.500000000000000E+01, indicating that the PWM duty cycle deviation is 15%.

Examples

```
:SOURce1:PWM:DEViation:DCYCle 15 /*Sets the PWM duty cycle
deviation to 15% for CH1.*/
:SOURce1:PWM:DEViation:DCYCle? /*Queries the PWM duty cycle
deviation for CH1. The query returns +1.500000000000000E+01.*/
```

3.12.28.3   [:SOURce[<n>]]:PWM:INTernal:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**PWM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**PWM:INTernal:FREQuency?** [<*lim_query*>]

Description

Sets or queries the modulation frequency of PWM modulation for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	2 mHz to 1 MHz	100 Hz
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

* This command is only available for internal modulation source (*[:SOURce[<n>]]:PWM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might return +1.500000000000000E+05, indicating that the frequency is 150 kHz.

Examples

```
:SOURce1:PWM:INTernal:FREQuency 150000 /*Sets the frequency of the
PWM modulating waveform to 150 kHz for CH1.*/
:SOURce1:PWM:INTernal:FREQuency? /*Queries the frequency of the
PWM modulating waveform for CH1. The query returns
+1.500000000000000E+05.*/
```

3.12.28.4   [:SOURce[<n>]]:PWM:INTernal:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**PWM:INTernal:FUNCtion** <*function*>

[:**SOURce**[<*n*>]]:**PWM:INTernal:FUNCtion?**

Description

Sets or queries the PWM modulating waveform for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<function>	Discrete	{SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|ARB}	SINusoid

Remarks

- PWM supports the following internal modulating waveforms:

  - **SINusoid:** Sine wave.

  - **SQUare:** Square with 50% duty cycle.

  - **TRIangle:** Triangle with 50% symmetry.

  - **RAMP:** UpRamp with 100% symmetry.

  - **NRAMp:** DnRamp with 0% symmetry.

  - **NOISe:** white gaussian noise.

  - **ARB:** arbitrary waveform.

- This command is only available for internal modulation source (*[:SOURce[<n>]]:PWM:SOURce*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns SIN, SQU, RAMP, NRAM, TRI, NOIS, or ARB.

Examples

```
:SOURce1:PWM:INTernal:FUNCtion SQUare /*Sets the PWM modulating
waveform to Square for CH1.*/
:SOURce1:PWM:INTernal:FUNCtion? /*Queries the PWM modulating
waveform for CH1. The query returns SQU.*/
```

3.12.28.5 [:SOURce[<n>]]:PWM:INTernal:FUNCtion:ARBitrary

Syntax

[:**SOURce**[<*n*>]]:**PWM:INTernal:FUNCtion:ARBitrary** <*arb*>

[:**SOURce**[<*n*>]]:**PWM:INTernal:FUNCtion:ARBitrary?**

Description

Sets or queries the modulating waveform (Arb) type of PWM for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	SINC

Remarks

- The parameter <arb> is used to set the built-in waveform type. The range is {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE| PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED| BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE| CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE| NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP| SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM| CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2| TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A| ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A| ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET| ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE| LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA|

WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO|
CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|
SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON|
ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|
ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN|
BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING|
HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|
ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|
ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|
ARCHAV|ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE|
POSFWRSINE|NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|
2NDOIR02|2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|
ISO167502VIT|ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE|
SEVENTONE|EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP|
LOWERSEMICIRCLE|DISTORTION|GAUSSDERIV|GAUSSHERMITE1|
GAUSSHERMITE2|GAUSSHERMITE3|GAUSSHERMITE4|GABOR1|GABOR3|
LEGENDRE3|LEGENDRE4|LEGENDRE5|LEGENDRE6|LEGENDRE7|LEGENDRE8|
LEGENDRE9|LEGENDRE10|LAGUERRE2|LAGUERRE3|LAGUERRE4|LAGUERRE5|
LAGUERRE6|LAGUERRE7|LAGUERRE8|LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|
CHEBYSHEV5|CHEBYSHEV6|CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|
CHEBYSHEV10|WEIERSTRASS|AIRYAI|AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|
GAMMAINV|COSHC|SINHC|TANHC|TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|
PRBS16|PRBS20|PRBS21|PRBS23}

- When the modulating waveform (*[:SOURce[<n>]]:PWM:INTernal:FUNCtion*) is set to Arb, you can use this command to select the Arb type as the modulating waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the Arb type, for example, SINC.

Examples

```
:SOURce1:PWM:INTernal:FUNCtion:ARBitrary SINC /*Sets the Arb type
of the PWM modulating waveform to SINC for CH1.*/
:SOURce1:PWM:INTernal:FUNCtion:ARBitrary? /*Queries the Arb type
of the PWM modulating waveform for CH1. The query returns SINC.*/
```

3.12.28.6 [:SOURce[<n>]]:PWM:SOURce

Syntax

[**:SOURce**[<*n*>]]**:PWM:SOURce** <*source*>

[**:SOURce**[<*n*>]]**:PWM:SOURce?**

Description

Sets or queries the PWM modulation source for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- The instrument can receive modulating waveforms from internal or external modulation.

  - **INTernal:** internal modulation source. After the internal modulation source is selected, you can send *[:SOURce[<n>]]:PWM:INTernal:FUNCtion* to select the modulating waveforms.

  - **EXTernal:** external modulation source. After the external modulation source is selected, the generator receives the external modulating signal from the front-panel **[Mod In]** connector.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns INT or EXT.

Examples

```
:SOURce1:PWM:SOURce EXTernal /*Sets the PWM modulation source to
external modulation source for CH1.*/
:SOURce1:PWM:SOURce? /*Queries the PWM modulation source for CH1.
The query returns EXT.*/
```

3.12.28.7   [:SOURce[<n>]]:PWM:STATe

Syntax

[**:SOURce**[<*n*>]]**:PWM:STATe** <*bool*>

[**:SOURce**[<*n*>]]**:PWM:STATe?**

Description

Sets or queries the on/off status of the PWM modulation function for the specified channel.

Parameter

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

Remarks

- The carrier waveform of PWM can only be pulse. The PWM modulation can be enabled only when the current waveform of the specified channel is a pulse wave. Different settings of the pulse parameters (e.g. frequency, amplitude range, offset, pulse width, duty cycle) will affect the output PWM modulated waveform.

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:PWM:STATe ON /*Enables the PWM modulation function for
CH1.*/
:SOURce1:PWM:STATe? /*Queries the on/off status of the PWM
modulation function for CH1. The query returns 1.*/
```

3.12.29 [:SOURce[<n>]]:SUM

[:SOURce[<n>]]:SUM commands are used to set and query the waveform summing parameters such as sum ratio, sum frequency, sum waveform, and the summing on/off status.

3.12.29.1 [:SOURce[<n>]]:SUM:AMPLitude

Syntax

[:**SOURce**[<*n*>]]:**SUM:AMPLitude** {<*amplitude*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**SUM:AMPLitude?** [<*lim_query*>]

Description

Sets or queries the sum ratio of the waveform summing function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<amplitude>	Real	0% to 100%	50%
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- Sum ratio is the ratio of the amplitude of the waveform to be added relative to the amplitude of the basic waveform. It is limited by the current carrier amplitude and the maximum amplitude.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the sum ratio in scientific notation. For example, the query might return +5.000000000000000E+01, indicating that the sum ratio is 50%.

Examples

```
:SOURce1:SUM:AMPLitude 50 /*Sets the sum ratio of the waveform
summing function to 50% for CH1.*/
:SOURce1:SUM:AMPLitude? /*Queries the sum ratio of the waveform
summing function for CH1. The query returns +5.000000000000000E
+01.*/
```

3.12.29.2 [:SOURce[<n>]]:SUM:INTernal:FREQuency

Syntax

[:**SOURce**[<*n*>]]:**SUM:INTernal:FREQuency** {<*frequency*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**SUM:INTernal:FREQuency?** [<*lim_query*>]

Description

Sets or queries the sum frequency of the waveform summing function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<frequency>	Real	2 mHz to 1 MHz	100 Hz

Name	Type	Range	Default
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- Sum frequency is the frequency of the waveform to be added to the current basic waveform.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the frequency in scientific notation. For example, the query might return +1.000000000000000E+02, indicating that the sum frequency is 100 Hz.

Examples

```
:SOURce1:SUM:INTernal:FREQuency 100 /*Sets the sum frequency of
the waveform summing function to 100 Hz for CH1.*/
:SOURce1:SUM:INTernal:FREQuency? /*Queries the sum frequency of
the waveform summing function for CH1. The query returns
+1.000000000000000E+02.*/
```

3.12.29.3 [:SOURce[<n>]]:SUM:INTernal:FUNCtion

Syntax

[:**SOURce**[<*n*>]]:**SUM:INTernal:FUNCtion** <*function*>

[:**SOURce**[<*n*>]]:**SUM:INTernal:FUNCtion?**

Description

Sets or queries the summing waveform of the waveform summing function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<function>	Discrete	{SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|ARB}	SINusoid

Remarks

- Summing waveform is the waveform to be added to the basic waveform. The following waveforms are supported.

    - **SINusoid:** Sine wave.

- **SQUare:** Square with 50% duty cycle.

- **TRIangle:** Triangle with 50% symmetry.

- **RAMP:** UpRamp with 100% symmetry.

- **NRAMp:** DnRamp with 0% symmetry.

- **NOISe:** white gaussian noise.

- **ARB:** arbitrary waveform.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns SIN, SQU, RAMP, NRAM, TRI, NOIS, or ARB.

Examples

```
:SOURce1:SUM:INTernal:FUNCtion SQUare /*Sets the summing waveform
of the waveform summing function to Square for CH1.*/
:SOURce1:SUM:INTernal:FUNCtion? /*Queries the summing waveform of
the waveform summing function for CH1. The query returns SQU.*/
```

3.12.29.4 [:SOURce[<n>]]:SUM:INTernal:FUNCtion:ARBitrary

Syntax

[:**SOURce**[<*n*>]]:**SUM:INTernal:FUNCtion:ARBitrary** <*arb*>

[:**SOURce**[<*n*>]]:**SUM:INTernal:FUNCtion:ARBitrary?**

Description

Sets or queries the sum waveform (Arb) for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<arb>	Discrete	Refer to *Remarks*	SINC

Remarks

• The parameter <arb> is used to set the built-in waveform type. The range is {ABSSINE|ABSSINEHALF|AMPALT|ATTALT|GAUSSPULSE|NEGRAMP|NPULSE| PPULSE|SINETRA|SINEVER|STAIRDN|STAIRUD|STAIRUP|TRAPEZIA|BANDLIMITED| BLASEIWAVE|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|COMBIN|CPULSE| CWPULSE|DAMPEDOSC|DUALTONE|GAMMA|GATEVIBR|LFMPULSE|MCNOISE| NIMHDISCHARGE|PAHCUR|QUAKE|RADAR|RIPPLE|ROUNDHALF|STEPRESP|

SWINGOSC|TV|VOICE|THREEAM|THREEFM|THREEPFM|THREEPM|THREEPWM|
CARDIAC|EOG|EEG|EMG|PULSILOGRAM|RESSPEED|LFPULSE|TENS1|TENS2|
TENS3|IGNITION|ISO167502SP|ISO167502VR|ISO76372TP1|ISO76372TP2A|
ISO76372TP3A|ISO76372TP2B|ISO76372TP3B|ISO76372TP4|ISO76372TP5A|
ISO76372TP5B|SCR|SURGE|AIRY|BESSELJ|BESSELY|CAUCHY|CUBIC|DIRICHLET|
ERF|ERFC|ERFCINV|ERFINV|EXPFALL|EXPRISE|GAUSS|HAVERSINE|LAGUERRE|
LAPLACE|LEGEND|LOG|LOGNORMAL|LORENTZ|MAXWELL|RAYLEIGH|VERSIERA|
WEIBULL|X2DATA|COSH|COSINT|COT|COTHCON|COTHPRO|CSCCON|CSCPRO|
CSCHCON|CSCHPRO|RECIPCON|RECIPPRO|SECCON|SECPRO|SECH|SINC|SINH|
SININT|SQRT|TAN|TANH|ACOS|ACOSH|ACOTCON|ACOTPRO|ACOTHCON|
ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|ACSCHPRO|ASECCON|ASECPRO|
ASECH|ASIN|ASINH|ATAN|ATANH|BARLETT|BARTHANN|BLACKMAN|
BLACKMANH|BOHMANWIN|BOXCAR|CHEBWIN|FLATTOPWIN|HAMMING|
HANNING|KAISER|NUTTALLWIN|PARZENWIN|TAYLORWIN|TRIANG|TUKEYWIN|
ROUNDPM|ECG1|ECG2|ECG3|ECG4|ECG5|ECG6|ECG7|ECG8|ECG9|ECG10|ECG11|
ECG12|ECG13|ECG14|ECG15|MODBESSELI0|SPHBESSELJ1|SPHBESSELJ2|
ARCHAV|ARCHCV|ACOT|NEGHALFSINE|POSHWRSINE|NEGHWRSINE|
POSFWRSINE|NEGFWRSINE|2NDOSR01|2NDOSR02|2NDOSR07|2NDOIR01|
2NDOIR02|2NDOIR07|DAMPEDSINE1|DAMPEDSINE3|DAMPEDSINE5|
ISO167502VIT|ISO167502VRT|THREETONE|FOURTONE|FIVETONE|SIXTONE|
SEVENTONE|EIGHTTONE|ISO167502LD1|ISO167502LD2|X3|POSRAMP|
LOWERSEMICIRCLE|DISTORTION|GAUSSDERIV|GAUSSHERMITE1|
GAUSSHERMITE2|GAUSSHERMITE3|GAUSSHERMITE4|GABOR1|GABOR3|
LEGENDRE3|LEGENDRE4|LEGENDRE5|LEGENDRE6|LEGENDRE7|LEGENDRE8|
LEGENDRE9|LEGENDRE10|LAGUERRE2|LAGUERRE3|LAGUERRE4|LAGUERRE5|
LAGUERRE6|LAGUERRE7|LAGUERRE8|LAGUERRE9|CHEBYSHEV3|CHEBYSHEV4|
CHEBYSHEV5|CHEBYSHEV6|CHEBYSHEV7|CHEBYSHEV8|CHEBYSHEV9|
CHEBYSHEV10|WEIERSTRASS|AIRYAI|AIRYBI|MATHIEU1|MATHIEU3|MATHIEU5|
GAMMAINV|COSHC|SINHC|TANHC|TICK|CLAUSEN|PRBS9|PRBS11|PRBS15|
PRBS16|PRBS20|PRBS21|PRBS23}

- When the sum waveform (*[:SOURce[<n>]]:SUM:INTernal:FUNCtion*) is set to Arb, you can use this command to select the Arb type.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the Arb type, for example, SINC.

Examples

```
:SOURce1:SUM:INTernal:FUNCtion:ARBitrary SINC /*Sets the sum
waveform to SINC for CH1.*/
:SOURce1:SUM:INTernal:FUNCtion:ARBitrary? /*Queries the sum
waveform for CH1. The query returns SINC.*/
```

3.12.29.5 [:SOURce[<n>]]:SUM:STATe

Syntax

[:**SOURce**[<*n*>]]:**SUM:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**SUM:STATe?**

Description

Sets or queries the on/off status of the waveform summing function for the specified channel.

Parameter

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

Remarks

- Waveform summing function is to sum the specified waveform on the basic waveform like Sine, Square, Ramp, and Arb and then output the summed waveform.

- If the Sweep (*[:SOURce[<n>]]:SWEep:STATe*), Burst (*[:SOURce[<n>]]:BURSt:STATe*), or Advanced (*[:SOURce[<n>]]:FUNCtion:ADVance[:STATe]*) function is currently enabled, it will be disabled automatically when the modulation function is enabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:SUM:STATe ON /*Enables the waveform summing function for
CH1.*/
:SOURce1:SUM:STATe? /*Queries the on/off status of the waveform
summing function for CH1. The query returns 1.*/
```

3.12.30 [:SOURce[<n>]]:SWEep

[:SOURce[<n>]]:SWEep are used to set and query sweep parameters including start hold time, stop hold time, return time, sweep type, number of steps, sweep time, and the on/off status of the sweep function.

3.12.30.1 [:SOURce[<n>]]:SWEep:HTIMe:STARt

Syntax

[:SOURce[<*n*>]]:SWEep:HTIMe:STARt {<*time*>|<*lim_set*>}

[:SOURce[<*n*>]]:SWEep:HTIMe:STARt? [<*lim_query*>]

Description

Sets or queries the start hold time of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	0 s to 3600 s	0 s
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The maximum value of <time> is limited by the sweep type, trigger source, return time, sweep time, and stop hold time. T_P = Sweep Time + Start Hold Time + Return Time + Stop Hold Time.

    - **Linear Sweep:** internal trigger source, T_P + 1 ms ≤ 8,000 s; manual/ external trigger source, T_P ≤ 250,000 s.

    - **Log/Step Sweep:** T_P ≤ 500 s.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the start hold time in scientific notation. For example, the query might return +1.000000000000000E-03, indicating that the start hold time is 1 ms.

Examples

```
:SOURce1:SWEep:HTIMe:STARt 0.001 /*Sets the start hold time of the
sweep function to 1 ms for CH1.*/
:SOURce1:SWEep:HTIMe:STARt? /*Queries the start hold time of the
sweep function for CH1. The query returns +1.000000000000000E-03.*/
```

3.12.30.2 [:SOURce[<n>]]:SWEep:HTIMe[:STOP]

Syntax

[:**SOURce**[<*n*>]]:**SWEep**:**HTIMe**[:**STOP**] {<*time*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**SWEep**:**HTIMe**[:**STOP**]? [<*lim_query*>]

Description

Sets or queries the stop hold time of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	0 s to 3600 s	0 s
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The maximum value of <time> is limited by the sweep type, trigger source, return time, sweep time, and start hold time. T_P = Sweep Time + Start Hold Time + Return Time + Stop Hold Time.

  - **Linear Sweep:** internal trigger source, T_P + 1 ms ≤ 8,000 s; manual/external trigger source, T_P ≤ 250,000 s.

  - **Log/Step Sweep:** T_P ≤ 500 s.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the stop hold time in scientific notation. For example, the query might return +1.000000000000000E-03, indicating that the stop hold time is 1 ms.

Examples

```
:SOURce1:SWEep:HTIMe:STOP 0.001 /*Sets the stop hold time of the
sweep function to 1 ms for CH1.*/
:SOURce1:SWEep:HTIMe:STOP? /*Queries the stop hold time of the
sweep function for CH1. The query returns +1.000000000000000E-03.*/
```

3.12.30.3 [:SOURce[<n>]]:SWEep:RTIMe

Syntax

[:**SOURce**[<*n*>]]:**SWEep:RTIMe** {<*time*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**SWEep:RTIMe?** [<*lim_query*>]

Description

Sets or queries the return time of the sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	0 s to 3600 s	0 s
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The maximum value of <time> is limited by the sweep type, start/stop hold time, trigger source, and sweep time. T_P = Sweep Time + Start Hold Time + Return Time + Stop Hold Time.

    - **Linear Sweep:** internal trigger source, T_P + 1 ms ≤ 8,000 s; manual/ external trigger source, T_P ≤ 250,000 s.

    - **Log/Step Sweep:** T_P ≤ 500 s.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the return time in scientific notation. For example, the query might return +1.000000000000000E-03, indicating that the return time is 1 ms.

Examples

```
:SOURce1:SWEep:RTIMe 0.001 /*Sets the return time of the sweep
function to 1 ms for CH1.*/
:SOURce1:SWEep:RTIMe? /*Queries the return time of the sweep
function for CH1. The query returns +1.000000000000000E-03.*/
```

3.12.30.4 [:SOURce[<n>]]:SWEep:SPACing

Syntax

[:**SOURce**[<*n*>]]:**SWEep:SPACing** <*type*>

[:**SOURce**[<*n*>]]:**SWEep:SPACing?**

Description

Sets or queries the sweep type for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<type>	Discrete	{LINear|LOGarithmic|STEP}	LINear

Remarks

- When you enable the sweep function for the specified channel, you can use this command to set the sweep type. This instrument provides the following three sweep types.

  - **LINear:** linear sweep. The instrument varies the output frequency linearly during the sweep, changing the output frequency by a constant number of Hz per second. It is characterized by "Start Frequency" (*[:SOURce[<n>]]:FREQuency:STARt*), "Stop Frequency" (*[:SOURce[<n>]]:FREQuency:STOP*), and "Sweep Time" (*[:SOURce[<n>]]:SWEep:TIME*).

  - **LOGarithmic:** logarithmic sweep. The instrument varies the output frequency logarithmically during the sweep, changing the frequency by a constant number of octaves. It is characterized by "Start Frequency", "Stop Frequency", and "Sweep Time".

  - **STEP:** step sweep. The instrument "steps" through a list of frequencies during the sweep. The period that the output signal dwells on each frequency is determined by "Sweep Time" and "Step Number" (*[:SOURce[<n>]]:SWEep:STEP*).

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns LIN, LOG, or STEP.

Examples

```
:SOURce1:SWEep:SPACing LINear /*Sets the sweep type to linear
sweep for CH1.*/
:SOURce1:SWEep:SPACing? /*Queries the sweep type for CH1. The
query returns LIN.*/
```

3.12.30.5 [:SOURce[<n>]]:SWEep:STATe

Syntax

[:**SOURce**[<*n*>]]:**SWEep:STATe** <*bool*>

[:**SOURce**[<*n*>]]:**SWEep:STATe?**

Description

Sets or queries the on/off status of the Sweep function for the specified channel.

Parameter

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

Remarks

- If the Modulation, Advanced, or Burst function is currently enabled, the Modulation, Advanced, or Burst function will be disabled automatically when the Sweep function is enabled.

- When the basic waveform (*[:SOURce[<n>]]:FUNCtion*) of the specified channel is set to harmonic, noise, DC, or pulse, the Sweep function cannot be enabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:SWEep:STATe ON /*Enables the Sweep function for CH1.*/
:SOURce1:SWEep:STATe? /*Queries the on/off status of the Sweep
function for CH1. The query returns 1.*/
```

3.12.30.6 [:SOURce[<n>]]:SWEep:STEP

Syntax

[:**SOURce**[<*n*>]]:**SWEep:STEP** {<*step*>|<*lim*>}

[:**SOURce**[<*n*>]]:**SWEep:STEP?** [<*lim*>]

Description

Sets or queries the step number of the step sweep function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<step>	Integer	2 to 1024	2
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- Step number specifies the number of steps required to complete the change from the "Start Frequency" (*[:SOURce[<n>]]:FREQuency:STARt*) to the "Stop Frequency" (*[:SOURce[<n>]]:FREQuency:STOP*) and to return from the "Stop Frequency" to the "Start Frequency". It is only available for step sweep.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the step number in scientific notation. For example, the query might return +5.000000000000000E+02, indicating that the step number is 500.

Examples

```
:SOURce1:SWEep:STEP 500 /*Sets the step number of the step sweep
function to 500 for CH1.*/
:SOURce1:SWEep:STEP? /*Queries the step number of the step sweep
function for CH1. The query returns +5.000000000000000E+02.*/
```

3.12.30.7   [:SOURce[<n>]]:SWEep:TIME

Syntax

[:**SOURce**[<*n*>]]:**SWEep:TIME** {<*time*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**SWEep:TIME?** [<*lim_query*>]

Description

Sets or queries the sweep time for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<time>	Real	1 ms to 250,000 s	1 s

Name	Type	Range	Default
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The maximum value of <time> is limited by the sweep type, start/stop hold time, trigger source, and return time. T_P = Sweep Time + Start Hold Time + Return Time + Stop Hold Time.

    - **Linear Sweep:** internal trigger source, T_P + 1 ms ≤ 8,000 s; manual/external trigger source, T_P ≤ 250,000 s.

    - **Log/Step Sweep:** T_P ≤ 500 s.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the sweep time in scientific notation. For example, the query might return +5.000000000000000E+00, indicating that the sweep time is 5 s.

Examples

```
:SOURce1:SWEep:TIME 5 /*Sets the sweep time to 5 s for CH1.*/
:SOURce1:SWEep:TIME? /*Queries the sweep time for CH1. The query
returns +5.000000000000000E+00.*/
```

3.12.31 [:SOURce[<n>]]:TRACk

Syntax

[:SOURce[<n>]]:TRACk <track>

[:SOURce[<n>]]:TRACk?

Description

Sets or queries the state of the channel track function for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<track>	Discrete	{ON|OFF|INVerted}	OFF

Remarks

- The track function can be enabled only for channels that are added to the Bundled Channels and do not serve as the benchmark channel (*:SYNChro:BENChmark*).

- The channel track function has the following three states.

  - **ON:** enables the track function. When the track function is enabled for a specified channel, the instrument automatically copies the parameters and states (except the channel output on/off state and the debounce on/off state) of the benchmark channel (*:SYNChro:BENChmark*) to the channel while the channel cannot be operated at this point. The modifications of the benchmark channel also apply to the channel.

  - **OFF:** disables the track function.

  - **INVerted:** the track function is enabled, but the output polarity of the target channel is opposite to that of the benchmark channel.

- The track function of other channels is disabled when the Advanced mode of the benchmark channel is enabled.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns ON, OFF, or INV.

Examples

```
:SOURce1:TRACk ON /*Enables the channel track function for CH1.*/
:SOURce1:TRACk? /*Queries the channel track function for CH1. The
query returns ON.*/
```

3.12.32 [:SOURce[<n>]]:VOLTage

[:SOURce[<n>]]:VOLTage commands are used to set and query the on/off status of amplitude range coupling function, specify the waveform amplitude range, waveform high/low level, waveform offset voltage, and amplitude range unit for the specified channel.

3.12.32.1 [:SOURce[<n>]]:VOLTage

Syntax

[:**SOURce**[<*n*>]]:**VOLTage** {<*amplitude*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**VOLTage?** [<*lim_query*>]

Description

Sets or queries the output amplitude for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<amplitude>	Real	Refer to *Remarks*	2.5 Vpp
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

• For SND output, refer to *Table 3.61 SND Output Amplitude Range* for the range of <amplitude>, which is limited by the impedance (*:OUTPut[<n>]:LOAD*), frequency/period (*[:SOURce[<n>]]:FREQuency*), and offset (*[:SOURce[<n>]]:VOLTage:OFFSet*) settings; for AMP output, refer to *Table 3.62 AMP Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period and offset settings; for HBW output, refer to *Table 3.63 HBW Output Amplitude Range (Load)* for the range of <amplitude>, which is limited by the frequency/period setting.

• When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the amplitude in scientific notation. For example, the query might return +2.500000000000000E+00, indicating that the output amplitude is 2.5 Vpp.

Examples

```
:SOURce1:VOLTage 2.5 /*Sets the output amplitude to 2.5 Vpp for
CH1.*/
:SOURce1:VOLTage? /*Queries the output amplitude for CH1. The
query returns +2.500000000000000E+00.*/
```

3.12.32.2   [:SOURce[<n>]]:VOLTage:COUPle:MODE

Syntax

[:SOURce[<*n*>]]:VOLTage:COUPle:MODE <*mode*>

[:SOURce[<*n*>]]:VOLTage:COUPle:MODE?

Description

Sets or queries the type of the amplitude range coupling mode for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<mode>	Discrete	{OFFSet|RATio}	OFFSet

Remarks

- The amplitude range coupling mode can be set to the following:

  - **OFFSet:** amplitude range offset mode. You can use
    [:SOURce[<n>]]:VOLTage:COUPle:OFFSet to set the amplitude range offset
    of the coupled channel.

  - **RATio:** amplitude range ratio mode. You can use
    [:SOURce[<n>]]:VOLTage:COUPle:RATio to set the amplitude range ratio of
    the coupled channel.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the
  output type is set to single-ended, the range is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns OFFS or RAT.

Examples

```
:SOURce1:VOLTage:COUPle:MODE OFFSet /*Sets the type of the
amplitude range coupling mode to amplitude range offset for CH1.*/
:SOURce1:VOLTage:COUPle:MODE /*Queries the type of the amplitude
range coupling mode for CH1. The query returns OFFS.*/
```

3.12.32.3   [:SOURce[<n>]]:VOLTage:COUPle:OFFSet

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:COUPle:OFFSet** <*voltage*>

[:**SOURce**[<*n*>]]:**VOLTage:COUPle:OFFSet?**

Description

Sets or queries the amplitude range offset of the amplitude range coupling for the
specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<voltage>	Real	-39.996 Vpp to +39.996 Vpp (AMP) -3.2 Vpp to +3.2 Vpp (HBW)	0 Vpp

Name	Type	Range	Default
		-19.998 Vpp to +19.998 Vpp (SND)	

Remarks

- In various output states, the amplitude range offset is converted and set according to the Vpp value (<voltage>) in the HighZ state. Since the impedance is fixed at 50 Ω for AMP and HBW outputs, the actual displayed offset value is half of the offset setting value.

- When modifying the offset, if the channel parameters exceed the limits after coupling calculation, the generator will automatically adjust the waveform parameters of the benchmark channel to avoid parameter overlimit. If the adjusted waveform parameters will still exceed the limit, then this offset is not allowed.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the amplitude range offset in scientific notation. For example, the query might return +5.000000000000000E+00, indicating that the amplitude range offset is 5 Vpp.

Examples

```
:SOURce1:VOLTage:COUPle:OFFSet 5 /*Sets the amplitude range offset
of the amplitude range coupling to 5 Vpp for CH1.*/
:SOURce1:VOLTage:COUPle:OFFSet? /*Queries the amplitude range
offset of the amplitude range coupling for CH1. The query returns
+5.000000000000000E+00.*/
```

3.12.32.4   [:SOURce[<n>]]:VOLTage:COUPle:RATio

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:COUPle:RATio** <*ratio*>

[:**SOURce**[<*n*>]]:**VOLTage:COUPle:RATio?**

Description

Sets or queries the amplitude range ratio of the amplitude range coupling for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<ratio>	Real	0.001 to 1000 (AMP/SND)	1

Name	Type	Range	Default
		0.2 to 5 (HBW)	

Remarks

* When modifying the ratio, if the channel parameters exceed the limits after coupling calculation, the generator will automatically adjust the waveform parameters of the benchmark channel to avoid parameter overlimit. If the adjusted waveform parameters will still exceed the limit, then this ratio is not allowed.

* When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the amplitude range ratio in scientific notation. For example, the query might return +2.000000000000000E+00, indicating that the ratio is 2.

Examples

```
:SOURce1:VOLTage:COUPle:RATio 2 /*Sets the amplitude range ratio
of the amplitude range coupling to 2 for CH1.*/
:SOURce1:VOLTage:COUPle:RATio? /*Queries the amplitude range ratio
of the amplitude range coupling for CH1. The query returns
+2.000000000000000E+00.*/
```

3.12.32.5   [:SOURce[<n>]]:VOLTage:COUPle[:STATe]

Syntax

[:SOURce[<n>]]:VOLTage:COUPle[:STATe] <bool>

[:SOURce[<n>]]:VOLTage:COUPle[:STATe]?

Description

Sets or queries the on/off status of the amplitude range coupling function for the specified channel.

Parameter

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

Remarks

* When the Coupling function is enabled, if parameter overlimit occurs due to waveform switching or parameter adjustments, the system automatically turns

off the corresponding coupling switch. When the Coupling function is disabled, it cannot be enabled if the coupling parameter exceeds the limit.

- The Coupling function can be enabled only when the channel is added to the Bundled Channels (*:SYNChro:BUNDle*) and is not used as the benchmark channel (*:SYNChro:BENChmark*).

- The amplitude range coupling function is available only when the output modes of the benchmark channel and the target channel are set to Continuous and the output waveform is set to Sine, Square, Ramp, Noise, or Arb.

- When the Track function is enabled, the Coupling function of the channel is disabled. After the Coupling function is enabled, the channel cannot be used as the target channel for the channel copy function.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns 0 or 1.

Examples

```
:SOURce1:VOLTage:COUPle:STATe ON /*Enables the amplitude range
coupling function for CH1.*/
:SOURce1:VOLTage:COUPle:STATe? /*Queries the on/off status of the
amplitude range coupling function. The query returns 1.*/
```

3.12.32.6 [:SOURce[<n>]]:VOLTage:HIGH

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:HIGH** {<*voltage*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**VOLTage:HIGH?** [<*lim_query*>]

Description

Sets or queries the high level for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<voltage>	Real	Refer to *Remarks*	1.25 V
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- High level setting is not available for differential output types.

- Define the amplitude upper/lower limit to Vpp_{max}/Vpp_{min}. The range of the high level should conform to the following restrictions:

  |High Level| ≤ Vpp_{max}/2, and Vpp_{min} ≤ (High Level - Low Level) ≤ Vpp_{max}

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the high level in scientific notation. For example, the query might return +2.000000000000000E+00, indicating that the high level is 2 V.

Examples

```
:SOURce1:VOLTage:HIGH 2 /*Sets the high level to 2 V for CH1.*/
:SOURce1:VOLTage:HIGH? /*Queries the high level for CH1. The query
returns +2.000000000000000E+00.*/
```

3.12.32.7   [:SOURce[<n>]]:VOLTage:LOW

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:LOW** {<*voltage*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**VOLTage:LOW?** [<*lim_query*>]

Description

Sets or queries the low level for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<voltage>	Real	Refer to *Remarks*	-1.25 V
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- Low level setting is not available for differential output types.

- Define the amplitude upper/lower limit to Vpp_{max}/Vpp_{min}. The range of the low level should conform to the following restrictions:

  |Low Level| ≤ Vpp_{max}/2, and Vpp_{min} ≤ (High Level - Low Level) ≤ Vpp_{max}

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the low level in scientific notation. For example, the query might return -1.000000000000000E+00, indicating that the low level is -1 V.

Examples

```
:SOURce1:VOLTage:LOW -1 /*Sets the low level to -1 V for CH1.*/
:SOURce1:VOLTage:LOW? /*Queries the low level for CH1. The query
returns -1.000000000000000E+00.*/
```

3.12.32.8   [:SOURce[<n>]]:VOLTage:OFFSet

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:OFFSet** {<*voltage*>|<*lim_set*>}

[:**SOURce**[<*n*>]]:**VOLTage:OFFSet?** [<*lim_query*>]

Description

Sets or queries the offset voltage for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<voltage>	Real	Refer to *Remarks*	0 Vdc
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

- The range of <voltage> is affected by the amplitude range setting. In SND output, |Offset|*2 plus the current amplitude range cannot exceed the upper limit of the amplitude range (*Table 3.61 SND Output Amplitude Range*). In AMP output, |Offset|*2 plus the current amplitude range cannot exceed the amplitude range (*Table 3.62 AMP Output Amplitude Range (Load)*). In HBW output, the offset ranges from -200 mVdc to 200 mVdc.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns the offset voltage in scientific notation. For example, the query might return +5.000000000000000E-01, indicating that the offset value is 0.5 Vdc.

Examples

```
:SOURce1:VOLTage:OFFSet 0.5 /*Sets the offset voltage to 0.5 Vdc
for CH1.*/
:SOURce1:VOLTage:OFFSet? /*Queries the offset voltage for CH1. The
query returns +5.000000000000000E-01.*/
```

3.12.32.9   [:SOURce[<n>]]:VOLTage:UNIT

Syntax

[:**SOURce**[<*n*>]]:**VOLTage:UNIT** <*unit*>

[:**SOURce**[<*n*>]]:**VOLTage:UNIT?**

Description

Sets or queries the amplitude unit for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<unit>	Discrete	{VPP|VRMS|DBM}	VPP

Remarks

- VPP: indicates the signal peak-to-peak voltage (Vpp); VRMS: indicates the root-mean-square voltage (Vrms); DBM: expresses the absolute power level (dBm). dBm is not available when the output impedance is set to HighZ.

- When [:SOURce[<n>]] or [<n>] is omitted, it is interpreted as CH1. When the output type is set to single-ended, the range is {1|2|3|4|5|6|7|8}.

Return Format

The query returns VPP, VRMS, or DBM.

Examples

```
:SOURce1:VOLTage:UNIT VPP /*Sets the amplitude unit to Vpp for
CH1.*/
:SOURce1:VOLTage:UNIT? /*Queries the amplitude unit for CH1. The
query returns VPP.*/
```

3.13   :SYSTem Commands

:SYSTem commands are used to set or query system parameters.

3.13.1 :SYSTem:BEEPer[:IMMediate]

Syntax

`:SYSTem:BEEPer[:IMMediate]`

Description

Issues a single beep immediately.

Parameter

None.

Remarks

This command is valid regardless of the beeper on/off state. This command issues a beep immediately even though the beeper is turned off.

Return Format

None.

Examples

`:SYSTem:BEEPer:IMMediate /*Issues a single beep immediately.*/`

3.13.2 :SYSTem:BEEPer:STATe

Syntax

`:SYSTem:BEEPer:STATe <state>`

`:SYSTem:BEEPer:STATe?`

Description

Sets or queries the on/off status of the beeper.

Parameter

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

Remarks

None.

Return Format

The query returns 1 or 0.

Examples

```
:SYSTem:BEEPer:STATe ON /*Enables the beeper.*/
:SYSTem:BEEPer:STATe? /*Queries the on/off status of the beeper.
The query returns 1.*/
```

3.13.3   :SYSTem:COMMunicate

3.13.3.1   :SYSTem:COMMunicate:LAN:AUToip[:STATe]

Syntax

:SYSTem:COMMunicate:LAN:AUToip[:STATe] <*bool*>

:SYSTem:COMMunicate:LAN:AUToip[:STATe]?

Description

Sets or queries the on/off status of the Auto IP mode.

Parameter

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

Remarks

- Before using the LAN interface, use the network cable to connect the instrument to the PC or the local area network (LAN) where the PC resides.

- In "Auto IP" mode, the instrument will acquire the IP address ranging from "169.254.0.1" to "169.254.255.254" and the subnet mask (255.255.0.0) automatically based on the current network configuration.

- This instrument provides three IP configuration types: DHCP, Auto IP, and Static IP. When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is "DHCP", "Auto IP", and "Static IP". Therefore, to enable the Auto IP mode, DHCP (*:SYSTem:COMMunicate:LAN:DHCP[:STATe]*) should be disabled.

- The three IP configuration types cannot be all turned off at the same time.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns 0 or 1.

Examples

```
:SYSTem:COMMunicate:LAN:AUToip:STATe ON /*Enables the Auto IP
mode.*/
```

```
:SYSTem:COMMunicate:LAN:AUToip:STATe? /*Queries the on/off status
of the Auto IP mode. The query returns 1.*/
```

3.13.3.2   :SYSTem:COMMunicate:LAN:CONTrol?

Syntax

`:SYSTem:COMMunicate:LAN:CONTrol?`

Description

Reads the port number of the initial control connecting port for socket communication.

Parameter

None.

Remarks

None.

Return Format

The query returns the port number; if the interface does not support the socket, it returns 0.

Examples

```
:SYSTem:COMMunicate:LAN:CONTrol? /*Reads the port number of the
initial control connecting port for socket communication. The
query returns 5000.*/
```

3.13.3.3   :SYSTem:COMMunicate:LAN:DHCP[:STATe]

Syntax

`:SYSTem:COMMunicate:LAN:DHCP[:STATe] <bool>`

`:SYSTem:COMMunicate:LAN:DHCP[:STATe]?`

Description

Sets or queries the on/off status of the DHCP mode.

Parameter

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

Remarks

•   In DHCP mode, it automatically assigns an IP address to the instrument from a DHCP server.

- When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is "DHCP", "Auto IP", and "Static IP".

- The three IP configuration types cannot be all turned off at the same time.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns 0 or 1.

Examples

```
:SYSTem:COMMunicate:LAN:DHCP:STATe ON /*Enables the DHCP mode.*/
:SYSTem:COMMunicate:LAN:DHCP:STATe? /*Queries the on/off status of
the DHCP mode. The query returns 1.*/
```

3.13.3.4   :SYSTem:COMMunicate:LAN:DNS

Syntax

:SYSTem:COMMunicate:LAN:DNS <*dns*>

:SYSTem:COMMunicate:LAN:DNS?

Description

Sets or queries the domain name server (DNS) address.

Parameter

Name	Type	Range	Default
<dns>	ASCII string	Refer to *Remarks*	-

Remarks

- The format of <dns> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (excluding 127), and the other three range from 0 to 255.

- You are recommended to ask your network administrator for an address available.

- When Static IP mode is enabled with both DHCP and Auto IP disabled, the DNS address is used.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns the DNS address, for example, 172.16.3.2.

Examples

```
:SYSTem:COMMunicate:LAN:DNS 172.16.3.2 /*Sets the DNS address to
172.16.3.2.*/
:SYSTem:COMMunicate:LAN:DNS? /*Queries the current DNS address.
The query returns 172.16.3.2.*/
```

3.13.3.5   :SYSTem:COMMunicate:LAN:DOMain?

Syntax

:SYSTem:COMMunicate:LAN:DOMain?

Description

Queries the domain name.

Parameter

None.

Remarks

None.

Return Format

The query returns a string.

Examples

```
:SYSTem:COMMunicate:LAN:DOMain? /*Queries the domain name. The
query returns YYYrigollan.*/
```

3.13.3.6   :SYSTem:COMMunicate:LAN:GATeway

Syntax

:SYSTem:COMMunicate:LAN:GATeway <*gateway*>

:SYSTem:COMMunicate:LAN:GATeway?

Description

Sets or queries the default gateway.

Parameter

Name	Type	Range	Default
<gateway>	ASCII string	Refer to *Remarks*	-

Remarks

- The format of <gateway> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (excluding 127), and the other three range from 0 to 255.

- You are recommended to ask your network administrator for a gateway available.

- When Static IP mode is enabled with both DHCP and Auto IP disabled, this default gateway is used.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns a string, for example, 172.16.3.1.

Examples

```
:SYSTem:COMMunicate:LAN:GATeway 172.16.3.1 /*Sets the default
gateway to 172.16.3.1.*/
:SYSTem:COMMunicate:LAN:GATeway? /*Queries the current default
gateway. The query returns 172.16.3.1.*/
```

3.13.3.7   :SYSTem:COMMunicate:LAN:HOSTname

Syntax

:SYSTem:COMMunicate:LAN:HOSTname <*name*>

:SYSTem:COMMunicate:LAN:HOSTname?

Description

Sets or queries the hostname.

Parameter

Name	Type	Range	Default
<name>	ASCII string	Refer to *Remarks*	-

Remarks

The parameter <name> is the specified hostname with a maximum length of 28 characters. The name must start with the letter from A to Z. It can contain letters, numbers (0-9), and hyphens (-).

Return Format

The query returns a string.

Examples

```
:SYSTem:COMMunicate:LAN:HOSTname RIGOL123 /*Sets the hostname to
RIGOL123.*/
:SYSTem:COMMunicate:LAN:HOSTname? /*Queries the hostname. The
query returns RIGOL123.*/
```

EN

3.13.3.8 :SYSTem:COMMunicate:LAN:IPADdress

Syntax

`:SYSTem:COMMunicate:LAN:IPADdress <`*ip*`>`

`:SYSTem:COMMunicate:LAN:IPADdress?`

Description

Sets or queries the IP address.

Parameter

Name	Type	Range	Default
<ip>	ASCII string	Refer to *Remarks*	-

Remarks

- The format of <ip> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (excluding 127), and the other three range from 0 to 255.

- You are recommended to ask your network administrator for an address available.

- When Static IP mode is enabled with both DHCP and Auto IP disabled, the IP address is used.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns the IP address, for example, 172.16.3.128.

Examples

```
:SYSTem:COMMunicate:LAN:IPADdress 172.16.3.128 /*Sets the IP
address to 172.16.3.128.*/
:SYSTem:COMMunicate:LAN:IPADdress? /*Queries the current IP
address. The query returns 172.16.3.128.*/
```

3.13.3.9 :SYSTem:COMMunicate:LAN:MAC?

Syntax

`:SYSTem:COMMunicate:LAN:MAC?`

Description

Queries the MAC address.

Parameter

None.

Remarks

A MAC (Media Access Control) address, also referred to as a hardware address, is used to identify the network device address. For each instrument, the MAC address is unique. When assigning the IP address for the instrument, the system uses the MAC address to identify the instrument. The MAC address (48 bits, namely 6 bytes) is usually expressed in hexadecimal format, such as 00:2A:A0:AA:E0:56.

Return Format

The query returns the MAC address, for example, 00:2A:A0:AA:E0:56.

Examples

```
:SYSTem:COMMunicate:LAN:MAC? /*Queries the MAC address. The query
returns 00:2A:A0:AA:E0:56.*/
```

3.13.3.10   :SYSTem:COMMunicate:LAN:SMASk

Syntax

`:SYSTem:COMMunicate:LAN:SMASk <`*submask*`>`

`:SYSTem:COMMunicate:LAN:SMASk?`

Description

Sets or queries the subnet mask.

Parameter

Name	Type	Range	Default
<submask>	ASCII string	Refer to *Remarks*	-

Remarks

- The format of <submask> is nnn.nnn.nnn.nnn.; wherein, the range of "nnn" is from 0 to 255.

- You are recommended to ask your network administrator for a subnet mask available.

- When Static IP mode is enabled with both DHCP and Auto IP disabled, the subnet mask is used.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns the subnet mask, such as 255.255.255.0.

Examples

```
:SYSTem:COMMunicate:LAN:SMASk 255.255.255.0 /*Sets the subnet mask
to 255.255.255.0.*/
:SYSTem:COMMunicate:LAN:SMASk? /*Queries the current subnet mask.
The query returns 255.255.255.0.*/
```

3.13.3.11   :SYSTem:COMMunicate:LAN:STATic[:STATe]

Syntax

:SYSTem:COMMunicate:LAN:STATic[:STATe] <*bool*>

:SYSTem:COMMunicate:LAN:STATic[:STATe]?

Description

Sets or queries the on/off status of the Static IP mode.

Parameter

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

Remarks

- In Static IP mode, you can self-define the network parameters (e.g. IP address) of the instrument.

- When the three IP configuration types are all turned on, the priority of the parameter configuration from high to low is "DHCP", "Auto IP", and "Static IP". Therefore, to enable the Static IP mode, you should disable the DHCP (*:SYSTem:COMMunicate:LAN:DHCP[:STATe]*) and Auto IP (*:SYSTem:COMMunicate:LAN:AUToip[:STATe]*).

- The three IP configuration types cannot be all turned off at the same time.

- After sending this command, execute *:SYSTem:COMMunicate:LAN:UPDate* to apply the current network setting for the new parameters to take effect.

Return Format

The query returns 0 or 1.

Examples

```
:SYSTem:COMMunicate:LAN:STATic:STATe ON /*Enables the Static IP
mode.*/
:SYSTem:COMMunicate:LAN:STATic:STATe? /*Queries the on/off status
of the Static IP mode. The query returns 1.*/
```

3.13.3.12   :SYSTem:COMMunicate:LAN:UPDate

Syntax

`:SYSTem:COMMunicate:LAN:UPDate`

Description

Stores all the modifications of the LAN setting to the non-volatile memory and restarts the LAN drive program using the updated setting.

Parameter

None.

Remarks

- You must send this command after modifying the DHCP, DNS, gateway, IP address, and subnet mask settings.

- Complete all the LAN settings before sending this command.

Return Format

None.

Examples

```
:SYSTem:COMMunicate:LAN:UPDate /*Stores all the modifications of
the LAN setting to the non-volatile memory and restarts the LAN
drive program using the updated setting.*/
```

3.13.3.13   :SYSTem:COMMunicate:USB:INFormation?

Syntax

`:SYSTem:COMMunicate:USB:INFormation?`

Description

Queries the instrument's USB information.

Parameter

None.

Remarks

None.

Return Format

The query returns a string, for example,
USB0::0x1AB1::0x052::DG60000000001::INSTR.

Examples

```
:SYSTem:COMMunicate:USB:INFormation? /*Queries the instrument's
USB information. The query returns
USB0::0x1AB1::0x052::DG60000000001::INSTR.*/
```

3.13.4 :SYSTem:DATE

Syntax

:SYSTem:DATE *<yyyy>,<mm>,<dd>*

:SYSTem:DATE?

Description

Sets or queries the system date.

Parameter

Name	Type	Range	Default
<yyyy>	Integer	1970 to 2037	-
<mm>	Integer	01 to 12	-
<dd>	Integer	01 to 31 (28, 29, or 30)	-

Remarks

None.

Return Format

The query returns the system date in character string. The year, month, and day are separated by "-".

Examples

```
:SYSTem:DATE 2022,05,01 /*Sets the system date to May 1, 2022.*/
:SYSTem:DATE? /*Queries the system date. The query returns
2022-05-01.*/
```

3.13.5 :SYSTem:ERRor?

Syntax

:SYSTem:ERRor?

Description

Queries and clears an error message in the error queue.

Parameter

None.

Remarks

When you read the error queue, the error will be cleared. You can also clear the error queue by using *CLS* or turning on/off the instrument.

Return Format

The query returns a string consisting of two parts separated by commas. The first part is the number of the error message and the second part is the content of the error message; wherein, the content is a string enclosed in double quotation marks. For example, the query might return -109,"Missing parameter"; wherein, -109 is the number of the error message and Missing parameter (the content enclosed in the double quotation marks) is the content of the error message.

Examples

```
:SYSTem:ERRor? /*Queries and clears an error message in the error
queue. The query returns -109,"Missing parameter".*/
```

3.13.6   :SYSTem:KLOCk

Syntax

:SYSTem:KLOCk <*bool*>

:SYSTem:KLOCk?

Description

Sets or queries the status (locked or unlocked) of all front-panel keys.

Parameter

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

Remarks

- This instrument allows you to lock all knobs and keys on the front panel to avoid danger due to misoperation.

- <bool> is used to lock or unlock the keys. ON or 1 indicates locking all the keys; OFF or 0 indicates unlocking all the keys.

Return Format

The query returns 0 or 1.

Examples

```
:SYSTem:KLOCk ON /*Locks all front-panel keys.*/
:SYSTem:KLOCk?  /*Queries whether all front-panel keys are locked.
The query returns 1.*/
```

3.13.7 :SYSTem:LANGuage

Syntax

:SYSTem:LANGuage <*language*>

:SYSTem:LANGuage?

Description

Sets or queries the system language.

Parameter

Name	Type	Range	Default
<language>	Discrete	{SCHinese|TCHinese|ENGLish}	-

Remarks

This instrument supports three system languages: Simplified Chinese (SCHinese), Traditional Chinese (TCHinese), and English (ENGLish). The language settings are not affected by factory default settings (*RST).

Return Format

The query returns SCH, TCH, or ENGL.

Examples

```
:SYSTem:LANGuage ENGLish /*Sets the system language to English.*/
:SYSTem:LANGuage? /*Queries the system language. The query returns
ENGL.*/
```

3.13.8 :SYSTem:LICense:CATalog?

Syntax

:SYSTem:LICense:CATalog?

Description

Queries the options currently activated.

Parameter

None.

Remarks

None.

Return Format

The query returns the options currently activated such as 2RL.

Examples

```
:SYSTem:LICense:CATalog? /*Queries the option list. The query
returns 2RL.*/
```

3.13.9 :SYSTem:LICense:DELete

Syntax

:SYSTem:LICense:DELete <*name*>

Description

Deletes the installed option.

Parameter

Name	Type	Range	Default
<name>	Discrete	{2RL}	-

Remarks

2RL: memory depth upgrade option. In differential output, the default memory depth is 256 Mpts/CH which can be upgraded to 512 Mpts/CH with the memory depth upgrade option installed; in single-ended output, the default memory depth is 128 Mpts/CH which can be upgraded to 256 Mpts/CH with the memory depth upgrade option installed.

Return Format

None.

Examples

```
:SYSTem:LICense:DELete 2RL /*Deletes the installed memory depth
upgrade option.*/
```

3.13.10 :SYSTem:LICense:DELete:ALL

Syntax

:SYSTem:LICense:DELete:ALL

Description

Deletes all the installed options.

Parameter

None.

Remarks

None.

Return Format

None.

Examples

```
:SYSTem:LICense:DELete:ALL /*Deletes all the installed options.*/
```

3.13.11   :SYSTem:LICense:INSTall

Syntax

:SYSTem:LICense:INSTall <*license*>

Description

Installs the option using license.

Parameter

Name	Type	Range	Default
<license>	ASCII string	Valid license	-

Remarks

•   To install the option, first purchase the required option to obtain the key, and then use the key to obtain the option license according to the following steps.

  -    Log in to the RIGOL official website (*http://www.rigol.com*), click **SERVICE CENTRE > License Activation** to enter the software license registration interface.

  -    In the software license registration interface, input the correct key, serial number (click or tap 🔧 > **Utility** > **About** to obtain the serial number of the instrument), and verification code. Then click **Generate** to obtain the option license file download link. If you need to use the file, please download it to the USB storage device.

•   The license is a fixed length of strings. Each instrument has a unique license.

Return Format

None.

Examples

```
None.
```

3.13.12   :SYSTem:LICense:INSTall:UDISk

Syntax

:SYSTem:LICense:INSTall:UDISk <*path*>

Description

Installs the option using license file.

Parameter

Name	Type	Range	Default
<path>	ASCII string	Valid directory	-

Remarks

- To install the option, first purchase the required option to obtain the key, and then use the key to obtain the option license according to the following steps.

  - Log in to the RIGOL official website (*http://www.rigol.com*), click **SERVICE CENTRE > License Activation** to enter the software license registration interface.

  - In the software license registration interface, input the correct key, serial number (click or tap > **Utility** > **About** to obtain the serial number of the instrument), and verification code. Then click **Generate** to obtain the option license file download link. If you need to use the file, please download it to the USB storage device.

- <path> is a valid license path which must contain file extension (.lic). For example, it can be set to USB:/rigol/license.lic.

Return Format

None.

Examples

```
:SYSTem:LICense:INSTall:UDISk USB:/rigol/license.lic /*Installs the
option using the "license.lic" file in the "rigol" folder of the
USB storage device.*/
```

3.13.13 :SYSTem:MODE

Syntax

:SYSTem:MODE <*mode*>

:SYSTem:MODE?

Description

Sets or queries the output type.

Parameter

Name	Type	Range	Default
<mode>	Discrete	{SND|HBW|AMP}	AMP

Remarks

- **SND:** single-ended output.
- **HBW:** high-bandwidth differential output.
- **AMP:** high-voltage differential output.

Return Format

The query returns SND, HBW, or AMP.

Examples

```
:SYSTem:MODE SND /*Sets the output type to SND.*/
:SYSTem:MODE? /*Queries the output type. The query returns SND*/
```

3.13.14 :SYSTem:PSTatus

Syntax

:SYSTem:PSTatus <*power*>

:SYSTem:PSTatus?

Description

Sets or queries the power status of the instrument.

Parameter

Name	Type	Range	Default
<power>	Discrete	{DEFault|OPEN}	DEFault

Remarks

- **DEFault:** After the instrument is connected to power, you need to press the front-panel power key to power on the instrument.

- **OPEN:** After the instrument is connected to power, it will be powered on immediately. It saves you from pressing the power key.

Return Format

The query returns DEF or OPEN.

Examples

```
:SYSTem:PSTatus DEFault /*Sets the power status to DEFault.*/
:SYSTem:PSTatus? /*Queries the power status of the instrument. The
query returns DEF.*/
```

3.13.15 :SYSTem:ROSCillator:SOURce

Syntax

`:SYSTem:ROSCillator:SOURce <source>`

`:SYSTem:ROSCillator:SOURce?`

Description

Sets or queries the system clock source.

Parameter

Name	Type	Range	Default
<source>	Discrete	{INTernal|EXTernal}	INTernal

Remarks

- This instrument provides an internal clock source (INTernal) and also accepts the external clock source (EXTernal) from the rear-panel **[10MHZ REF IN]** connector.

- If an external source is selected, the system accepts an external clock source from the rear-panel **[10MHZ REF IN]** connector. If no valid clock source is detected, the instrument will continue to output, but the output frequency is unstable.

Return Format

The query returns INT or EXT.

Examples

```
:SYSTem:ROSCillator:SOURce INTernal /*Sets the system clock source
to internal source.*/
:SYSTem:ROSCillator:SOURce? /*Queries the system clock source. The
query returns INT.*/
```

3.13.16 :SYSTem:TIME

Syntax

`:SYSTem:TIME <hour>,<minute>,<second>`

`:SYSTem:TIME?`

Description

Sets or queries the system time.

Parameter

Name	Type	Range	Default
<hour>	Integer	0 to 23	-

Name	Type	Range	Default
<minute>	Integer	0 to 59	-
<second>	Integer	0 to 59	-

Remarks

There is a certain delay between the returned time value and the set time value due to the command response time and other factors.

Return Format

The query returns the system time in string.

Examples

```
:SYSTem:TIME 16,10,17 /*Sets the system time to 16:10:17.*/
:SYSTem:TIME? /*Queries the system time. The query returns
16:10:17.*/
```

3.13.17 :SYSTem:TOUCh

Syntax

:SYSTem:TOUCh <*bool*>

:SYSTem:TOUCh?

Description

Sets or queries whether the touch screen is enabled.

Parameter

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

Remarks

- 1/ON: enables the touch screen.

- 0/OFF: disables the touch screen.

Return Format

The query returns 0 or 1.

Examples

```
:SYSTem:TOUCh OFF /*Locks the touch screen.*/
:SYSTem:TOUCh? /*Queries whether the touch screen is enabled. The
query returns 0.*/
```

3.13.18 :SYSTem:TRIGger:LEVel

Syntax

:SYSTem:TRIGger:LEVel {<*level*>|<*lim_set*>}

:SYSTem:TRIGger:LEVel? [<*lim_query*>]

Description

Sets or queries the trigger level for an external trigger.

Parameter

Name	Type	Range	Default
<level>	Real	-8 V to 8 V	1.65 V
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

A valid trigger event occurs when the input trigger signal crosses the trigger level from below to above (rising edge trigger) or from above to below (falling edge trigger).

Return Format

The query returns the trigger level in scientific notation. For example, the query may return +2.000000000000000E+00, indicating that the trigger level is 2 V.

Examples

```
:SYSTem:TRIGger:LEVel 2 /*Sets the trigger level for an external
trigger to 2 V.*/
:SYSTem:TRIGger:LEVel? /*Queries the trigger level for an external
trigger. The query returns +2.000000000000000E+00.*/
```

3.13.19 :SYSTem:VERSion?

Syntax

:SYSTem:VERSion?

Description

Queries the version number of the SCPI used by the system.

Parameter

None.

Remarks

None.

Return Format

The query returns a string (SCPI version) in the form of "YYYY.V", where "YYYY" represents the year of the version and "V" represents a version for that year (e.g. 1994.0).

Examples

```
:SYSTem:VERSion? /*Queries the version number of the SCPI used by
the system. It might return 1994.0.*/
```

3.14 :TRIGger Commands

3.14.1 :TRIGger<n>:COUNt

Syntax

`:TRIGger<n>:COUNt {<count>|<lim_set>}`

`:TRIGger<n>:COUNt? [<lim_query>]`

Description

Sets or queries the trigger count for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<count>	Integer	1 to 1000000	1
<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

• Trigger count is used to set the number of cycles of the effective output signals after each trigger event. After the trigger count is complete, the trigger system enters the idle state.

• It is only available for remote mode.

• The trigger count is valid only when *:INITiate[<n>]:CONTinuous* is set to 0|OFF.

• When the output type is set to single-ended, the range of <n> is {1|2|3|4|5|6|7| 8}.

Return Format

The query returns an integer.

Examples

```
:TRIGger1:COUNt 100 /*Sets the trigger count to 100.*/
:TRIGger1:COUNt? /*Queries the trigger count. The query returns
100.*/
```

3.14.2   :TRIGger\<n>:DELay

Syntax

:TRIGger\<n>**:DELay** {\<*seconds*>|\<*lim_set*>}

:TRIGger\<n>**:DELay?** [\<*lim_query*>]

Description

Sets or queries the trigger delay for the specified channel.

Parameter

Name	Type	Range	Default
\<n>	Discrete	{1|2|3|4}	1
\<seconds>	Real	Refer to *Remarks*	0 s
\<lim_set>	Discrete	{MINimum|MAXimum|DEFault}	-
\<lim_query>	Discrete	{MINimum|MAXimum}	-

Remarks

Trigger delay is only available for N-Cycle burst mode. The range of \<seconds> is related to the burst trigger source:

- Manual/external trigger: 0 s to 85 s.

- Internal trigger: 0 s to (T_{burst} - $\lceil T_{wave} \times N_{cycle} \div 6.4$ ns$\rceil \times 6.4$ ns -4 µs)[1], and no greater than 85 s.
    - T_{burst}: burst period
    - T_{wave}: period of basic waveform (e.g. Sine and Square)
    - N_{cycle}: burst count

- When the output type is set to single-ended, the range of \<n> is {1\|2\|3\|4\|5\|6\|7\|8}.

TIP

[1]: $\lceil x \rceil$ indicates that x is rounded up.

Return Format

The query returns the trigger delay in scientific notation. For example, the query might return +1.050000000000000E-01, indicating that the trigger delay is 105 ms.

Examples

```
:TRIGger1:DELay 0.105 /*Sets the trigger delay to 105 ms for CH1.*/
:TRIGger1:DELay? /*Queries the trigger delay for CH1. The query
returns +1.050000000000000E-01.*/
```

3.14.3 :TRIGger<n>[:IMMediate]

Syntax

:TRIGger<*n*>[:IMMediate]

Description

Generates a trigger event in the specified channel.

Parameter

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

Remarks

- This command is only available for the Burst mode (*[:SOURce[<n>]]:BURSt:STATe*), the Sweep mode (*[:SOURce[<n>]]:SWEep:STATe*), the Advanced-Sequence mode (*[:SOURce[<n>]]:FUNCtion:ADVance:SEQuence:STATe*), and Advanced-Multi-pulse mode (*[:SOURce[<n>]]:FUNCtion:ADVance:MPULse:STATe*) using manual trigger (*:TRIGger<n>:SOURce*).

- If the output of the corresponding channel is not enabled, the trigger will be ignored.

- When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

None.

Examples

```
:TRIGger1:IMMediate /*Generates a trigger event in CH1.*/
```

3.14.4 :TRIGger<n>:SLOPe

Syntax

:TRIGger<*n*>:SLOPe <*slope*>

:TRIGger<*n*>:SLOPe?

Description

Sets or queries the edge type of the external trigger signal for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<slope>	Discrete	{POSitive|NEGative}	POSitive

Remarks

- This command is only available for the external trigger (*:TRIGger<n>:SOURce*) of the Burst mode (*[:SOURce[<n>]]:BURSt:STATe*) and Sweep mode (*[:SOURce[<n>]]:SWEep:STATe*). When the external trigger is selected, the instrument receives the trigger signal from the rear-panel **[AUX IN]** connector. A burst or sweep is generated each time a TTL pulse with the specified polarity is received.

- The edge of the input signal can be set to leading edge (POSitive) or trailing edge (NEGative).

- When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns POS or NEG.

Examples

```
:TRIGger1:SLOPe NEGative /*Sets the edge type of the trigger input
signal to trailing edge for CH1.*/
:TRIGger1:SLOPe? /*Queries the edge type of the trigger input
signal for CH1. The query returns NEG.*/
```

3.14.5   :TRIGger<n>:SOURce

Syntax

:TRIGger<*n*>:SOURce <*source*>

:TRIGger<*n*>:SOURce?

Description

Sets or queries the trigger type for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<source>	Discrete	{IMMediate|EXTernal|BUS|TIMer}	IMMediate

Description

- This command is only available for the Burst mode or Sweep mode.

- **IMMediate:** immediate trigger. The frequency of N-Cycle bursts is determined by the "Burst Period" (*[:SOURce[<n>]]:BURSt:INTernal:PERiod*). The trigger period of the sweep waveforms is determined by the specified sweep time (*[:SOURce[<n>]]:SWEep:TIME*), return time (*[:SOURce[<n>]]:SWEep:RTIMe*), start hold time (*[:SOURce[<n>]]:SWEep:HTIMe:STARt*), and stop hold time (*[:SOURce[<n>]]:SWEep:HTIMe[:STOP]*).

- **EXTernal:** external trigger. The instrument receives the trigger signal from the rear-panel **[AUX IN]** connector. A burst or sweep output is generated each time a TTL pulse with the specified polarity is received. You can specify the edge type (*:TRIGger<n>:SLOPe*) for trigger input signal.

- **BUS:** manual/bus trigger. You can initiate a burst or sweep output immediately in all channels with **TRG* command or in the corresponding channel with *:TRIGger[<n>][:IMMediate]* command. If the channel output is not enabled, the trigger will be ignored.

- **TIMer:** timer trigger. In Burst mode, the trigger event is determined by the timer (*:TRIGger<n>:TIMer*). The trigger occurs when the instrument is in the waiting-for-trigger state. It is only available for remote mode.

- When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns IMM, EXT, TIM, or BUS.

Examples

```
:TRIGger2:SOURce EXTernal /*Sets the trigger source to external for
CH2.*/
:TRIGger2:SOURce? /*Queries the trigger source for CH2. The query
returns EXT.*/
```

3.14.6   :TRIGger<n>:TIMer

Syntax

:TRIGger<*n*>**:TIMer** {<*timer*>|<*lim*>}

:TRIGger<*n*>**:TIMer?** [<*lim*>]

Description

Sets or queries the trigger timer for the specified channel.

Parameter

Name	Type	Range	Default
<n>	Discrete	{1|2|3|4}	1
<timer>	Real	1 µs to 8000 s	-
<lim>	Discrete	{MINimum|MAXimum}	-

Remarks

- This command is available only when the trigger type is set to timer trigger (*:TRIGger<n>:SOURce*) for the specified channel.

- The timer starts only in waiting-for-trigger state. The trigger is generated only when the timer is complete.

- When the output type is set to single-ended, the range of <n> is {1\|2\|3\|4\|5\|6\|7\|8}.

Return Format

The query returns the trigger timer in scientific notation. For example, the query might return +1.000000000000000E+00, indicating that the trigger timer is 1 s.

Examples

```
:TRIGger1:TIMer 1 /*Sets the trigger timer to 1 s for CH1.*/
:TRIGger1:TIMer? /*Queries the trigger timer for CH1. The query
returns +1.000000000000000E+00.*/
```

4 Application Examples

This chapter provides application examples of the SCPI commands. You can use a series of SCPI commands to realize the main functions of the instrument.

NOTE

1. The ranges of some parameters may differ for different instrument models. Therefore, you need to adjust the parameter range for the specified model.

2. Before using the examples in this chapter, make the correct connections using USB or LAN. In addition, you have to install the PC software for sending commands on your PC.

3. The content enclosed in "/*" and "*/" after each command in the examples of this chapter is the annotation for easier understanding and is not a part of the command.

4.1 To Output Basic Waveforms

Requirements

Use the SCPI commands to realize the following functions:

Output a sine wave (500 Hz frequency, 2.5 Vpp amplitude range, 1 Vdc offset, and 90° start phase) from the CH1 output connector on the front panel.

Method 1

```
*IDN? /*Queries the ID string of the signal generator to check
whether the remote communication is normal.*/
:SOURce1:APPLy:SINusoid 500,2.5,1,90 /*Sets the CH1 waveform to
sine wave with 500 Hz frequency, 2.5 Vpp amplitude range, 1 Vdc
offset, and 90° start phase.*/
:OUTPut1:STATe ON /*Enables the output of CH1.*/
```

Method 2

```
*IDN? /*Queries the ID string of the signal generator to check
whether the remote communication is normal.*/
:SOURce1:FUNCtion SINusoid /*Sets the CH1 waveform to sine wave.*/
:SOURce1:FREQuency 500 /*Sets the frequency to 500 Hz for CH1.*/
:SOURce1:VOLTage 2.5 /*Sets the amplitude range to 2.5 Vpp for
CH1.*/
:SOURce1:VOLTage:OFFSet 1 /*Sets the offset to 1 Vdc for CH1.*/
:SOURce1:PHASe 90 /*Sets the start phase to 90° for CH1.*/
:OUTPut1:STATe ON /*Enables the output of CH1.*/
```

4.2 To Output Arbitrary Waveforms

Requirements

Use the SCPI commands to realize the following functions:

Output an arbitrary waveform (100 Hz frequency, 1 Vpp amplitude range, 2 Vdc offset, and 3° start phase) from the CH1 output connector on the front panel.

Method

```
*IDN? /*Queries the ID string of the signal generator to check
whether the remote communication is normal.*/
:SOURce1:APPLy:ARBitrary 100,1,2,3 /*Sets the CH1 waveform to an
arbitrary wave with 100 Hz frequency, 1 Vpp amplitude range, 2 Vdc
offset, and 3° start phase.*/
:OUTPut1 ON /*Enables the output of CH1.*/
```

4.3 To Output Harmonic

Requirements

Use the SCPI commands to realize the following functions:

Output harmonic waveform from the front-panel output connector of CH1; the
fundamental waveform parameters are 1 kHz frequency, 5 Vpp amplitude range, 0
Vdc offset, and 0° start phase; output 2nd order harmonic (2 Vpp amplitude range,
30° phase) and 4th order harmonic (1 Vpp amplitude range, 50° phase).

Method

```
*IDN? /*Queries the ID string of the signal generator to test
whether the remote communication works normally.*/
:SOURce1:FUNCtion HARMonic /*Enables the Harmonic function for
CH1.*/
:SOURce1:FREQuency 1000 /*Sets the fundamental frequency to 1 kHz.*/
:SOURce1:VOLTage 5 /*Sets the fundamental amplitude range to 5 Vpp
for CH1.*/
:SOURce1:VOLTage:OFFSet 0 /*Sets the offset to 0 Vdc for CH1.*/
:SOURce1:PHASe 0 /*Sets the start phase to 0° for CH1.*/
:SOURce1:HARMonic:TYPE COMBine /*Sets the harmonic type to Combine
for CH1.*/
:SOURce1:HARMonic:COMBine X1010000000000000000 /*Sets the combine
harmonic to 2nd order harmonic and 4th order harmonic.*/
:SOURce1:HARMonic:COMBine:AMPLitude 2,2 /*Sets the amplitude range
to 2 Vpp for 2nd order harmonic.*/
:SOURce1:HARMonic:COMBine:PHASe 2,30 /*Sets the phase to 30° for
2nd order harmonic.*/
:SOURce1:HARMonic:COMBine:AMPLitude 4,1 /*Sets the amplitude range
to 1 Vpp for 4th order harmonic.*/
:SOURce1:HARMonic:COMBine:PHASe 4,50 /*Sets the phase to 50° for
4th order harmonic.*/
:OUTPut1 ON /*Enables the output of CH1.*/
```

4.4 To Output AM Modulated Waveform

Requirements

Use the SCPI commands to realize the following functions:

Output AM modulated waveform from the front-panel output connector of CH1; set
the carrier waveform to Sine (1 kHz frequency, 5 Vpp amplitude range, 0 Vdc offset
voltage, and 0° start phase); select internal modulation source; set the modulating
waveform to Sine, the modulation depth to 80%, and the modulation frequency to
200 Hz; enable the DSSC function.

Method

```
*IDN? /*Queries the ID string of the signal generator to test
whether the remote communication works normally.*/
:SOURce1:APPLy:SINusoid 1000,5,0,0 /*Sets the waveform of CH1 to
Sine with 1kHz frequency, 5 Vpp amplitude range, 0 Vdc offset, and
0° start phase.*/
:SOURce1:AM:STATe ON /*Enables the AM function for CH1.*/
:SOURce1:AM:SOURce INTernal /*Sets the AM modulation source to
internal modulation source for CH1.*/
:SOURce1:AM:INTernal:FUNCtion SINusoid /*Sets the AM modulation
waveform to Sine for CH1.*/
:SOURce1:AM:DEPTh 80 /*Sets the AM modulation depth to 80% for
CH1.*/
:SOURce1:AM:INTernal:FREQuency 200 /*Sets the AM modulation
frequency to 200 Hz for CH1.*/
:SOURce1:AM:DSSC ON /*Enables the AM DSSC function.*/
:OUTPut1 ON /*Enables the output of CH1.*/
```

4.5   To Output FSK Modulated Waveform

Requirements

Use the SCPI commands to realize the following functions:

Output FSK modulated waveform from the front-panel output connector of CH1; set
the carrier waveform to Sine (1 kHz frequency, 5 Vpp amplitude range, 0 Vdc offset
voltage, and 0° start phase); select external modulation source; set the hop frequency
to 2 kHz and the polarity to Positive.

Method

```
*IDN? /*Queries the ID string of the signal generator to test
whether the remote communication works normally.*/
:SOURce1:APPLy:SINusoid 1000,5,0,0 /*Sets the waveform of CH1 to
Sine with 1 kHz frequency, 5 Vpp amplitude range, 0 Vdc offset, and
0° start phase.*/
:SOURce1:FSKey:STATe ON /*Enables the FSK function for CH1.*/
:SOURce1:FSKey:SOURce EXTernal /*Sets the FSK modulation source to
external modulation source for CH1.*/
:SOURce1:FSKey:FREQuency 2000 /*Sets the FSK hop frequency to 2 kHz
for CH1.*/
:SOURce1:FSKey:POLarity POSitive /*Sets the FSK modulation polarity
to Positive for CH1.*/
:OUTPut1 ON /*Enables the output of CH1.*/
```

4.6   To Output a Frequency Sweep

Requirements

Use the SCPI commands to realize the following functions:

Output a sweep waveform from the front-panel output connector of CH1; set the
sweep waveform to Sine (5 Vpp amplitude range, 0 Vdc offset), the sweep type to
Linear, the sweep time to 3 s, the return time to 0.1 s, the start frequency to 100 Hz,
and the stop frequency to 1 kHz; enable the frequency mark function and set the
mark frequency to 500 Hz, the start hold time to 0.1 s, the stop hold to 0.1 s, the

trigger source to manual, and the edge type of the trigger output signal to leading edge.

Method

```
*IDN? /*Queries the ID string of the signal generator to test
whether the remote communication works normally.*/
:SOURce1:FUNCtion SINusoid /*Sets the waveform to Sine for CH1.*/
:SOURce1:VOLTage 5 /*Sets the waveform amplitude range to 5 Vpp for
CH1.*/
:SOURce1:VOLTage:OFFSet 0 /*Sets the offset to 0 Vdc for CH1.*/
:SOURce1:SWEep:STATe ON /*Enables the Sweep function for CH1.*/
:SOURce1:SWEep:SPACing LINear /*Sets the sweep type to linear sweep
for CH1.*/
:SOURce1:SWEep:TIME 3 /*Sets the sweep time to 3 s for CH1.*/
:SOURce1:SWEep:RTIMe 0.1 /*Sets the return time of the Sweep
function to 0.1 s for CH1.*/
:SOURce1:FREQuency:STARt 100 /*Sets the start frequency of the
Sweep function to 100 Hz for CH1.*/
:SOURce1:FREQuency:STOP 1000 /*Sets the stop frequency of the Sweep
function to 1 kHz for CH1.*/
:OUTPut1:SYNC:MODE MARKer /*Enables the mark frequency function for
CH1.*/
:SOURce1:MARKer:FREQuency 500 /*Sets the mark frequency to 500 Hz
for CH1.*/
:SOURce1:SWEep:HTIMe:STARt 0.1 /*Sets the start hold time to 0.1 s
for CH1.*/
:SOURce1:SWEep:HTIMe:STOP 0.1 /*Sets the stop hold time to 0.1 s
for CH1.*/
:TRIGger1:SOURce BUS /*Sets the sweep trigger source to manual for
CH1.*/
:OUTPut1:TRIGger ON /*Enables the trigger output for CH1.*/
:OUTPut1:TRIGger:SLOPe POSitive /*Sets the edge of the trigger
output signal to leading edge for CH1.*/
:OUTPut1 ON /*Enables the output of CH1.*/
:TRIGger1:IMMediate /*Triggers a sweep immediately in CH1.*/
```

4.7 To Output a Burst Waveform

Requirements

Use the SCPI commands to realize the following functions:

Output a burst waveform from the CH1 output connector on the front panel; set the burst waveform to sine wave (1 kHz frequency, 5 Vpp amplitude range, 0 Vdc offset, and 0° start phase), the burst type to N-Cycle burst with 10 burst count, the burst time to 0.1 s, the trigger source to internal trigger, the edge of the trigger output signal to trailing edge, and the trigger delay to 0.01 s.

Method

```
*IDN? /*Queries the ID string of the signal generator to check
whether the remote communication is normal.*/
:SOURce1:APPLy:SINusoid 1000,5,0,0 /*Sets the CH1 waveform to sine
wave with 1 kHz frequency, 5 Vpp amplitude range, 0 Vdc offset, and
0° start phase.*/
:SOURce1:BURSt:STATe ON /*Enables the burst function for CH1.*/
:SOURce1:BURSt:MODE TRIGgered /*Sets the burst type to N-Cycle for
CH1.*/
:TRIGger1:SOURce IMMediate /*Sets the trigger source to internal
```

EN

```
for CH1.*/
:SOURce1:BURSt:NCYCles 10 /*Sets the burst count of N-Cycle bursts
to 10 for CH1.*/
:SOURce1:BURSt:INTernal:PERiod 0.1 /*Sets the burst period of
internally-triggered N-Cycle bursts to 0.1 s for CH1.*/
:OUTPut1:TRIGger ON /*Enables the trigger output of CH1*/
:OUTPut1:TRIGger:SLOPe NEGative /*Sets the edge of the trigger
output signal to trailing edge for CH1.*/
:TRIGger1:DELay 0.01 /*Sets the trigger delay of N-Cycle bursts to
0.01 s for CH1.*/
:OUTPut1 ON /*Enables the output of CH1.*/
```

4.8   To Output a Sequence Waveform

Requirements

Output a sequence waveform (3 kSa/s sample rate, 5 Vpp amplitude range, 1 Vdc offset, and step filter) with five steps from the CH1 output connector on the front panel. Set the burst count to 5 for all steps; set the event input to "Manual" and the event jump to "Last" for step 3; use default values for other parameters.

Method

```
*IDN? /*Queries the ID string of the signal generator to test
whether the remote communication works normally.*/
:SOURce1:FUNCtion:ADVance:SEQuence:STATe ON /*Enables the Sequence
output function for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:SRATe 3000 /*Sets the sequence
sample rate to 3 kSa/s for CH1.*/
:SOURce1:VOLTage 5 /*Sets the output amplitude range to 5 Vpp for
CH1.*/
:SOURce1:VOLTage:OFFSet 1 /*Sets the offset voltage to 1 Vdc for
CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:FILTer STEP /*Sets the sequence
filter to step for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ADD /*Adds a new step (sine by
default) at the end of the
sequence.*/ :SOURce1:FUNCtion:ADVance:SEQuence:ADD /*Adds a new
step (sine by default) at the end of the sequence.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ADD /*Adds a new step (sine by
default) at the end of the sequence.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ADD /*Adds a new step (sine by
default) at the end of the sequence.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 1,5 /*Sets the burst
count of step 1 to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 2,5 /*Sets the burst
count of step 2 to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 3,5 /*Sets the burst
count of step 3 to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 4,5 /*Sets the burst
count of step 4 to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:PERiod 5,5 /*Sets the burst
count of step 5 to 5 for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:EVENt 3,MAN /*Sets the
event jump trigger source of step 3 to Manual for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:ITEM:JUMP 3,LAST /*Sets the
event jump destination of step 3 to Last for CH1.*/
:SOURce1:FUNCtion:ADVance:SEQuence:APPLy /*Applies the settings of
the CH1 sequence.*/
:OUTPut1:STATe ON /*Enables the output of CH1.*/
```

5   Programming Examples

This chapter illustrates how to control the instrument by programming in LabVIEW, Visual Basic, and Visual C++. These examples are programmed based on Virtual Instrument Software Architecture (VISA) library.

RIGOL official website (*http://www.rigol.com*) provides the programming examples based on LabVIEWk, Visual Basic, Visual C++, Matlab, and Python. You can go to the official website and click **SUPPORT > Programming Demo** to obtain the programming examples.

5.1   Programming Preparations

Before programming, you need to prepare the following tasks:

You can log in to the RIGOL official website (*http://www.rigol.com*) to download the software. Then install the software according to the installation wizard. After Ultra Sigma is installed successfully, NI-VISA library will be completely installed automatically. In this manual, the default installation path is C:\Program Files\IVI Foundation\VISA.

In the manual, the instrument communicates with the PC via the USB interface. Connect the USB Device interface on the rear panel of the instrument to the PC by using the USB cable. After the instrument is properly connected to the PC, power on the instrument to start it.

The following parts will make a detailed introduction about the programming examples in LabVIEW, Visual Basic, and Visual C++.

5.2   LabVIEW Programming Example

Program used in this example: LabVIEW 2009

Function realized in this example: search for the instrument address, connect the instrument, send command, and read the returned value.

1. Run LabVIEW, and then create a VI file named Demo_LABVIEW.

2. Add controls in the front panel interface, including the **Address**, **Command**, and

    Return field as well as the **Connect**, **Write**, **Read**, and **Exit** buttons.
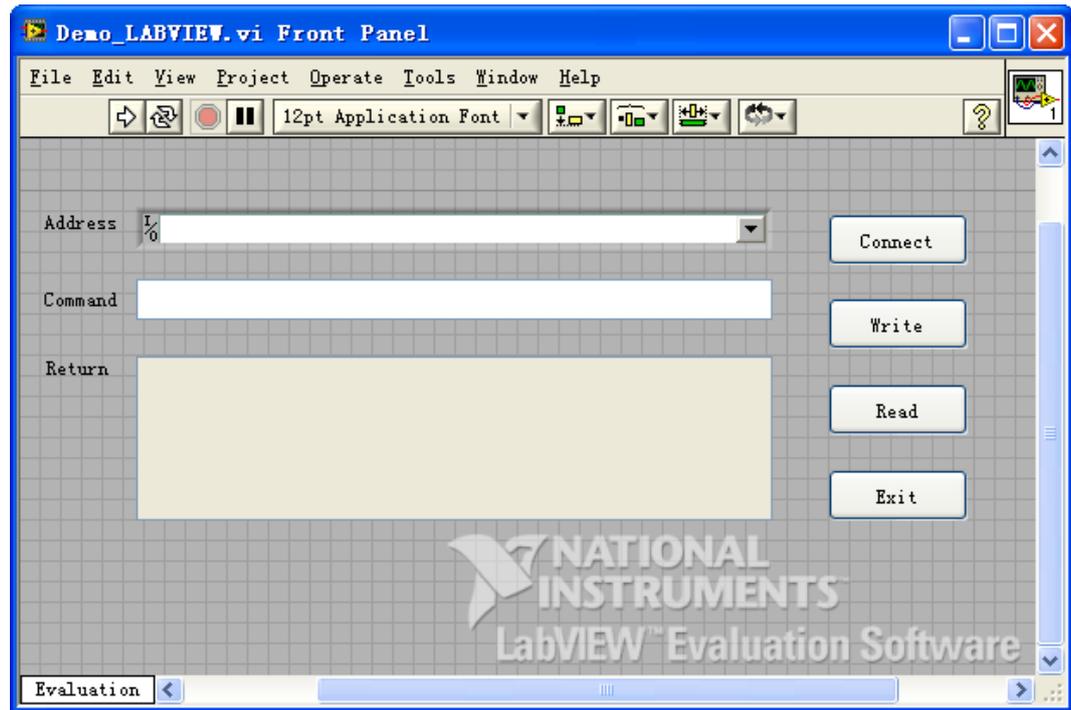
3. Click **Show Block Diagram** in the **Window** menu to create event structure.
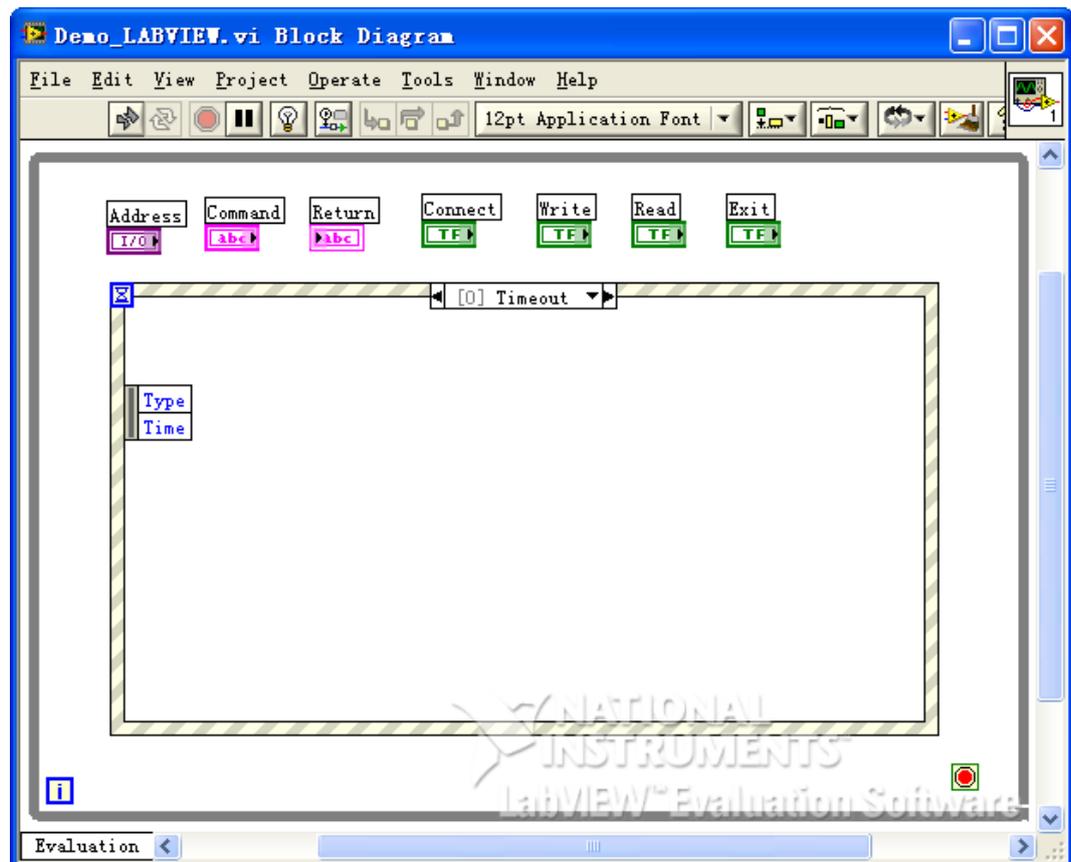
4. Add events, including connecting instrument, write operation, read operation, and

exit.

a. Connect the instrument (including error processing):
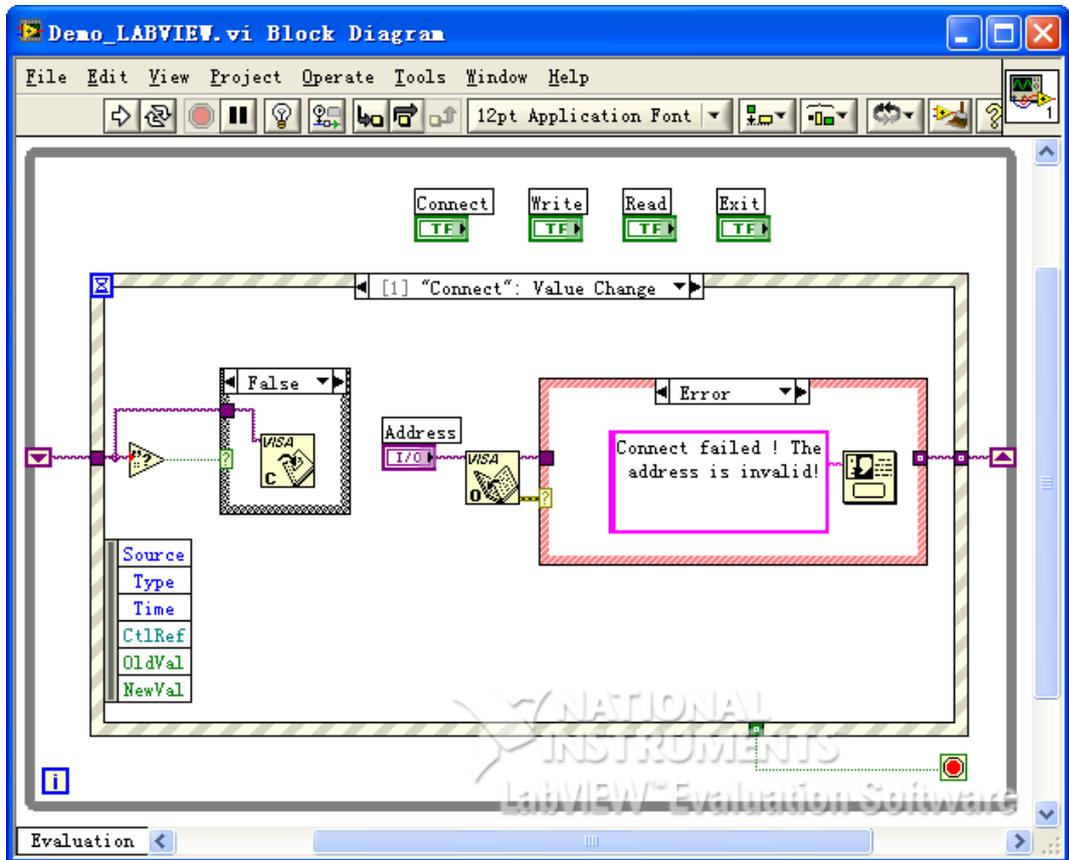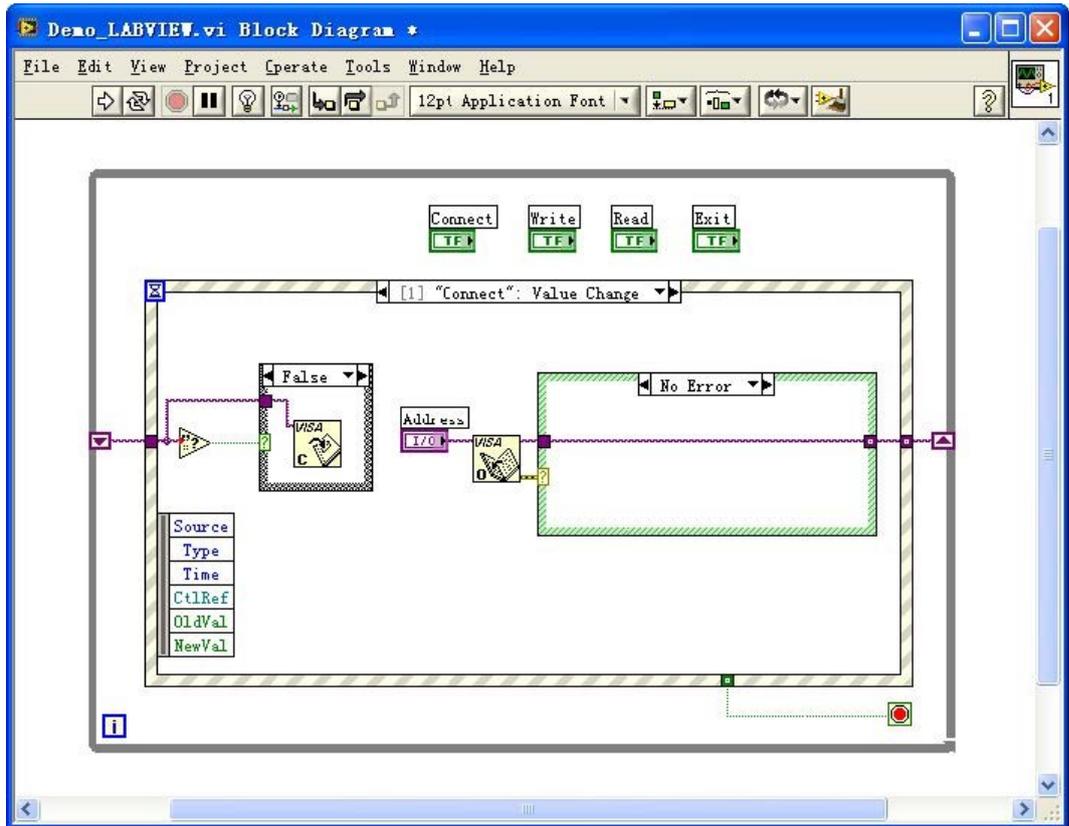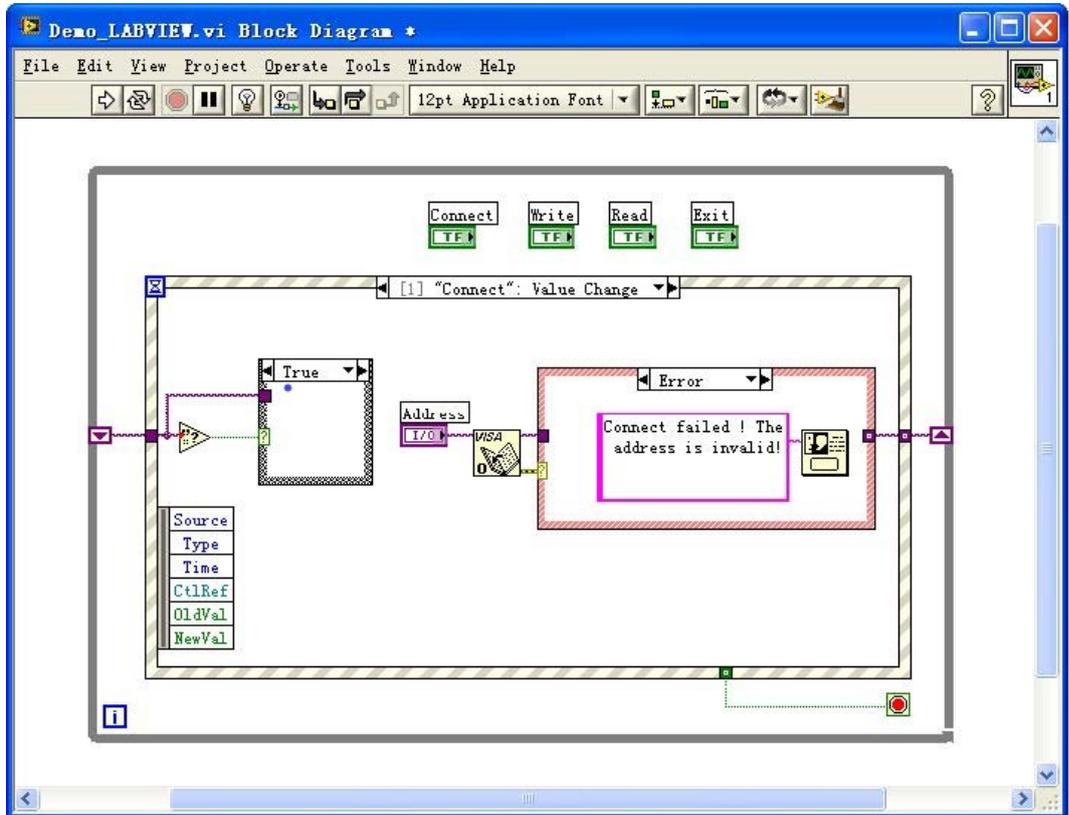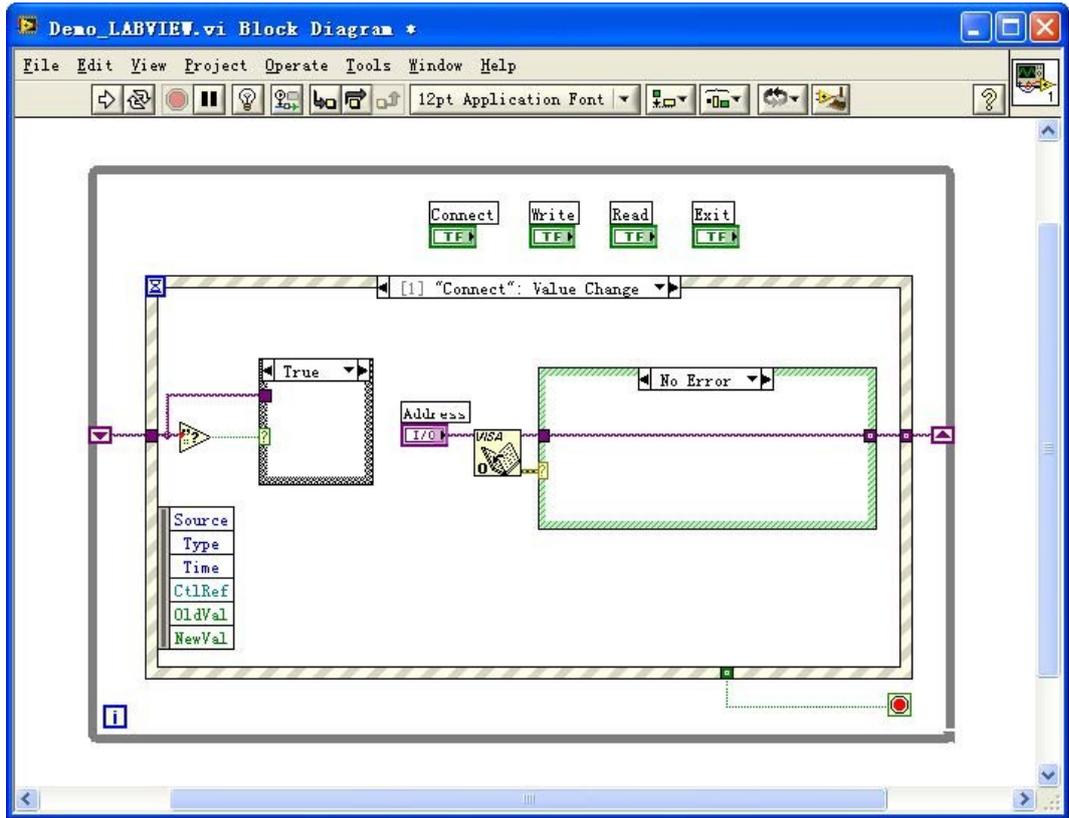
b. Write operation (including error judgment):
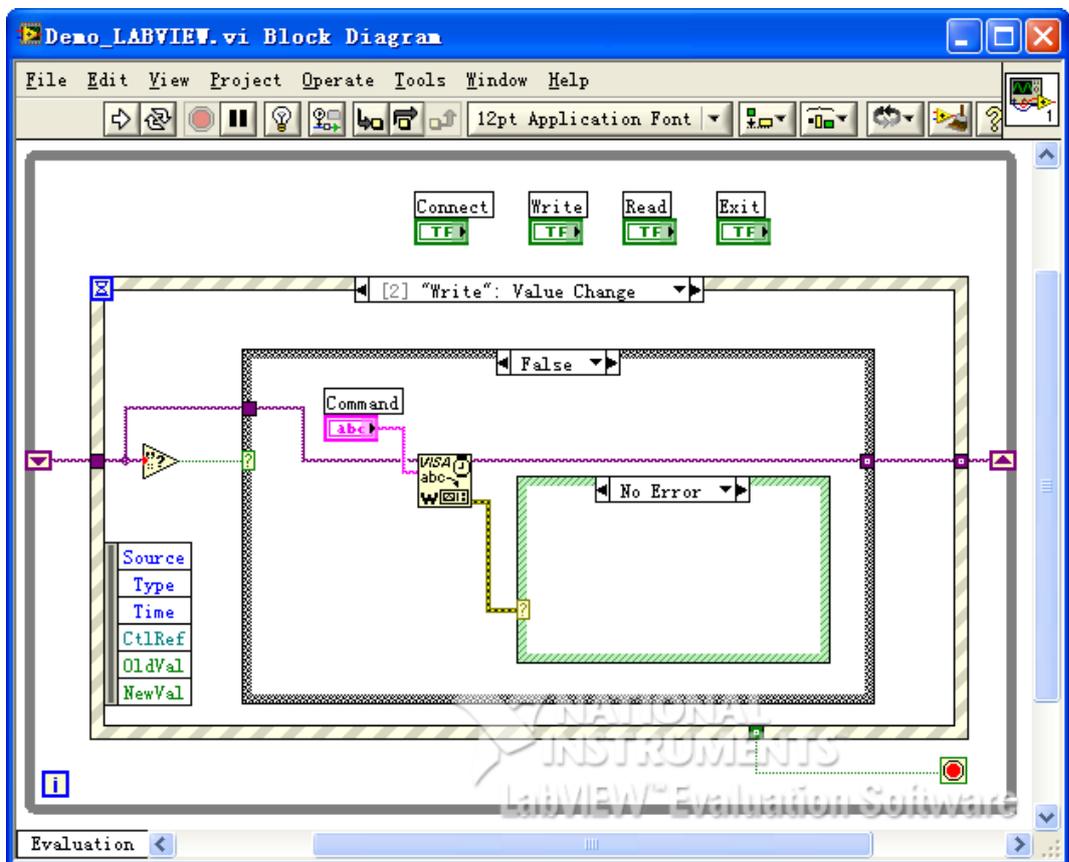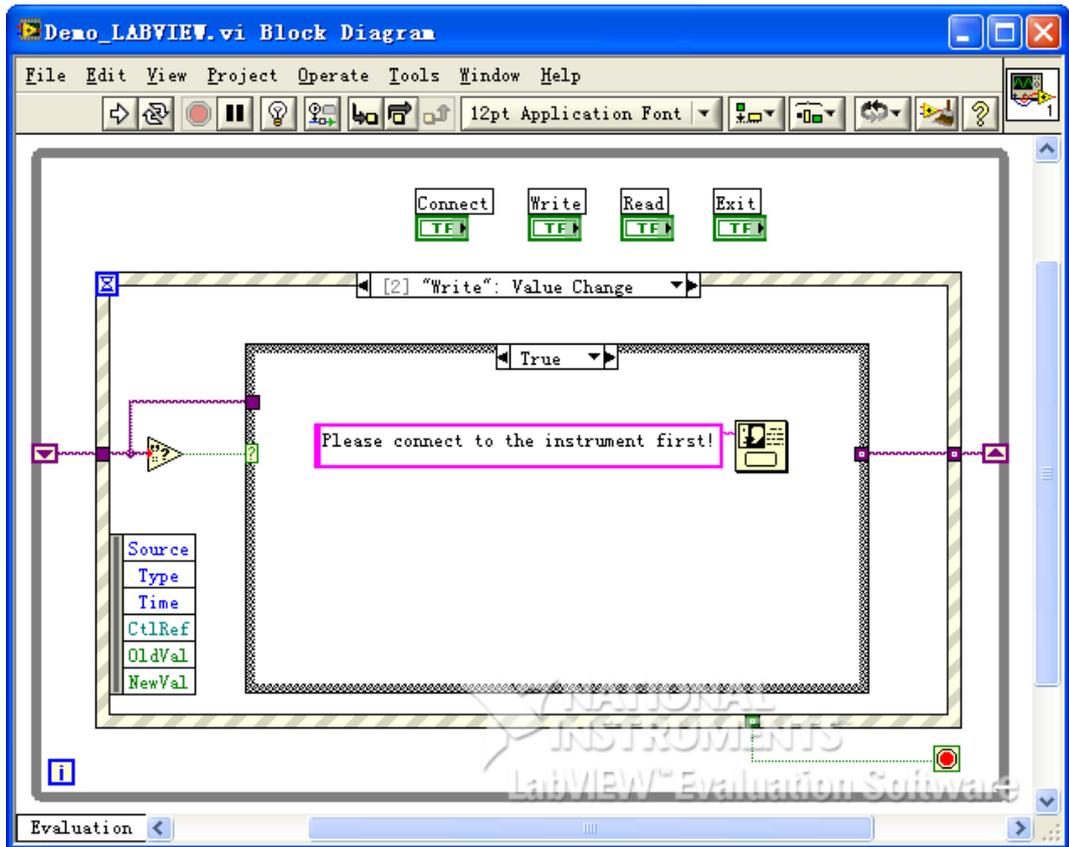
c. Read operation (including error processing):
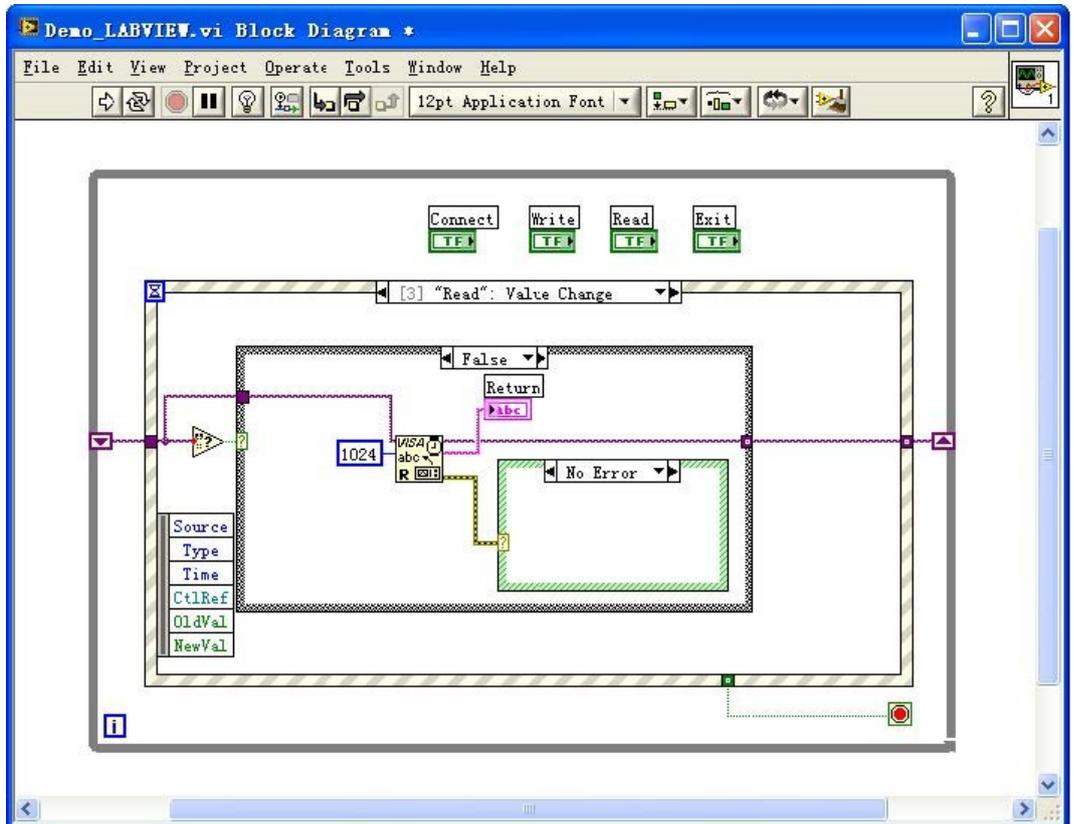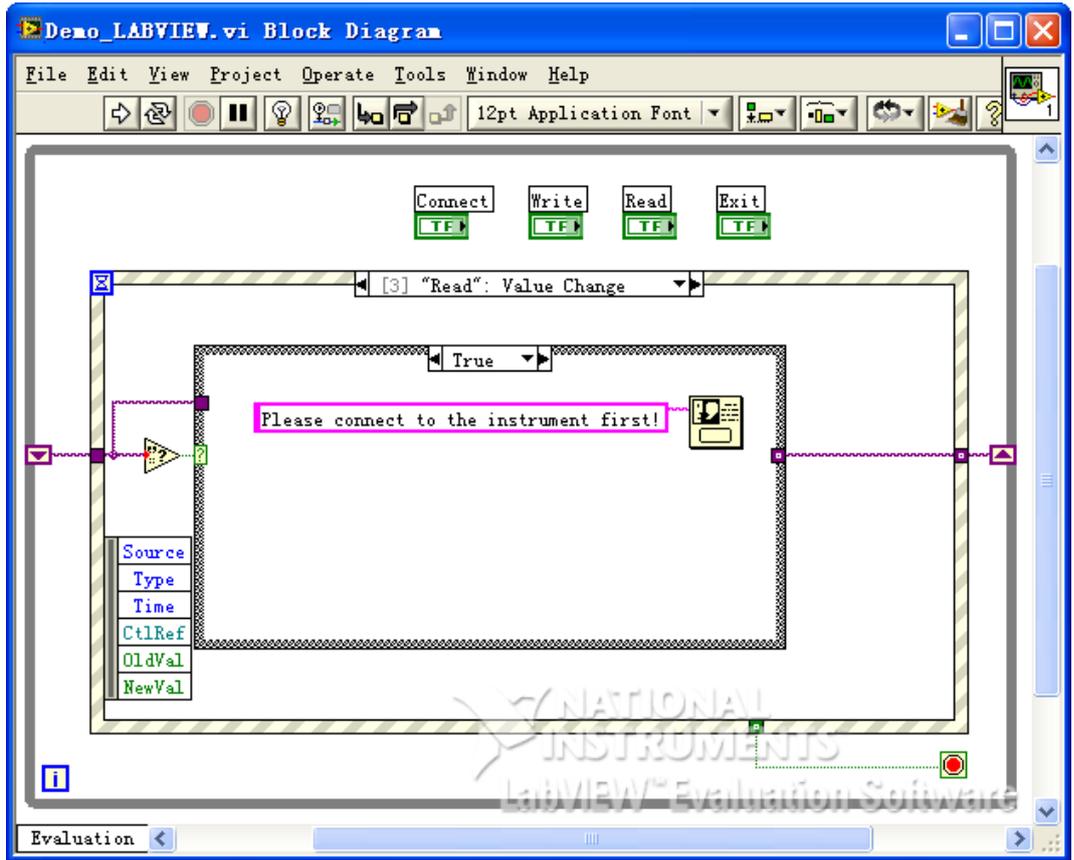
d. Exit:
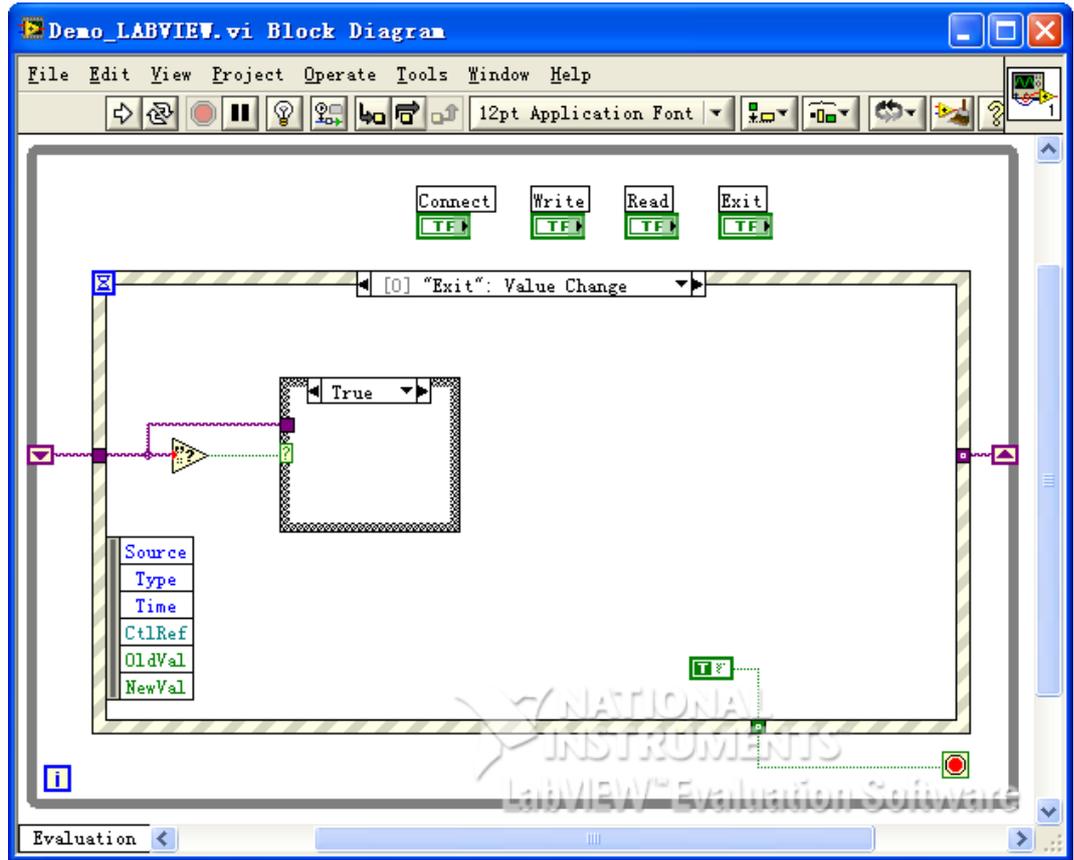
5. Run the program and the interface as shown in the figure below is displayed. Click the **Address** drop-down button and select the VISA resource name; click **Connect** to connect the instrument; enter the command into the **Command** input field and click **Write** to write the command into the instrument. If the command is a query command, click **Read** and the returned value is displayed in the **Return** field.
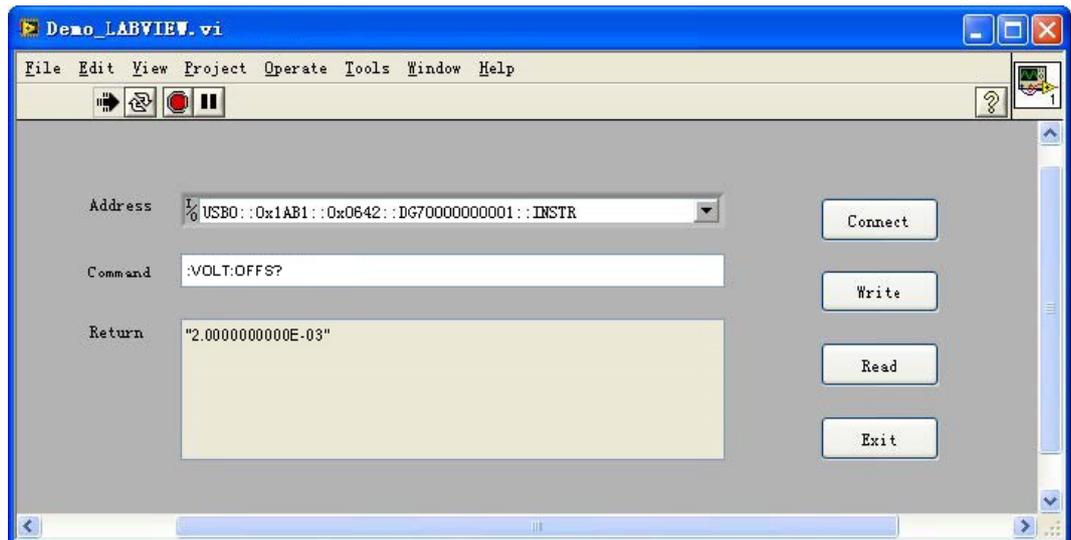
5.3　　　Visual Basic Programming Example

Program used in this example: Visual Basic 6.0

Function realized in this example: control the on/off state of any channel (taking CH1 and CH2 as examples).

Enter the Visual Basic 6.0 programming environment, and perform the following procedures.

1. Build a standard application program project (Standard EXE), and name it "Demo".

2. Click **Project** > **Add Module** to open the Add Module dialog box. In the dialog box, click the Existing tab to search for the visa32.bas file in the include folder under the **NI-VISA** installation path and add the file.
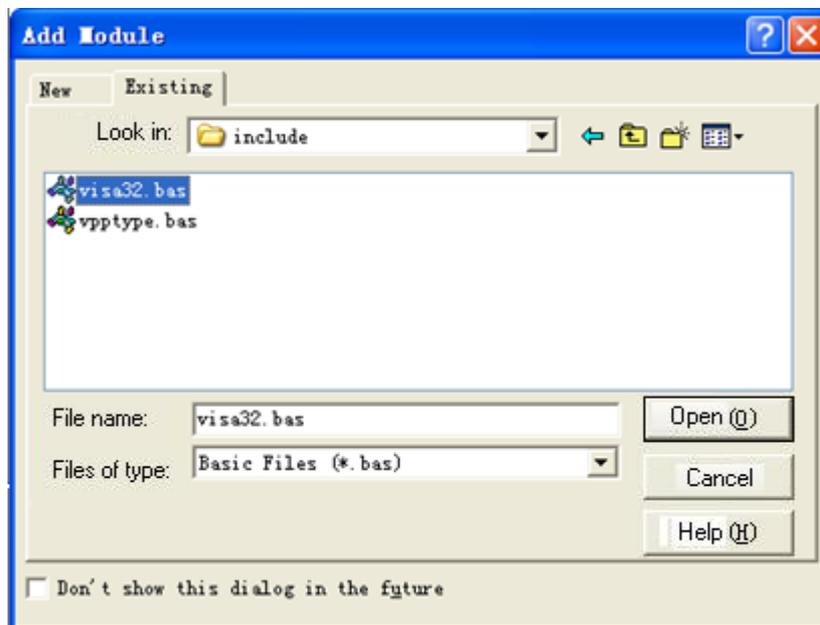
3. In the Demo dialog box, add two buttons to represent CH1～CH2. Add two Labels (Label1(0) and Label1(1)) to represent the status of CH1～CH2 respectively (when the channel is enabled, it displays the color of the channel; when the channel is disabled, it displays gray). See the figure below.
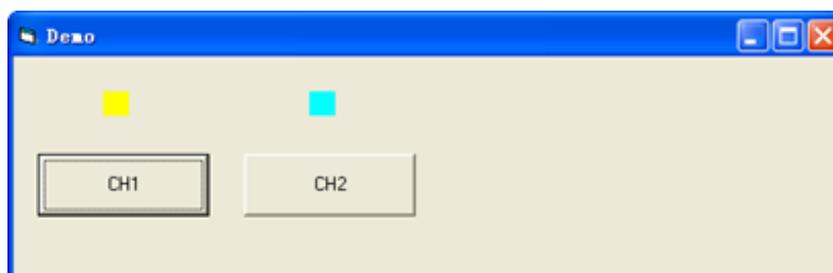
4. Click **Project** > **Project1 Properties** to open the Project1 – Project Properties dialog box. In the dialog box, click on the General tab and select Form1 from the drop-down list under **Startup Object**.

5. Double-click CH1 to enter the programming environment. Add the following codes to control CH1-CH2. The codes of CH1 are as shown below; the codes of the other channel are similar.

```
Dim defrm As Long
Dim vi As Long
Dim strRes As String * 200
Dim list As Long
Dim nmatches As Long
Dim matches As String * 200 'Reserve the obtained device number
Dim s32Disp As Integer
' Obtain the usb resource of visa
Call viOpenDefaultRM(defrm)
Call viFindRsrc(defrm, "USB?*", list, nmatches, matches)
' Turn on the instrument
Call viOpen(defrm, matches, 0, 0, vi)
' Send a command to query the status of CH1
Call viVPrintf(vi, ":OUTP1:STAT?" + Chr$(10), 0)
' Obtain the status of CH1
Call viVScanf(vi, "%t", strRes)
s32Disp = CInt(strRes)
If (s32Disp = 1) Then
' Send the setting command
Call viVPrintf(vi, ":OUTP1:STAT 0" + Chr$(10), 0)
Label1(0).ForeColor = &H808080 'Gray
Else
Call viVPrintf(vi, ":OUTP1:STAT 1" + Chr$(10), 0)
Label1(0).ForeColor = &HFFFF& 'Yellow
End If
' Close the resource
Call viClose(vi)
Call viClose(defrm)
```

6. Save and run the project to obtain a single exe program for demo. When the instrument is correctly connected to the PC, you can control the on/off status of CH1~CH2.

5.4 Visual C++ Programming Example

Program used in this example: Visual C++6.0

Function realized in this example:search for the instrument address, connect to the instrument, send commands, and read return values.

Enter the Visual C++6.0 programming environment, and perform the following procedures.

1. Create a MFC project based on a dialog box.

2. Click **Project** > **Settings** to open the **Project Setting** dialog box. In the dialog box,

click the **C/C++** tab, select **Code Generation** from the drop-down list under

Category. Choose **Debug Multithreaded DLL** from the drop-down list under **Use run-time library**. Click **OK** to close the dialog box.
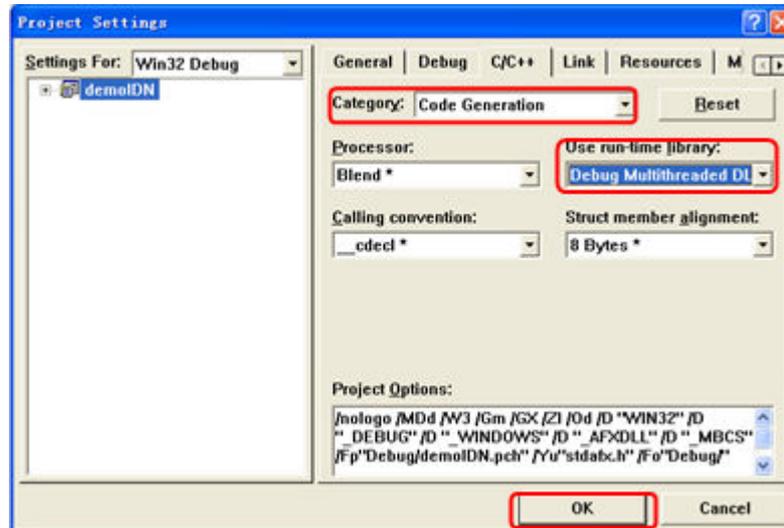
3. Click **Project** > **Settings** to open the **Project Setting** dialog box. In the dialog box, click the **Link** tab, add "visa32.lib" under **Object/library modules**, then click **OK** to close the dialog box.
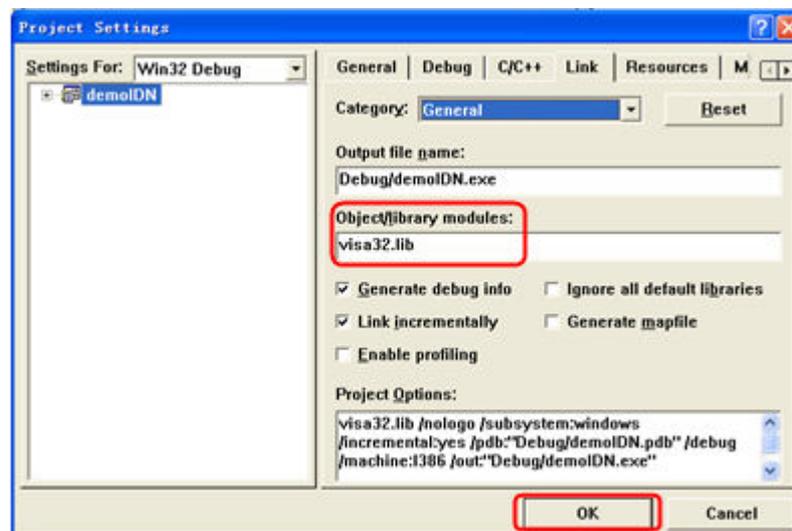

4. Click **Tools** > **Options** to open the Options dialog box. Then click the **Directories** tab.

Select **Include files** from the drop-down list under **Show directories for**. Double click the empty space under **Directories** to enter the specified path of Include files: C:\Program Files\IVI Foundation\VISA\WinNT\include. Click **OK** to close the dialog box.

Select **Library files** from the drop-down list under **Show directories for**. Double click the empty space under **Directories** to enter the specified path of Library files:

C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc. Click **OK** to close the dialog box.
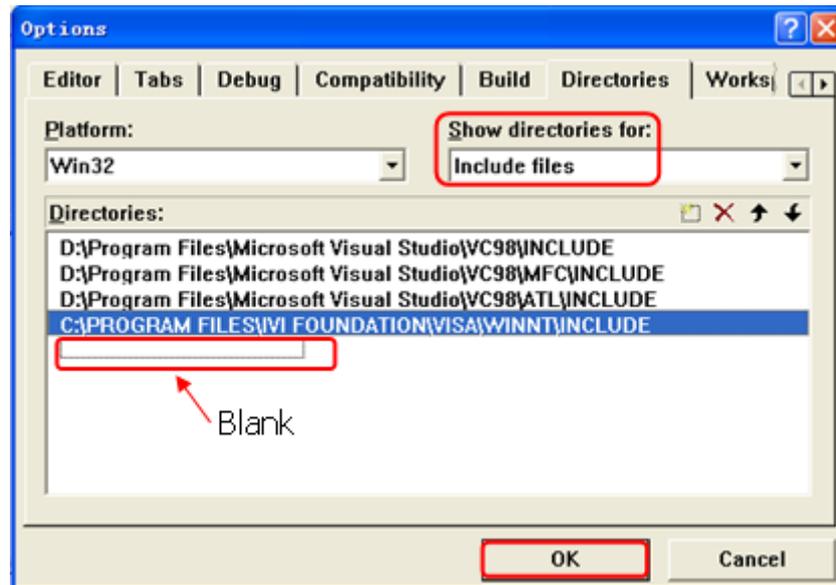
Note: By now, VISA library has been added.

5. Add the **Text**, **Combo Box**, **Button**, and **Edit Box** controls. The layout interface for adding controls is as follows:
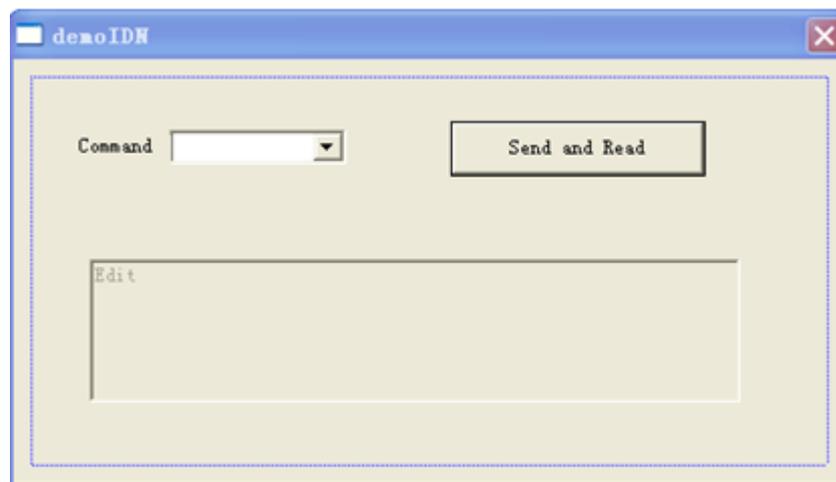
6. Modify the control attributes.

   a. Name **Text** as "Command".

   b. Open the **Data** item in the **Combo Box** attribute and input the following command *IDN? manually.

   c. Open the **General** item in the **Edit Box** attribute and select **Disabled**.

   d. Name **Button** as **Send and Read**.

7. Add the variables m_combox and m_receive to the **Combo Box** and **Edit Box**

controls respectively.
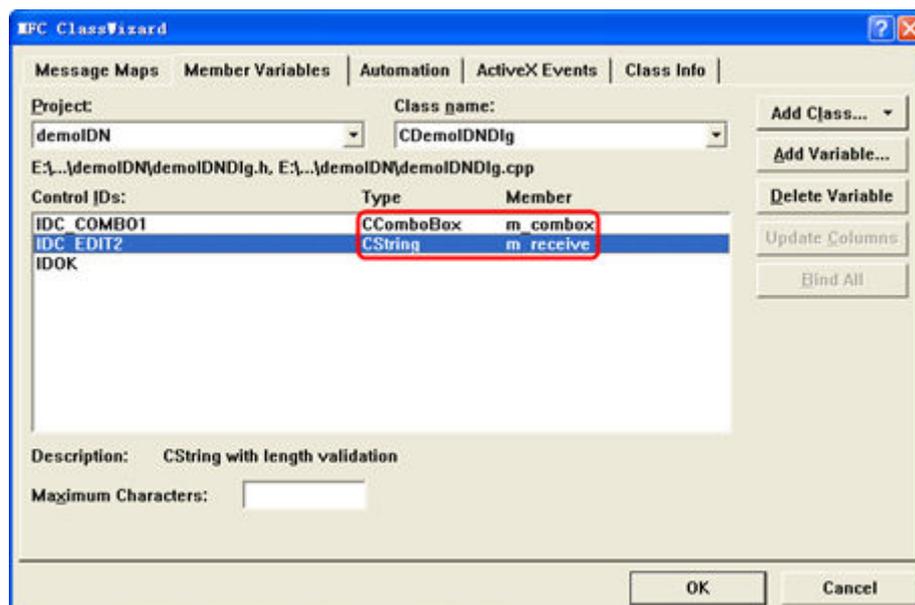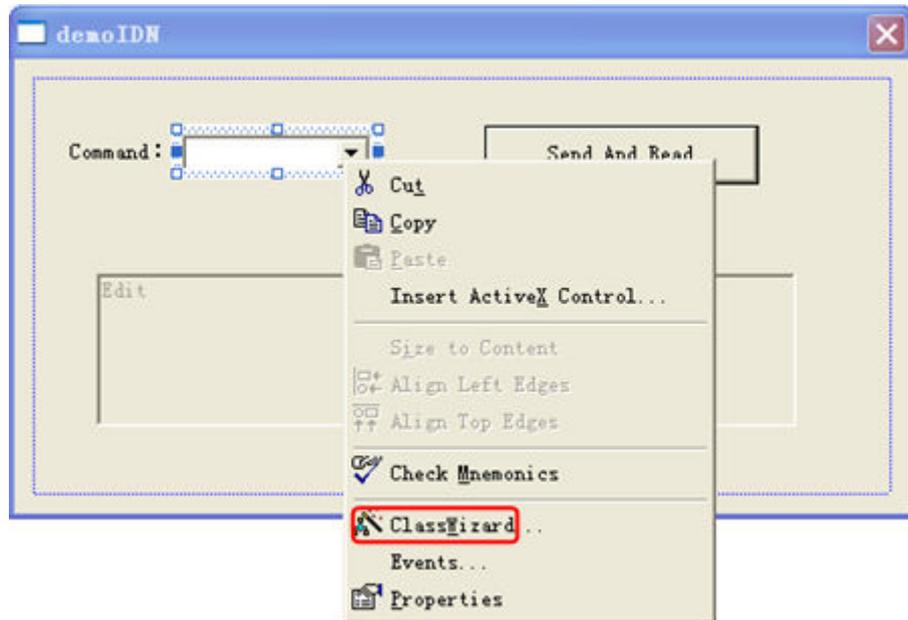
8. Add codes.

Double-click **Send and Read** to enter the programming environment. Declare the #include <visa.h> of the VISA library in the header file and then add the following codes:

```
ViSession defaultRM, vi;
char buf [256] = {0};
CString s,strTemp;
char* stringTemp;

ViChar buffer [VI_FIND_BUFLEN];
```

```
ViRsrc matches=buffer;
ViUInt32 nmatches;
ViFindList list;

viOpenDefaultRM (&defaultRM);
//Acquire the USB resource of VISA
viFindRsrc(defaultRM, "USB?*", &list,&nmatches, matches);
viOpen (defaultRM,matches,VI_NULL,VI_NULL,&vi);

//Send the command received
m_combox.GetLBText(m_combox.GetCurSel(),strTemp);
strTemp = strTemp + "\n";
stringTemp = (char *)(LPCTSTR)strTemp;
viPrintf (vi,stringTemp);

//Read the results
viScanf (vi, "%t\n", &buf);

//Display the results
UpdateData (TRUE);
m_receive = buf;
UpdateData (FALSE);
viClose (vi);
viClose (defaultRM);
```

9. Save, compile, and run the project to obtain a single exe file. When the instrument

is correctly connected to the PC, enter a command (for example, *IDN?) and click

Send and Read to execute the command. Then, the reading results will be
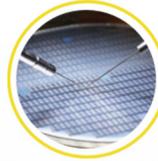
returned.

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