



Programming Guide

DG1000Z Series Function / Arbitrary Waveform Generator

Sep. 2016

RIGOL TECHNOLOGIES, INC.

Guaranty and Declaration

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Publication Number

PGB09105-1110

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Document Overview

This manual introduces how to program the signal generator over the remote interfaces in details.

Main Topics in this Manual:

Chapter 1 Programming Overview

This chapter introduces how to build the remote communication between the signal generator and PC and how to control the signal generator remotely. It also introduces the syntax, symbols, parameter types and abbreviation rules of the SCPI commands.

Chapter 2 Command System

This chapter introduces the syntax, function, parameters and using instructions of each DG1000Z command in A-Z order.

Chapter 3 Application Examples

This chapter provides the application examples of the main functions of the signal generator. In the examples, a series of commands are combined to realize the basic functions of the signal generator.

Chapter 4 Programming Demos

This chapter introduces how to program and control DG1000Z using various development tools, such as Visual C++, Visual Basic and LabVIEW.

Chapter 5 Appendix

This chapter provides the command list and the factory settings.

Tip

For the newest version of this manual, download it from www.rigol.com.

Format Conventions in this Manual:

1. Button

The function key at the front panel is denoted by the format of “Button Name (Bold) + Text Box” in the manual, for example, **Utility** denotes the “Utility” key.

2. Menu

The menu item is denoted by the format of “Menu Word (Bold) + Character Shading” in the manual, for example, **System** denotes the “System” item under **Utility**.

3. Operation Step

The next step of the operation is denoted by an arrow “→” in the manual. For example, **Utility** → **System** denotes pressing **Utility** at the front panel and then pressing **System**.

Content Conventions in this Manual:

DG1000Z series function/arbitrary waveform generator includes the following models. Unless otherwise noted in this manual, DG1062Z is taken as an example to introduce each command of the DG1000Z series.

Model	Channels	Max. Output Frequency
DG1062Z	2	60MHz
DG1032Z	2	30MHz
DG1022Z	2	25MHz

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Chapter 1 Programming Overview

This chapter introduces how to build the remote communication between the signal generator and PC and how to control the signal generator remotely. It also introduces the syntax, symbols, parameter types and abbreviation rules of the SCPI commands.

Main topics of this chapter:

- ◆ [To Build Remote Communication](#)
- ◆ [Remote Control Methods](#)
- ◆ [SCPI Command Overview](#)

To Build Remote Communication

You can build the remote communication between DG1000Z and the PC via the USB (USB Device), LAN or GPIB interface (option, extended from the USB Host interface using the USB-GPIB interface converter).

Operation Steps:

1. Install the Ultra Sigma common PC software

Download the Ultra Sigma common PC software from www.rigol.com and install it according to the instructions.

2. Connect the instrument and PC and configure the interface parameters of the instrument

DG1000Z supports the USB, LAN and GPIB (option, extended from the USB Host interface using the USB-GPIB interface converter) communication interfaces, as shown in the figure below.

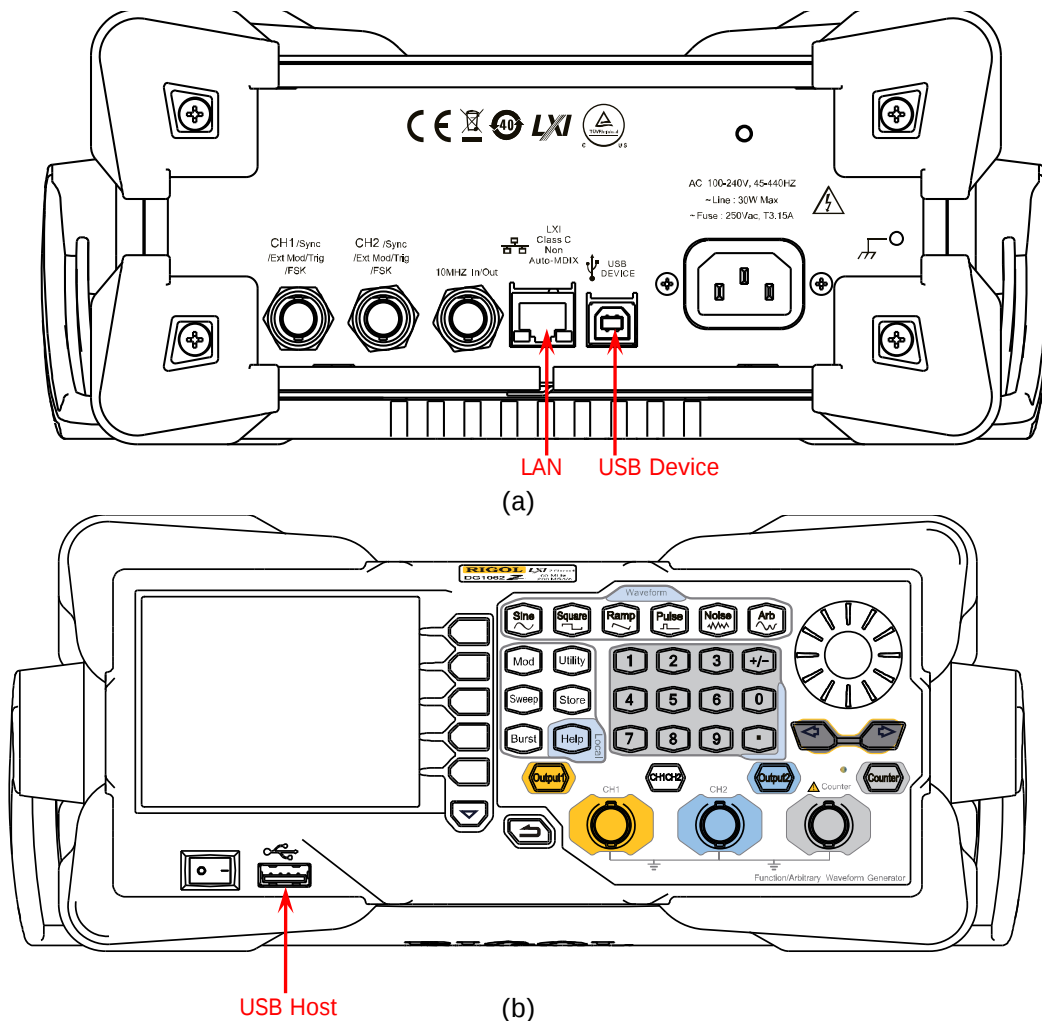


Figure 1-1 DG1000Z Communication Interfaces

- 1) Use the USB interface: connect the USB Device interface at the rear panel of DG1000Z and the USB Host interface of the PC using a USB cable. The “Found New Hardware Wizard” dialog box will be displayed and please install the “USB Test and Measurement Device (IVI)” according to the instructions (refer to “Remote Control via USB” in Chapter 3 “Remote Control” in *DG1000Z User's Guide*).
- 2) Use the LAN interface:
 - Make sure that your PC is connected to the local network.
 - Check whether your local network supports the DHCP or auto IP mode. If not, you need to

acquire the network interface parameters available, such as the IP address, subnet mask, default gateway and DNS service.

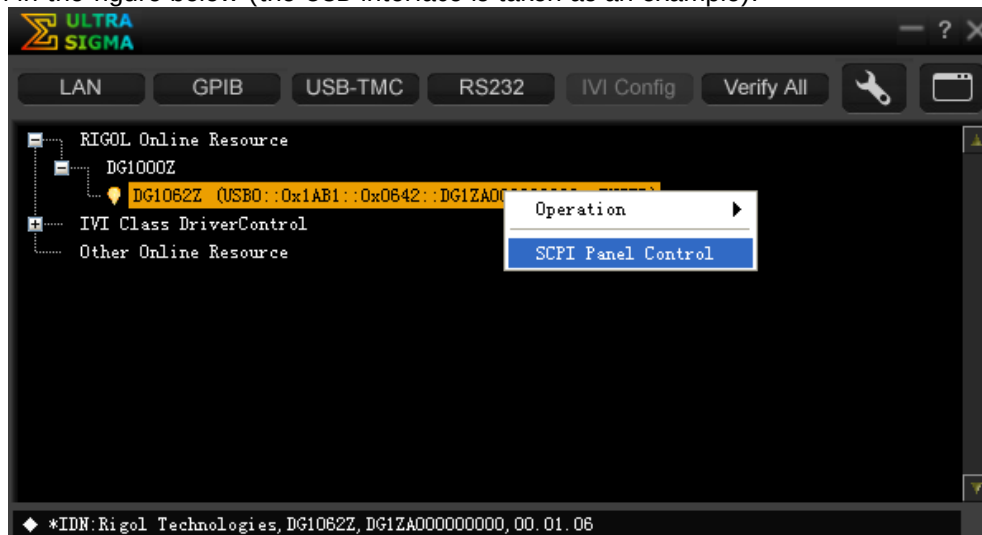
- Connect DG1000Z to the local network using a network cable.
- Press **Utility** → **I/O Config** → **LAN** to configure the IP address, subnet mask, default gateway and DNS service.

3) Use the GPIB interface:

- Extend a GPIB interface by connecting the USB Host interface at the front panel of DG1000Z using the USB-GPIB interface converter.
- Connect the instrument and PC using a GPIB cable.
- Press **Utility** → **I/O Config** → **GPIB** to set the GPIB address of the instrument.

3. Check whether the connection is successful

Start up the **Ultra Sigma** and the software will automatically search for the instrument resources currently connected to the PC. Right click the resource name and select “SCPI Panel Control”. Input a correct command in the pop-up SCPI control panel and click **Send Command** and **Read Response** subsequently or directly click **Send & Read** to check whether the connection is successful, as shown in the figure below (the USB interface is taken as an example).



Remote Control Methods

1. User-defined Programming

Users can use the SCPI (Standard Commands for Programmable Instruments) commands listed in chapter 2 “**Command System**” of this manual to program and control the instrument in various development environments (such as Visual C++, Visual Basic, LabVIEW and so on). For details, refer to the introductions in chapter 4 “**Programming Demos**”.

2. Send SCPI Commands via the PC Software

You can control the signal generator remotely by sending the SCPI commands via the PC software (Ultra Sigma) provided by **RIGOL**. Besides, you can also control the instrument using the “Measurement & Automation Explorer” of NI (National Instruments Corporation) or the “Agilent IO Libraries Suite” of Agilent (Agilent Technologies, Inc.).

SCPI Command Overview

SCPI (Standard Commands for Programmable Instruments) is a standardized instrument programming language that is built upon the standard IEEE488.1 and IEEE 488.2 and conforms to various standards (such as the floating point operation rule in IEEE754 standard, ISO646 7-bit coded character for information interchange (equivalent to ASCII programming)). This section introduces the syntax, symbols, parameters and abbreviation rules of the SCPI commands.

Syntax

The SCPI commands provide a hierarchical tree structure and include multiple subsystems. Each command subsystem consists of a root keyword and one or more sub-keywords. The command string usually starts with ":", the keywords are separated by ":" and are followed by the parameter settings available; "?" is added at the end of the command string to indicate query; the command and parameter are separated by space.

For example,

```
:SYSTem:COMMunicate:LAN:IPADdress <ip_address>  
:SYSTem:COMMunicate:LAN:IPADdress?
```

SYSTem is the root keyword of the command. COMMunicate, LAN and IPADdress are the second-level, third-level and forth-level keywords respectively. The command string starts with ":" which is also used to separate the multiple-level keywords. <ip_address> represents the parameters available for setting. "?" represents query; the instrument returns the corresponding information (the input value or internal setting value of the instrument) when receiving the query command. The command :SYSTem:COMMunicate:LAN:IPADdress and parameter <ip> are separated by space.

"," is generally used for separating multiple parameters contained in the same command, for example, :DISPlay:TEXT[:SET] <quoted string>[,x[,y]]

Symbol Description

The following symbols are not the content of the SCPI commands and will not be sent with the commands. They are usually used to describe the parameters in the commands.

1. Braces { }

Multiple optional parameters are enclosed in the braces and one of the parameters must be selected when sending the command. For example, `:DISPlay:MODE {DPV|DGV|SV}`.

2. Vertical Bar |

The vertical bar is used to separate multiple parameters and one of the parameters must be selected when sending the command. For example, `:DISPlay:MODE {DPV|DGV|SV}`.

3. Square Brackets []

The content (command keyword or parameter) in the square brackets can be omitted. If the parameter is omitted, the instrument will set the parameter to its default. For example, for the `:COUNter:STATistics[:STATE]?` command, send any of the following two commands can achieve the same effect.

`:COUNter:STATistics?`

`:COUNter:STATistics:STATE?`

4. Triangle Brackets < >

The parameter enclosed in the triangle brackets must be replaced by an effective value. For example, sending the `:COUNter:LEVEL <value>` command in `:COUNter:LEVEL 1` form.

Parameter Type

The parameters of the commands introduced in this manual contain the following 5 types: bool, integer, real number, discrete and ASCII string.

1 Bool

The parameter could be ON (1) or OFF (0). For example, `:COUNter:HF {ON|1|OFF|0}`.

2 Integer

Unless otherwise noted, the parameter can be any integer within the effective value range. Note that do not set the parameter to a decimal; otherwise, errors will occur. For example, in the `:DISPlay:BRIGhtness <brightness>` command, `<brightness>` can be any integer from 0 to 100.

3 Real Number

Unless otherwise noted, the parameter can be any real number within the effective value range. For example, the range of `<value>` in the `:COUNter:LEVEL <value>` command is from -2.5V to 2.5V.

4 Discrete

The parameter could only be one of the specified values or characters. For example, in the `:DISPlay:MODE {DPV|DGV|SV}` command, the parameter can only be DPV, DGV or SV.

5 ASCII String

The parameter should be the combinations of ASCII characters. For example, in the `:MMEMory:LOAD:STATE <filename>` command, `<filename>` is the filename of the state file to be loaded under the current directory of the external memory and can include English characters and numbers.

Besides, you can replace the parameters in many commands with **MINimum** or **MAXimum** to set the parameters to their minimum or maximum value. For example, **MINimum** and **MAXimum** in the `:DISPlay:BRIGhtness {<brightness>|MINimum|MAXimum}` command are used to set the brightness to the minimum or maximum.

Command Abbreviation

All the commands are case-insensitive and you can use any of them. If abbreviation is used, all the capital letters in the command must be written completely. For example, the :COUNter:COUPling? command can be abbreviated to :COUN:COUP?.

Chapter 2 Command System

This chapter introduces the syntax, function, parameter and using instruction of each DG1000Z command in A-Z order.

Main topics of this chapter:

- ◆ [:COUNter Commands](#)
- ◆ [:COUPLing Commands](#)
- ◆ [:DISPlay Commands](#)
- ◆ [:HCOPy Commands](#)
- ◆ [IEEE488.2 Common Commands](#)
- ◆ [:LICense Command](#)
- ◆ [:LXI Commands](#)
- ◆ [:MEMory Commands](#)
- ◆ [:MMEMory Commands](#)
- ◆ [:OUTPut Commands](#)
- ◆ [:PA Commands](#)
- ◆ [:ROSCillator Commands](#)
- ◆ [:SOURce Commands](#)
- ◆ [:SYSTem Commands](#)
- ◆ [:TRIGger Commands](#)

Explanation: In this command system, setting commands relating to the frequency and amplitude parameters can be sent with units. The units available and the default unit of each parameter are as shown in the table below.

Parameter Type	Units Available	Default Unit
Frequency	MHz/kHz/Hz/uHz	Hz
Sample Rate	MSa/s、kSa/s、Sa/s、uSa/s	Sa/s
Amplitude	Vpp/mVpp/Vrms/mVrms/dBm	Vpp/Vrms/dBm (depend on the parameter to be set)
Offset	V _{DC} /mV _{DC}	V _{DC}
High Level/Low Level	V/mV	V
Time	s/ms/us/ns	s
Phase	°	°
Duty Cycle/ Modulation Depth/ Brightness/ Contrast	%	%
Impedance	Ω	Ω

Note:

- In this manual, the range of the parameter in the command is based on DG1062Z.
- As all the commands are case-insensitive, for DG1000Z, MHZ (mhz) and MSA/S (msa/s) are interpreted as megahertz and mega points per second respectively; while MVPP (mvpp), MVRMS (mvrms), MVDC (mvdc), MV (mv) and MS (ms) are interpreted as millivolt (peak-peak value), millivolt (effective value), millivolt (DC), millivolt and millisecond respectively.
- When the output impedance is HighZ, the amplitude unit dBm is invalid.

:COUNter Commands

The :COUNter commands are used to turn on or off the frequency counter and set the related information of the frequency counter.

Command List^[1]:

- ◆ [:COUNter:AUTO](#)
- ◆ [:COUNter:COUPLing](#)
- ◆ [:COUNter:GATETIME](#)
- ◆ [:COUNter:HF](#)
- ◆ [:COUNter:LEVEL](#)
- ◆ [:COUNter:MEASure?](#)
- ◆ [:COUNter:SENSitive](#)
- ◆ [:COUNter\[:STATe\]](#)
- ◆ [:COUNter:STATistics:CLEAr](#)
- ◆ [:COUNter:STATistics:DISPlay](#)
- ◆ [:COUNter:STATistics\[:STATe\]](#)

:COUNter:AUTO

Syntax :COUNter:AUTO

Description The instrument will select a proper gate time automatically according to the characteristics of the signal under test after sending this command.

Explanation You can also send the [:COUNter:GATETIME](#) command to set the desired gate time.

Related Command [:COUNter:GATETIME](#)

:COUNter:COUPLing

Syntax :COUNter:COUPLing {AC|DC}

:COUNter:COUPLing?

Description Set the coupling mode of the input signal to AC or DC.

Query the coupling mode of the input signal.

Parameter

Name	Type	Range	Default
{AC DC}	Discrete	AC DC	AC

Return Format The query returns AC or DC.

Example :COUN:COUP DC /*Set the coupling mode of the input signal to DC*/

:COUN:COUP? /*Query the coupling mode of the input signal and the query returns DC*/

Note^[1]: In the “Command List” in this manual, the parameters in the setting commands and the query commands are not included and you can refer to the complete introductions of the commands in the text according to the keywords.

:COUNter:GATetime

Syntax :COUNter:GATetime {USER1|USER2|USER3|USER4|USER5|USER6}

:COUNter:GATetime?

Description Select the gate time of the measurement system.

Query the gate time of the measurement system.

Parameter

Name	Type	Range	Default
{USER1 USER2 USER3 USER4 USER5 USER6}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6	USER1

Explanation

- The gate times represented by USER1 to USER6 are as shown in the table below.

USER1	USER2	USER3	USER4	USER5	USER6
1.310ms	10.48ms	166.7ms	1.342s	10.73s	>10s

- For low-frequency signals (for example, the frequency is lower than 5Hz), you are recommended to set the gate time to USER6.
- Send the [:COUNter:AUTO](#) command and the instrument will select a proper gate time automatically according to the characteristics of the signal under test. During this process, "AUTO" is displayed in the gate time area in the frequency counter interface. The gate time currently selected by the instrument will be displayed in the gate time area in the frequency counter interface after the instrument selects a proper gate time.

Return Format

If users have currently selected a gate time, the query returns USER1, USER2, USER3, USER4, USER5 or USER6. If users send the [:COUNter:AUTO](#) command to let the instrument select a proper gate time automatically, the query returns "AUTO" during this process and returns USER1, USER2, USER3, USER4, USER5 or USER6 after a proper gate time is selected by the instrument.

Example

:COUN:GATE USER2 /*Set the gate time of the measurement system to USER2 (10.48ms)*/

:COUN:GATE? /*Query the gate time of the measurement system and the query returns USER2*/

Related Command

[:COUNter:AUTO](#)

:COUNter:HF

Syntax :COUNter:HF {ON|1|OFF|0}
:COUNter:HF?

Description Enable or disable the high-frequency rejection function of the frequency counter.
Query the on/off status of the high-frequency rejection function of the frequency counter.

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation Enable the high-frequency rejection when measuring low-frequency signal with lower than 250kHz frequency to filter out the high-frequency noise and improve the measurement accuracy. Disable the high-frequency rejection when measuring high-frequency signal with greater than 250kHz frequency; at this point, the maximum input frequency is 200MHz.

Return Format The query returns ON or OFF.

Example :COUN:HF ON /*Enable the high-frequency rejection function of the frequency counter*/
:COUN:HF? /*Query the on/off status of the high-frequency rejection function of the frequency counter and the query returns ON*/

:COUNter:LEVEL

Syntax :COUNter:LEVEL {<value>|MINimum|MAXimum}
:COUNter:LEVEL? [MINimum|MAXimum]

Description Set the trigger level of the frequency counter.
Query the trigger level of the frequency counter.

Parameter	Name	Type	Range	Default
	<value>	Real	-2.5V to 2.5V	0V

Explanation ➤ The frequency counter starts measuring when the input signal reaches the specified trigger level.
➤ The minimum resolution is 6mV.

Return Format The query returns the trigger level in scientific notation. The return value contains 7 effective digits, for example, 1.500000E+00 (the trigger level is 1.5V).

Example :COUN:LEVE 1.5 /*Set the trigger level of the frequency counter to 1.5V*/
:COUN:LEVE? /*Query the trigger level of the frequency counter and the query returns 1.500000E+00*/

:COUNter:MEASure?

Syntax :COUNter:MEASure?

Description Query the measurement results of the frequency counter.

Explanation When the frequency counter is in the "RUN" or "SINGLE" state, send this command to query the measurement values. When the frequency counter is in the "STOP" state, send this command to query the measurement values of the last measurement.

Return Format The query returns a string consisting of 5 parts (represent the frequency, period, duty cycle, positive pulse width and negative pulse width respectively) separated by commas. Each part is expressed in scientific notation and contains 10 effective bits, for example,
 2.000000000E+03,5.000000000E-04,4.760800000E+01,2.380415000E-04,
 2.619585000E-04 (represents the measurement result is 2kHz frequency, 500us period, 47.608% duty cycle, 238.0415us positive pulse width and 261.9585us negative pulse width).
 When the frequency counter function is disabled, the query returns
 0.000000000E+00,0.000000000E+00,
 0.000000000E+00,0.000000000E+00,0.000000000E+00.

Example :COUN:MEAS? /*Query the measurement results of the frequency counter and the query returns 2.000000000E+03,5.000000000E-04, 4.760800000E+01,2.380415000E-04,2.619585000E-04*/

:COUNter:SENSitive

Syntax :COUNter:SENSitive {<value>|MINimum|MAXimum}
 :COUNter:SENSitive? [MINimum|MAXimum]

Description Set the trigger sensitivity of the frequency counter.

Query the trigger sensitivity of the frequency counter.

Parameter	Name	Type	Range	Default
	<value>	Real	0% to 100%	25%

Explanation Relatively higher sensitivity is recommended for signal with small amplitude; low sensitivity is recommended for low-frequency signal with large amplitude or signal with slow rising edge to ensure more accurate measurement result.

Return Format The query returns the trigger sensitivity in scientific notation. The return value contains 7 effective digits, for example, 3.000000E+01 (the trigger sensitivity of the frequency counter is 30%).

Example :COUN:SENS 30 /*Set the trigger sensitivity of the frequency counter to 30%*/
 :COUN:SENS? /*Query the trigger sensitivity of the frequency counter and the query returns 3.000000E+01*/

:COUNter[:STATe]

Syntax :COUNter[:STATe] {ON|1|OFF|0|RUN|STOP|SINGLE}

:COUNter[:STATe]?

Description Set the status of the frequency counter.

Query the status of the frequency counter.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0 RUN STOP SINGLE}	Discrete	ON 1 OFF 0 RUN STOP SINGLE	OFF

- Explanation**
- “ON” and “1” denote enabling the frequency counter function; “OFF” and “0” denote disabling the frequency counter function; “RUN”, “STOP” and “SINGLE” denote setting the running status of the frequency counter to “run”, “stop” and “single” respectively.
 - The command for setting the running status (the parameter is RUN, STOP or SINGLE) is only valid when the frequency counter function is enabled.
 - When the frequency counter function is enabled, the sync output of CH2 will be disabled.
 - In the “RUN” status, the frequency counter measures the input signal continuously according to the current configuration. In the “SINGLE” status, the frequency counter executes a measurement and then stops. In the “STOP” status, the frequency counter stops measuring.
 - When the frequency counter is enabled, the default running status is “run” and the instrument measures the input signal continuously according to the current configuration. At this point, if you send the :COUNter:STATe SINGLE command, the frequency counter enters the “single” status, finishes the current measurement and then stops; if you send the :COUNter:STATe STOP command, the frequency counter enters the “STOP” state immediately.
 - When the frequency counter is in the “STOP” status, the frequency counter performs a measurement and then enters the “STOP” status each time you send the :COUNter:STATe SINGLE command.

Return Format When the frequency counter function is enabled, the query returns the current running status (RUN, STOP or SINGLE); when the frequency counter function is disabled, the query returns OFF.

Example

```
:COUN OFF      /*Disable the frequency counter function*/
:COUN?         /*Query the status of the frequency counter and the query returns
               OFF*/
:COUN 1        /*Enable the frequency counter function*/
:COUN?         /*Query the status of the frequency counter and the query returns
               RUN (the default running status)*/
:COUN STOP     /*Set the running status of the frequency counter to “STOP”*/
:COUN?         /*Query the status of the frequency counter and the query returns
               STOP*/
```

:COUNter:STATistics:CLEAr

Syntax :COUNter:STATistics:CLEAr

Description Clear the statistic results.

- Explanation**
- This command is only valid when the statistic function of the frequency counter is enabled ([:COUNter:STATistics\[:STATe\]](#)).
 - The statistic results are cleared automatically when the statistic function of the frequency counter is disabled.

Related Command [:COUNter:STATistics\[:STATe\]](#)

:COUNter:STATistics:DISPlay

Syntax :COUNter:STATistics:DISPlay {DIGITAL|CURVE}
:COUNter:STATistics:DISPlay?

Description Set the display format of the statistic results of the measurement values of the frequency counter to DIGITAL or CURVE.

Query the display format of the statistic results of the measurement values of the frequency counter.

Parameter	Name	Type	Range	Default
	{DIGITAL CURVE}	Discrete	DIGITAL CURVE	DIGITAL

Return Format The query returns DIGITAL or CURVE.

Example

```
:COUN:STATI:DISP CURVE /*Set the display format of the statistic results of the
                        measurement values of the frequency counter to
                        CURVE*/

:COUN:STATI:DISP? /*Query the display format of the statistic results of
                  the measurement values of the frequency counter
                  and the query returns CURVE*/
```

:COUNter:STATistics[:STATe]

Syntax :COUNter:STATistics[:STATe] {ON|1|OFF|0}
:COUNter:STATistics[:STATe]?

Description Enable or disable the statistic function of the measurement values of the frequency counter.

Query the on/off status of the statistic function of the measurement values of the frequency counter.

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Return Format The query returns ON or OFF.

Example

```
:COUN:STATI ON /*Enable the statistic function of the measurement values of
                the frequency counter*/

:COUN:STATI? /*Query the on/off status of the statistic function of the
              measurement values of the frequency counter and the query
              returns ON*/
```

:COUPling Commands

The :COUPling commands are used to set the related information of the channel frequency coupling, amplitude coupling and phase coupling as well as enable and disable the three coupling functions.

Command List:

- ◆ [:COUPling:AMPL:DEViation](#)
- ◆ [:COUPling:AMPL:MODE](#)
- ◆ [:COUPling:AMPL:RATio](#)
- ◆ [:COUPling:AMPL\[:STATe\]](#)
- ◆ [:COUPling:FREQuency:DEViation](#)
- ◆ [:COUPling:FREQuency:MODE](#)
- ◆ [:COUPling:FREQuency:RATio](#)
- ◆ [:COUPling:FREQuency\[:STATe\]](#)
- ◆ [:COUPling:PHASe:DEViation](#)
- ◆ [:COUPling:PHASe:MODE](#)
- ◆ [:COUPling:PHASe:RATio](#)
- ◆ [:COUPling:PHASe\[:STATe\]](#)
- ◆ [:COUPling\[:STATe\]](#)

Note: The coupling function is only valid when both the two channels are in the basic waveform (Sine, Square, Ramp) or arbitrary waveform (except DC) mode.

:COUPling:AMPL:DEVIation

Syntax :COUPling:AMPL:DEVIation <deviation>

:COUPling:AMPL:DEVIation?

Description Set the amplitude deviation in the amplitude coupling.

Query the amplitude deviation in the amplitude coupling.

Parameter	Name	Type	Range	Default
	<deviation>	Real	-19.998Vpp to 19.998Vpp	0Vpp

- Explanation**
- Select the desired amplitude coupling mode ([:COUPling:AMPL:MODE](#)) and set the corresponding amplitude deviation or amplitude ratio ([:COUPling:AMPL:RATio](#)) before enabling the amplitude coupling function ([:COUPling:AMPL\[:STATe\]](#)). You cannot set the amplitude coupling mode and amplitude deviation/ratio after the amplitude coupling function is enabled.
 - When the amplitude coupling function is disabled, if the current amplitude coupling mode is amplitude deviation, send this command can set the amplitude deviation; if the current amplitude coupling mode is amplitude ratio, send this command can set the amplitude coupling mode to amplitude deviation and set the amplitude deviation.

Return Format The query returns the amplitude deviation in scientific notation. The return value contains 7 effective digits, for example, 1.000000E+00 (the amplitude deviation is 1Vpp).

Example :COUP:AMPL:DEV 1 /*Set the amplitude deviation in the amplitude coupling to 1Vpp*/

:COUP:AMPL:DEV? /*Query the amplitude deviation in the amplitude coupling and the query returns 1.000000E+00*/

Related Commands [:COUPling:AMPL:MODE](#)
[:COUPling:AMPL:RATio](#)
[:COUPling:AMPL\[:STATe\]](#)

:COUPling:AMPL:MODE

Syntax :COUPling:AMPL:MODE {OFFSet|RATio}

:COUPling:AMPL:MODE?

Description Set the amplitude coupling mode to amplitude deviation (OFFSet) or amplitude ratio (RATio).

Query the selected amplitude coupling mode.

Parameter

Name	Type	Range	Default
{OFFSet RATio}	Discrete	OFFSet RATio	RATio

Explanation

- Amplitude deviation mode: the amplitudes of CH1 and CH2 have certain deviation relation. The parameter relations are $A_{CH2} = A_{CH1} + A_{Dev}$ (the reference source is CH1); $A_{CH1} = A_{CH2} - A_{Dev}$ (the reference source is CH2). Wherein, A_{CH1} is the amplitude of CH1, A_{CH2} is the amplitude of CH2 and A_{Dev} is the amplitude deviation.
- Amplitude ratio mode: the amplitudes of CH1 and CH2 have certain ratio relation. The parameter relations are $A_{CH2} = A_{CH1} * A_{Ratio}$ (the reference source is CH1); $A_{CH1} = A_{CH2} / A_{Ratio}$ (the reference source is CH2). Wherein, A_{CH1} is the amplitude of CH1, A_{CH2} is the amplitude of CH2 and A_{Ratio} is the amplitude ratio.
- If the amplitude of CH1 or CH2 exceeds the amplitude upper limit or lower limit of the channel after the channel coupling, the instrument will automatically adjust the amplitude upper limit or lower limit of the other channel to avoid parameter overrange.
- Select the desired amplitude coupling mode and set the corresponding amplitude deviation ([:COUPling:AMPL:DEViation](#)) or amplitude ratio ([:COUPling:AMPL:RATio](#)) before enabling the amplitude coupling function ([:COUPling:AMPL\[:STATe\]](#)). You cannot set the amplitude coupling mode and amplitude deviation/ratio after the amplitude coupling function is enabled.

Return Format The query returns OFFSET or RATIO.

Example :COUP:AMPL:MODE OFFS /*Set the amplitude coupling mode to amplitude deviation*/

:COUP:AMPL:MODE? /*Query the amplitude coupling mode and the query returns OFFSET*/

Related Commands [:COUPling:AMPL:DEViation](#)
[:COUPling:AMPL:RATio](#)
[:COUPling:AMPL\[:STATe\]](#)

:COUPling:AMPL:RATio

Syntax :COUPling:AMPL:RATio {<value>|MINimum|MAXimum}
:COUPling:AMPL:RATio?

Description Set the amplitude ratio in the amplitude coupling.

Query the amplitude ratio in the amplitude coupling.

Parameter

Name	Type	Range	Default
<value>	Real	0.001 to 1000	1

- Explanation**
- Select the desired amplitude coupling mode ([:COUPling:AMPL:MODE](#)) and set the corresponding amplitude deviation ([:COUPling:AMPL:DEVIation](#)) or amplitude ratio before enabling the amplitude coupling function ([:COUPling:AMPL\[:STATe\]](#)). You cannot set the amplitude coupling mode and amplitude deviation/ratio after the amplitude coupling function is enabled.
 - When the amplitude coupling function is disabled, if the current amplitude coupling mode is amplitude ratio, send this command can set the amplitude ratio; if the current amplitude coupling mode is amplitude deviation, send this command can set the amplitude coupling mode to amplitude ratio and set the amplitude ratio.

Return Format The query returns the amplitude ratio in scientific notation. The return value contains 7 effective digits, for example, 1.123000E+00 (the amplitude ratio is 1.123).

Example :COUP:AMPL:RAT 1.123 /*Set the amplitude ratio in the amplitude coupling to 1.123*/

:COUP:AMPL:RAT? /*Query the amplitude ratio in the amplitude coupling and the query returns 1.123000E+00*/

Related Commands [:COUPling:AMPL:DEVIation](#)
[:COUPling:AMPL:MODE](#)
[:COUPling:AMPL\[:STATe\]](#)

:COUPling:AMPL[:STATe]

Syntax :COUPling:AMPL[:STATe] {ON|1|OFF|0}

:COUPling:AMPL[:STATe]?

Description Enable or disable the amplitude coupling function.

Query the on/off status of the amplitude coupling function.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

- Explanation**
- After the amplitude coupling function is enabled, CH1 and CH2 take each other as the reference source. When the amplitude of a channel (this channel is the reference source) is changed, the amplitude of the other channel changes accordingly automatically and always keeps the specified amplitude deviation or ratio with that of the reference channel.
 - Select the desired amplitude coupling mode ([:COUPling:AMPL:MODE](#)) and set the corresponding amplitude deviation ([:COUPling:AMPL:DEVIation](#)) or amplitude ratio ([:COUPling:AMPL:RATio](#)) before enabling the amplitude coupling function. You cannot set the amplitude coupling mode and amplitude deviation/ratio after the amplitude coupling function is enabled.
 - You can also send the [\[:SOURce\[<n>\]\]:VOLTage:COUPle\[:STATe\]](#) command to set or query the on/off status of the amplitude coupling function.

Return Format The query returns ON or OFF.

Example :COUP:AMPL ON /*Enable the amplitude coupling function*/

:COUP:AMPL? /*Query the on/off status of the amplitude coupling function and the query returns ON*/

Related Commands [:COUPling:AMPL:DEVIation](#)

[:COUPling:AMPL:MODE](#)

[:COUPling:AMPL:RATio](#)

[\[:SOURce\[<n>\]\]:VOLTage:COUPle\[:STATe\]](#)

:COUPLing:FREQuency:DEViation

Syntax :COUPLing:FREQuency:DEViation <deviation>

:COUPLing:FREQuency:DEViation?

Description Set the frequency deviation in the frequency coupling.

Query the frequency deviation in the frequency coupling.

Parameter	Name	Type	Range	Default
	<deviation>	Real	-59.999 999 999 999MHz to 59.999 999 999 999MHz	0Hz

- Explanation**
- Select the desired frequency coupling mode ([:COUPLing:FREQuency:MODE](#)) and set the corresponding frequency deviation or frequency ratio ([:COUPLing:FREQuency:RATio](#)) before enabling the frequency coupling function ([:COUPLing:FREQuency\[:STATe\]](#)). You cannot set the frequency coupling mode and frequency deviation/ratio after the frequency coupling function is enabled.
 - When the frequency coupling function is disabled, if the current frequency coupling mode is frequency deviation, send this command can set the frequency deviation; if the current frequency coupling mode is frequency ratio, send this command can set the frequency coupling mode to frequency deviation and set the frequency deviation.
 - You can also send the [\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#) command to set or query the frequency deviation in the frequency coupling.

Return Format The query returns the frequency deviation in scientific notation. The return value contains 7 effective digits, for example, 1.000000E+02 (the frequency deviation is 100Hz).

Example :COUP:FREQ:DEV 100 /*Set the frequency deviation in the frequency coupling to 100Hz*/

:COUP:FREQ:DEV? /*Query the frequency deviation in the frequency coupling and the query returns 1.000000E+02*/

Related Commands

- [:COUPLing:FREQuency:MODE](#)
- [:COUPLing:FREQuency:RATio](#)
- [:COUPLing:FREQuency\[:STATe\]](#)
- [\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)

:COUPling:FREQuency:MODE

Syntax :COUPling:FREQuency:MODE {OFFSet|RATio}

:COUPling:FREQuency:MODE?

Description Set the frequency coupling mode to frequency deviation (OFFSet) or frequency ratio (RATio).

Query the selected frequency coupling mode.

Parameter

Name	Type	Range	Default
{OFFSet RATio}	Discrete	OFFSet RATio	RATio

- Explanation**
- Frequency deviation mode: the frequencies of CH1 and CH2 have certain deviation relation. The parameter relations are $F_{CH2}=F_{CH1}+F_{Dev}$ (the reference source is CH1); $F_{CH1}=F_{CH2}-F_{Dev}$ (the reference source is CH2). Wherein, F_{CH1} is the frequency of CH1, F_{CH2} is the frequency of CH2 and F_{Dev} is the frequency deviation.
 - Frequency ratio mode: the frequencies of CH1 and CH2 have certain ratio relation. The parameter relations are $F_{CH2}=F_{CH1} * F_{Ratio}$ (the reference source is CH1); $F_{CH1}=F_{CH2}/F_{Ratio}$ (the reference source is CH2). Wherein, F_{CH1} is the frequency of CH1, F_{CH2} is the frequency of CH2 and F_{Ratio} is the frequency ratio.
 - If the frequency of CH1 or CH2 exceeds the frequency upper limit or lower limit of the channel after the channel coupling, the instrument will automatically adjust the frequency upper limit or lower limit of the other channel to avoid parameter overrange.
 - Select the desired frequency coupling mode and set the corresponding frequency deviation ([:COUPling:FREQuency:DEVIation](#)) or frequency ratio ([:COUPling:FREQuency:RATio](#)) before enabling the frequency coupling function ([:COUPling:FREQuency\[:STATe\]](#)). You cannot set the frequency coupling mode and frequency deviation/ratio after the frequency coupling function is enabled.
 - You can also send the [\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#) command to set or query the frequency coupling mode of the specified channel.

Return Format The query returns OFFSET or RATIO.

Example :COUP:FREQ:MODE OFFS /*Set the frequency coupling mode to frequency deviation*/

:COUP:FREQ:MODE? /*Query the selected frequency coupling mode and the query returns OFFSET*/

Related Commands [:COUPling:FREQuency:DEVIation](#)

[:COUPling:FREQuency:RATio](#)

[:COUPling:FREQuency\[:STATe\]](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)

:COUPling:FREQuency:RATio

Syntax :COUPling:FREQuency:RATio {<value>|MINimum|MAXimum}

:COUPling:FREQuency:RATio?

Description Set the frequency ratio in the frequency coupling.

Query the frequency ratio in the frequency coupling.

Parameter	Name	Type	Range	Default
	<value>	Real	0.000 001 to 1 000 000	1

- Explanation**
- Select the desired frequency coupling mode ([:COUPling:FREQuency:MODE](#)) and set the corresponding frequency deviation ([:COUPling:FREQuency:DEViation](#)) or frequency ratio before enabling the frequency coupling function ([:COUPling:FREQuency\[:STATe\]](#)). You cannot set the frequency coupling mode and frequency deviation/ratio after the frequency coupling function is enabled.
 - When the frequency coupling function is disabled, if the current frequency coupling mode is frequency ratio, send this command can set the frequency ratio; if the current frequency coupling mode is frequency deviation, send this command can set the frequency coupling mode to frequency ratio and set the frequency ratio.
 - You can also send the [\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#) command to set or query the frequency ratio in the frequency coupling.

Return Format The query returns the frequency ratio in scientific notation. The return value contains 7 effective digits, for example, 1.001230E+02 (the frequency ratio is 100.123).

Example :COUP:FREQ:RAT 100.123 /*Set the frequency ratio in the frequency coupling to 100.123*/

:COUP:FREQ:RAT? /*Query the frequency ratio in the frequency coupling and the query returns 1.001230E+02*/

Related Commands

- [:COUPling:FREQuency:MODE](#)
- [:COUPling:FREQuency:DEViation](#)
- [:COUPling:FREQuency\[:STATe\]](#)
- [\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)

:COUPling:FREQuency[:STATe]

Syntax :COUPling:FREQuency[:STATe] {ON|1|OFF|0}

:COUPling:FREQuency[:STATe]?

Description Enable or disable the frequency coupling function.

Query the on/off status of the frequency coupling function.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation

- When the frequency coupling mode is disabled, you can select the frequency coupling mode and set the corresponding frequency deviation or frequency ratio. After the frequency coupling function is enabled, CH1 and CH2 take each other as the reference source. When the frequency of a channel (this channel is the reference source) is changed, the frequency of the other channel changes accordingly automatically and always keeps the specified frequency deviation or ratio with that of the reference channel.
- Select the desired frequency coupling mode ([:COUPling:FREQuency:MODE](#)) and set the corresponding frequency deviation ([:COUPling:FREQuency:DEVIation](#)) or frequency ratio ([:COUPling:FREQuency:RATio](#)) before enabling the frequency coupling function. You cannot set the frequency coupling mode and frequency deviation/ratio after the frequency coupling function is enabled.
- You can also send the [\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#) command to set or query the status of the frequency counter function.

Return Format The query returns ON or OFF.

Example :COUP:FREQ ON /*Enable the frequency coupling function*/

:COUP:FREQ? /*Query the on/off status of the frequency coupling function and the query returns ON*/

Related Commands [:COUPling:FREQuency:DEVIation](#)

[:COUPling:FREQuency:MODE](#)

[:COUPling:FREQuency:RATio](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)

:COUPling:PHASe:DEVIation

Syntax :COUPling:PHASe:DEVIation <deviation>

:COUPling:PHASe:DEVIation?

Description Set the phase deviation in the phase coupling.

Query the phase deviation in the phase coupling.

Parameter

Name	Type	Range	Default
<deviation>	Real	-360° to 360°	0

- Explanation**
- Select the desired phase coupling mode ([:COUPling:PHASe:MODE](#)) and set the corresponding phase deviation or phase ratio ([:COUPling:PHASe:RATio](#)) before enabling the phase coupling function ([:COUPling:PHASe\[:STATe\]](#)). You cannot set the phase coupling mode and phase deviation/ratio after the phase coupling function is enabled.
 - When the phase coupling function is disabled, if the current phase coupling mode is phase deviation, send this command can set the phase deviation; if the current phase coupling mode is phase ratio, send this command can set the phase coupling mode to phase deviation and set the phase deviation.

Return Format The query returns the phase deviation in scientific notation. The return value contains 7 effective digits, for example, 9.000000E+01 (the phase deviation is 90°).

Example

```
:COUP:PHAS:DEV 90      /*Set the phase deviation in the phase coupling to 90°*/
:COUP:PHAS:DEV?        /*Query the phase deviation in the phase coupling and the
                        query returns 9.000000E+01*/
```

Related Commands

- [:COUPling:PHASe:MODE](#)
- [:COUPling:PHASe:RATio](#)
- [:COUPling:PHASe\[:STATe\]](#)

:COUPLing:PHASe:MODE

Syntax :COUPLing:PHASe:MODE {OFFSet|RATio}

:COUPLing:PHASe:MODE?

Description Set the phase coupling mode to phase deviation (OFFSet) or phase ratio (RATio).

Query the selected phase coupling mode.

Parameter

Name	Type	Range	Default
{OFFSet RATio}	Discrete	OFFSet RATio	RATio

- Explanation**
- Phase deviation mode: the phase of CH1 and CH2 have certain deviation relation. The parameter relations are $P_{CH2} = P_{CH1} + P_{Dev}$ (the reference source is CH1); $P_{CH1} = P_{CH2} - P_{Dev}$ (the reference source is CH2). Wherein, P_{CH1} is the phase of CH1, P_{CH2} is the phase of CH2 and P_{Dev} is the phase deviation.
 - Phase ratio mode: the phase of CH1 and CH2 have certain ratio relation. The parameter relations are $P_{CH2} = P_{CH1} * P_{Ratio}$ (the reference source is CH1); $P_{CH1} = P_{CH2} / P_{Ratio}$ (the reference source is CH2). Wherein, P_{CH1} is the phase of CH1, P_{CH2} is the phase of CH2 and P_{Ratio} is the phase ratio.
 - If the phase of CH1 or CH2 exceeds the phase upper limit or lower limit of the channel after the channel coupling, the instrument will automatically adjust the phase upper limit or lower limit of the other channel to avoid parameter overrange.
 - Select the desired phase coupling mode and set the corresponding phase deviation (:COUPLing:PHASe:DEVIation) or phase ratio (:COUPLing:PHASe:RATio) before enabling the phase coupling function (:COUPLing:PHASe[:STATe]). You cannot set the phase coupling mode and phase deviation/ratio after the phase coupling function is enabled.

Return Format The query returns OFFSET or RATIO.

Example :COUP:PHAS:MODE OFFS /*Set the phase coupling mode to phase deviation*/
:COUP:PHAS:MODE? /*Query the phase coupling mode and the query returns OFFSET*/

Related Commands [:COUPLing:PHASe:DEVIation](#)
[:COUPLing:AMPL:RATio](#)
[:COUPLing:PHASe\[:STATe\]](#)

:COUPling:PHASe:RATio

Syntax :COUPling:PHASe:RATio {<value>|MINimum|MAXimum}
:COUPling:PHASe:RATio?

Description Set the phase ratio in the phase coupling.

Query the phase ratio in the phase coupling.

Parameter

Name	Type	Range	Default
<value>	Real	0.01 to 100	1

- Explanation**
- Select the desired phase coupling mode ([:COUPling:PHASe:MODE](#)) and set the corresponding phase deviation or phase ratio ([:COUPling:PHASe:RATio](#)) before enabling the phase coupling function ([:COUPling:PHASe\[:STATe\]](#)). You cannot set the phase coupling mode and phase deviation/ratio after the phase coupling function is enabled.
 - When the phase coupling function is disabled, if the current phase coupling mode is phase ratio, send this command can set the phase ratio; if the current phase coupling mode is phase deviation, send this command can set the phase coupling mode to phase ratio and set the phase ratio.

Return Format The query returns the phase ratio in scientific notation. The return value contains 7 effective digits, for example, 1.120000E+00 (the phase ratio is 1.12).

Example :COUP:PHAS:RAT 1.12 /*Set the phase ratio in the phase coupling to 1.12*/
:COUP:PHAS:RAT? /*Query the phase ratio in the phase coupling and the query returns 1.120000E+00*/

Related Commands [:COUPling:PHASe:MODE](#)
[:COUPling:PHASe:RATio](#)
[:COUPling:PHASe\[:STATe\]](#)

:COUPling:PHASe[:STATe]

Syntax :COUPling:PHASe[:STATe] {ON|1|OFF|0}
 :COUPling:PHASe[:STATe]?

Description Enable or disable the phase coupling function.

Query the on/off status of the phase coupling function.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

- Explanation**
- After the phase coupling function is enabled, CH1 and CH2 take each other as the reference source. When the phase of a channel (this channel is the reference source) is changed, the phase of the other channel changes accordingly automatically and always keeps the specified phase deviation or ratio with that of the reference channel.
 - Select the desired phase coupling mode ([:COUPling:PHASe:MODE](#)) and set the corresponding phase deviation ([:COUPling:PHASe:DEVIation](#)) or phase ratio ([:COUPling:PHASe:RATio](#)) before enabling the phase coupling function. You cannot set the phase coupling mode and phase deviation/ratio after the phase coupling function is enabled.
 - When the phase coupling function is disabled, you can select the phase coupling mode and set the corresponding phase deviation or ratio.

Return Format The query returns ON or OFF.

Example :COUP:PHAS ON /*Enable the phase coupling function*/
 :COUP:PHAS? /*Query the on/off status of the phase coupling function and the query returns ON*/

Related Commands [:COUPling:PHASe:DEVIation](#)
[:COUPling:PHASe:MODE](#)
[:COUPling:PHASe:RATio](#)

:COUPling[:STATe]

Syntax :COUPling[:STATe] {ON|1|OFF|0}
:COUPling[:STATe]?

Description Enable or disable the frequency coupling, phase coupling and amplitude coupling of the channel at the same time.

Query the on/off states of the frequency coupling, phase coupling and amplitude coupling of the channel.

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation

- DG1000Z supports the frequency, amplitude and phase coupling functions. After the coupling functions are enabled, CH1 and CH2 take each other as the reference source. When the frequency, amplitude or phase of a channel (this channel is the reference source) is changed, the frequency, amplitude or phase of the other channel changes accordingly automatically and always keeps the specified frequency deviation/ratio, amplitude deviation/ratio or phase deviation/ratio with that of the reference channel.
- You can also enable or disable the frequency coupling function ([:COUPling:FREQuency\[:STATe\]](#)), phase coupling function ([:COUPling:PHASe\[:STATe\]](#)) and amplitude coupling function ([:COUPling:AMPL\[:STATe\]](#)) respectively.

Return Format The query returns a string consisting of 3 parts (represent the on/off states of the frequency coupling, phase coupling and amplitude coupling functions in order) separated by commas, for example, `FREQ:ON,PHASE:OFF,AMPL:OFF`.

Example

```
:COUP ON      /*Enable the frequency coupling, phase coupling and amplitude
               coupling of the channel at the same time*/

:COUP?        /*Query the on/off states of the frequency coupling, phase coupling
               and amplitude coupling of the channel and the query returns
               FREQ:ON,PHASE:ON,AMPL:ON*/
```

Related Commands

- [:COUPling:AMPL\[:STATe\]](#)
- [:COUPling:FREQuency\[:STATe\]](#)
- [:COUPling:PHASe\[:STATe\]](#)

:DISPlay Commands

The :DISPlay commands are used to set the display-related information, display the specified characters on the screen and clear the characters displayed on the screen.

Command List:

- ◆ [:DISPlay:BRIGhtness](#)
- ◆ [:DISPlay:CONTrast](#)
- ◆ [:DISPlay:DATA?](#)
- ◆ [:DISPlay:MODE](#)
- ◆ [:DISPlay:SAVer:IMMediate](#)
- ◆ [:DISPlay:SAVer\[:STATe\]](#)
- ◆ [:DISPlay\[:STATe\]](#)
- ◆ [:DISPlay:TEXT?](#)
- ◆ [:DISPlay:TEXT:CLEAr](#)
- ◆ [:DISPlay:TEXT\[:SET\]](#)

:DISPlay:BRIGhtness

Syntax :DISPlay:BRIGhtness {<brightness>|MINimum|MAXimum}
:DISPlay:BRIGhtness? [MINimum|MAXimum]

Description Set the screen brightness.

Query the screen brightness.

Parameter

Name	Type	Range	Default
<brightness>	Integer	1% to 100%	50%

Return Format The query returns the screen brightness in scientific notation. The return value contains 7 effective digits, for example, 5.100000E+01 (the screen brightness is 51%).

Example :DISP:BRIG 51 /*Set the screen brightness to 51%*/
:DISP:BRIG? /*Query the screen brightness and the query returns
5.100000E+01*/

:DISPlay:CONTRast

Syntax :DISPlay:CONTRast {<contrast>|MINimum|MAXimum}

:DISPlay:CONTRast? [MINimum|MAXimum]

Description Set the screen contrast.

Query the screen contrast.

Parameter

Name	Type	Range	Default
<contrast>	Integer	1% to 100%	25%

Return Format The query returns the screen contrast in scientific notation. The return value contains 7 effective digits, for example, 2.800000E+01 (the screen contrast is 28%).

Example :DISP:CONT 28 /*Set the screen contrast to 28%*/
 :DISP:CONT? /*Query the screen contrast and the query returns
 2.800000E+01*/

:DISPlay:DATA?

Syntax :DISPlay:DATA?

Description Query the image of the front panel screen (screenshot).

Explanation You can also send the [:HCOPY:SDUMp:DATA?](#) to query the image of the front panel screen.

Return Format The query returns a definite-length binary data block containing the image. The block starts with #. For example, #9000230456BM6\x84\x03\x00.....; wherein, “9” following “#” denotes that the 9 characters following (000230456) are used to denote the data length.

Related Command [:HCOPY:SDUMp:DATA?](#)

:DISPlay:MODE

Syntax :DISPlay:MODE {DPV|DGV|SV}

:DISPlay:MODE?

Description Set the display mode to dual-channel parameters (DPV), dual-channel graph (DGV) or single-channel (SV) display mode.

Query the display mode.

Parameter

Name	Type	Range	Default
{DPV DGV SV}	Discrete	DPV DGV SV	DPV

Explanation

- Dual-channel parameters (DPV): display the parameters and waveforms of the two channels in both the digital and graph forms.
- Dual-channel graph (DGV): display the waveforms of the two channels in graph form.
- Single-channel (SV): display the parameters and waveform of the channel currently selected in both the digital and graph forms.

Return Format The query returns DPV, DGV or SV.

Example :DISP:MODE DGV /*Set the display mode to dual-channel graph*/
:DISP:MODE? /*Query the display mode and the query returns DGV*/

:DISPlay:SAVer:IMMediate

Syntax :DISPlay:SAVer:IMMediate

Description Enable the screen saver immediately without waiting.

:DISPlay:SAVer[:STATe]

Syntax :DISPlay:SAVer[:STATe] {ON|1|OFF|0}

:DISPlay:SAVer[:STATe]?

Description Enable or disable the screen saver function.

Query the on/off status of the screen saver function.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

Explanation When the screen saver function is enabled, the instrument enters the screen saver mode automatically when you stop operating the instrument for more than 15 minutes and it enters the black screen state automatically after another 30 minutes.

Return Format The query returns ON or OFF.

Example :DISP:SAV OFF /*Disable the screen saver function*/
:DISP:SAV? /*Query the on/off status of the screen saver function and the query returns OFF*/
:DISP:SAV 1 /*Enable the screen saver function*/
:DISP:SAV? /*Query the on/off status of the screen saver function and the query returns ON*/

:DISPlay[:STATe]

Syntax :DISPlay[:STATe] {ON|1|OFF|0}

:DISPlay[:STATe]?

Description Enable or disable the screen display.

Query the status of the screen display.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

Explanation The disabling the screen display function is only valid when the instrument is in the remote mode. When the instrument returns to the local mode, the screen display is enabled automatically. Press **Help** at the front panel to make the instrument return to the local mode from the remote mode.

Return Format The query returns ON or OFF.

Example

```
:DISP OFF      /*Disable the screen display*/
:DISP?         /*Query the status of the screen display and the query returns
               OFF*/
:DISP 1        /*Enable the screen display*/
:DISP?         /*Query the status of the screen display and the query returns ON*/
```

:DISPlay:TEXT?

Syntax :DISPlay:TEXT?

Description Query the string currently displayed on the screen.

Explanation You can send the [:DISPlay:TEXT:CLEAr](#) command to clear the string currently displayed on the screen.

Return Format The query returns a string enclosed in double quotation marks and the content in the double quotation marks is the content currently displayed on the screen (the double quotation marks at the outermost of the string are not displayed on the screen), for example, "RIGOL".

Example

```
:DISP:TEXT "RIGOL",25,35 /*Display the string RIGOL from (25,35) on the
screen*/
:DISP:TEXT?              /*Query the string currently displayed on the screen
and the query returns "RIGOL"*/
```

Related Command [:DISPlay:TEXT:CLEAr](#)

:DISPlay:TEXT:CLEAr

Syntax :DISPlay:TEXT:CLEAr

Description Clear the string currently displayed on the screen.

Explanation You can send the [:DISPlay:TEXT?](#) command to query the string currently displayed on the screen.

Related Command [:DISPlay:TEXT?](#)

:DISPlay:TEXT[:SET]

Syntax :DISPlay:TEXT[:SET] <quoted string>[,x[,y]]

Description Display the specified string from the specified coordinate on the screen.

Parameter

Name	Type	Range	Default
<quoted string>	ASCII string	Refer to the "Explanation"	None
x	Integer	2 to 319	2
y	Integer	2 to 239	2

- Explanation**
- <quoted string> is a string enclosed in double quotation marks (note that the double quotation marks at the outermost of the string are not displayed on the screen), for example, "RIGOL". The specified string can contain up to 45 characters and the command is invalid when the specified string exceeds 45 characters. The specified string will be truncated when it cannot be displayed in a single row.
 - The x and y in [,x[,y]] denotes the coordinate setting values of the X axis (the horizontal axis) and Y axis (the vertical axis) respectively (the coordinate values set are the coordinate values of the upper-left corner of the string displayed on the screen). When only one coordinate value is specified, the instrument treated it as the horizontal axis value (x) by default. When the parameters are omitted, the instrument displays the specified string from the last effective coordinate (if no coordinate has been set after power-on, the default coordinate will be used).
 - You can send the [:DISPlay:TEXT?](#) command to query the string currently displayed on the screen or send the [:DISPlay:TEXT:CLEAr](#) command to clear the string currently displayed on the screen.

Return Format The query returns a string enclosed in double quotation marks and the content in the double quotation marks is the content currently displayed on the screen (the double quotation marks at the outermost of the string are not displayed on the screen), for example, "RIGOL".

Example :DISP:TEXT "RIGOL",25,35 /*Display the string RIGOL from (25,35) on the screen*/

Related Commands [:DISPlay:TEXT?](#)
[:DISPlay:TEXT:CLEAr](#)

:HCOPy Commands

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

Command List:

- ◆ [:HCOPy:SDUMp:DATA?](#)
- ◆ [:HCOPy:SDUMp:DATA:FORMat](#)

:HCOPy:SDUMp:DATA?

Syntax :HCOPy:SDUMp:DATA?

Description Query the image displayed on the front panel screen (screenshot).

Explanation You can also send the [:DISPlay:DATA?](#) command to query the image displayed on the front panel screen.

Return Format The query returns a definite-length binary data block containing the image. The block starts with #. For example, #9000230456BM6\x84\x03\x00.....; wherein, “9” following “#” denotes that the 9 characters following (000230456) are used to denote the data length.

Related Command [:DISPlay:DATA?](#)

:HCOPy:SDUMp:DATA:FORMat

Syntax :HCOPy:SDUMp:DATA:FORMat BMP
:HCOPy:SDUMp:DATA:FORMat?

Description Set the format of the image returned of the screenshot operation to BMP.
Query the format of the image returned of the screenshot operation.

Return Format The query returns BMP.

Example

:HCOP:SDUM:DATA:FORM BMP	/*Set the format of the image returned of the screenshot operation to BMP*/
:HCOP:SDUM:DATA:FORM?	/*Query the format of the image returned of the screenshot operation and the query returns BMP*/

IEEE488.2 Common Commands

The IEEE488.2 standard defines a series of common commands used to execute various functions, such as the reset, self-test and status operations.

Command List:

- ◆ [*CLS](#)
- ◆ [*ESE](#)
- ◆ [*ESR?](#)
- ◆ [*IDN?](#)
- ◆ [*OPC](#)
- ◆ [*OPT?](#)
- ◆ [*PSC](#)
- ◆ [*RCL](#)
- ◆ [*RST](#)
- ◆ [*SAV](#)
- ◆ [*SRE](#)
- ◆ [*STB?](#)
- ◆ [*TRG](#)
- ◆ [*WAI](#)

*CLS

Syntax *CLS

Description Clear the event registers of all the register sets and the error queue.

ESE*Syntax** *ESE <value>

*ESE?

Description Enable the bits to be reported to the status byte register in the standard event register.

Query the bits enabled in the standard event register.

Parameter

Name	Type	Range	Default
<value>	Integer	Refer to the "Explanation"	None

Explanation

- <value> is a decimal value corresponding to the sum of the binary weights of the bits to be reported to the status byte register in the standard event register.
- When <enable value> is set to 0, executing this command will clear the enable register of the standard even register.
- If you have configured the instrument using the [*PSC 1](#) command, the enable register of the standard event register will be cleared at the next power-on of the instrument; if you have configured the instrument using the [*PSC 0](#) command, the enable register of the standard event register will not be cleared at the next power-on of the instrument.

Return Format The query returns a decimal value corresponding to the sum of the binary weights of the bits enabled in the standard event register.**Related Command** [*PSC](#)***ESR?****Syntax** *ESR?**Description** Query the event register of the standard event register.

Explanation The event register of the standard event register is read-only. Its bits are latched and the event register will be cleared when you query it. Once a bit is set, the later occurred events corresponding to that bit will be ignored until the register is cleared by the query command or the [*CLS](#) command (used to clear the status).

Return Format The query returns a decimal value corresponding to the sum of the binary weights of all the bits in the event register of the standard event register.**Related Command** [*CLS](#)***IDN?****Syntax** *IDN?**Description** Query the ID string of the instrument.

Return Format The query returns the ID string of the instrument. The return value consists of 4 parts separated by commas, for example, Rigol Technologies,DG1062Z,DG1ZA000000001,00.01.03; wherein, the first part is the manufacturer name, the second part is the instrument model, the third part is the instrument serial number and the forth part is the digital board version number.

OPC*Syntax** *OPC

*OPC?

Description Set the OPC (operation complete) bit in the standard event register after all the previous commands that have been sent are executed.

Query whether all the previous commands that have been sent are executed. If yes, return 1 to the output buffer.

- Explanation**
- Here, “operation complete” refers to that all the previous commands that have been sent, including the *OPC command, are executed.
 - You can also use the *OPC (operation complete) or *OPC? (operation complete query) command to set the system to output signal when finishing the sweep or burst. The *OPC commands sets the OPC (operation complete) bit in the standard event register after all the previous commands that have been sent are executed; when the bus is used to trigger the sweep or burst, the system can execute other commands before this bit is set. The *OPC? command returns 1 to the output buffer after all the previous commands that have been sent are executed and the system cannot execute any other command before this command is completed.
 - Sending the *OPC? command (query command) and reading the result can ensure synchronization.
 - When setting the instrument by programming (by executing command strings), taking the *OPC command as the last command of the command queue can determine when the command queue is completed (the OPC (operation complete) bit in the standard event register is set after the command queue is completed).

Return Format The query returns 1 or 0.

Example *OPC /*Configure the instrument to set the OPC (operation complete) bit in the standard event register after all the previous commands that have been sent are executed*/

*OPC? /*Query whether all the previous commands that have been sent are executed. If yes, return 1 to the output buffer*/

OPT?*Syntax** *OPT?**Description** Query whether the 16M internal memory option (Arb 16M) has been installed.**Return Format** The query returns OFFICAL (the 16M internal memory option has been installed) or UNINSTALL (the 16M internal memory option is not installed).

PSC*Syntax** *PSC {0|1}

*PSC?

Description Enable or disable the function to clear the status byte enable register and standard event enable register at power-on.

Query whether to clear the status byte enable register and standard event enable register at power-on.

Parameter

Name	Type	Range	Default
{0 1}	Discrete	0 1	1

Explanation

- The *PSC 1 command means clearing the status byte enable register and standard event enable register at power-on. The *PSC 0 command means the status byte enable register and standard event enable register will not be affected at power-on.
- You can also send the [*SRE 0](#) and [*ESE 0](#) commands to clear the status byte enable register and standard event enable register respectively.

Return Format The query returns 0 or 1.**Example**

*PSC 1 /*Enable the function to clear the status byte enable register and standard event enable register at power-on*/

*PSC? /*Query the status clear setting at power-on and the query returns 1*/

Related Commands[*ESE](#)[*SRE](#)

***RCL**

Syntax *RCL
 {USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10|
 ARB1|ARB2|ARB3|ARB4|ARB5|ARB6|ARB7|ARB8|ARB9|ARB10}

Description Recall the state file (USER) or arbitrary waveform file (ARB) stored in the specified location in the internal non-volatile memory.

Parameter	Name	Type	Range	Default
	{USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10 ARB1 ARB2 ARB3 ARB4 ARB5 ARB6 ARB7 ARB8 ARB9 ARB10}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10 ARB1 ARB2 ARB3 ARB4 ARB5 ARB6 ARB7 ARB8 ARB9 ARB10	None

- Explanation**
- The instrument provides 10 storage locations (numbered 1 to 10) in the internal memory for storing the state files and arbitrary waveform files respectively. Sending this command can recall the state file or arbitrary waveform file stored in the specified storage location in the internal non-volatile memory. Select number 1 to 10 to recall the state file or arbitrary waveform file stored in the corresponding storage location respectively.
 - This command is only valid when an effective state file or arbitrary waveform file is stored in the specified storage location in the internal non-volatile memory.
 - The state file stored includes the waveforms, frequencies, amplitudes, offsets, duty cycles, symmetries, phases, the modulation, sweep, burst parameters, the frequency counter parameters of the two channels as well as the utility parameters and system parameters under the Utility menu.
 - The arbitrary waveform file stores the voltage corresponding to each waveform point in binary data form. In the sample rate editing mode, there are only **Sa** points if the number of points is set to **Sa** and the voltage of each point is the voltage set by users. In the period editing mode, if the number of points is set to **Sa**, the voltages of the first **Sa** points is the voltages set by users and the voltages of the (**Sa**+1)th point to 8192nd point are low level. The voltage of each point occupies 2 bytes (namely 16 bits); wherein, the 14 low-order bits denote the voltage and the 2 high-order bits are not used. Therefore, the format of the binary data is 0x0000 to 0x3FFF; wherein, 0x0000 corresponds to the low level of the arbitrary waveform and 0x3FFF corresponds to the high level of the arbitrary waveform.

RST*Syntax** *RST**Description** Restore the instrument to its factory state.

- Explanation**
- Restore the instrument to its factory state (please refer to “**Appendix B: Factory Setting**”) and it is not affected by the [:MEMory:STATe:RECall:AUTO](#) command.
 - This command will stop the sweep or burst in progress in an abnormal way and the screen display will be turned on if it is previously turned off (using the [:DISPlay\[:STATe\]](#) command).

Related Commands [:DISPlay\[:STATe\]](#)
[:MEMory:STATe:RECall:AUTO](#)

***SAV**

Syntax *SAV
 {USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10|
 ARB1|ARB2|ARB3|ARB4|ARB5|ARB6|ARB7|ARB8|ARB9|ARB10}

Description Store the current instrument state (USER) or arbitrary waveform data (ARB) in the specified storage location in the internal non-volatile memory with the default name.

Parameter	Name	Type	Range	Default
	{USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10 ARB1 ARB2 ARB3 ARB4 ARB5 ARB6 ARB7 ARB8 ARB9 ARB10}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10 ARB1 ARB2 ARB3 ARB4 ARB5 ARB6 ARB7 ARB8 ARB9 ARB10	None

- Explanation**
- The internal memory of the instrument provides 10 storage locations (numbered 1 to 10) for the instrument state and arbitrary waveform data respectively. The default state file name is Scpin.RSF and the default arbitrary waveform file name is Scpin.RAF; wherein, n corresponds to the number of the storage location.
 - If the specified storage location already contains a file, this command will store the current instrument state or arbitrary waveform data in the specified storage location and directly overwrite the original file. If the original state file in the specified storage location is locked ([:MEMory:STATe:LOCK](#)), this command is invalid (do not overwrite the original file).
 - For the introductions of the state file and arbitrary waveform file, please refer to the “Explanation” under the [*RCL](#) command.
 - You can send the [*RCL](#) command to recall the state file and arbitrary waveform file stored in the internal non-volatile memory of the instrument.

Example *SAV USER1 /*Store the current instrument state in storage location 1 in the internal non-volatile memory of the instrument with the filename Scpi1.RSF*/

Related Commands [:MEMory:STATe:LOCK](#)
[*RCL](#)

SRE*Syntax** *SRE <value>

*SRE?

Description Enable the bits in the status byte register to generate service request.

Query the bits enabled in the status byte register.

Parameter

Name	Type	Range	Default
<value>	Integer	Refer to the "Explanation"	None

- Explanation**
- <value> is a decimal value corresponding to the sum of the binary weights of the bits enabled in the status byte register. The bits selected are accumulated on bit6 (main accumulation bit) of the status byte register and service request will be generated if any of the bits selected changes from 0 to 1.
 - When <value> is set to 0, executing this command will clear the enable register of the status byte register.
 - If you have configured the instrument using the [*PSC 1](#) command, the enable register of the status byte register will be cleared at the next power-on of the instrument; if you have configured the instrument using the [*PSC 0](#) command, the enable register of the status byte register will not be cleared at the next power-on of the instrument.

Return Format The query returns a decimal value corresponding to the sum of the binary weights of the bits enabled in the status byte register.

Related Command [*PSC](#)

STB?*Syntax** *STB?**Description** Query the status register of the status byte register.

Explanation This command cannot clear the service request. Bit6 (main accumulation bit) of the status byte register will not be cleared as long as the condition that generates the service request is still in effect.

Return Format The query returns a decimal value corresponding to the sum of the binary weights of all the bits in the status register of the status byte register.

TRG*Syntax** *TRG**Description** Trigger a sweep or burst.

Explanation

- You can only trigger the sweep or burst via the remote interface when the sweep or burst function is currently enabled and the trigger source is set to manual (use the [\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#) or [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#) command).
- You can also send the [\[:SOURce\[<n>\]\]:SWEep:TRIGger\[:IMMediate\]](#) or [\[:SOURce\[<n>\]\]:BURSt:TRIGger\[:IMMediate\]](#) command to trigger a sweep or burst when the sweep or burst function is currently enabled and the trigger source is set to manual.

Related Commands

- [\[:SOURce\[<n>\]\]:BURSt:TRIGger\[:IMMediate\]](#)
- [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)
- [\[:SOURce\[<n>\]\]:SWEep:TRIGger\[:IMMediate\]](#)
- [\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#)

WAI*Syntax** *WAI

Description Execute any other command via the interface after all the pending operations are completed.

Explanation This command is only applicable to the triggered sweep mode or triggered burst mode, and is used to ensure synchronization.

:LICense Command

The :LICense command is used to install the 16M internal memory option (used to expand the memory depth of the arbitrary waveform).

Before installing the option, you need to acquire the option license through the following method.

1. Order this option (its ordering number is Arb16M-DG1000Z) to acquire the key.
2. Visit the website of **RIGOL** (www.rigol.com) and click **Customer Center** → **License Generate** to enter the license generation interface.
3. Input the correct **Key**, **Sn** (series number of the instrument and can be acquired by pressing **Utility** → **System Info**) and **Identifying Code** and click **Generate** to generate the option license.

Command List:

◆ [:LICense:INSTall](#)

◆ [:LICense:SET](#)

:LICense:INSTall

:LICense:SET

Syntax :LICense:INSTall <license>

:LICense:SET <license>

Description Install the 16M internal memory option.

Parameter

Name	Type	Range	Default
<license>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- <license>, namely the option license (removing the hyphens), is a string of 28 bytes. It can include uppercase English letters and numbers.
 - Each instrument corresponds to an option license. If you need to use this option, please order this option to acquire the key. Then, visit the website of **RIGOL** to generate the option license.

Example :LICense:INSTall SM9KD3YPMWNP2AQMST8J5H592EQT

:LXI Commands

Command List:

- ◆ [:LXI:IDENtify\[:STATE\]](#)
- ◆ [:LXI:MDNS:ENABle](#)
- ◆ [:LXI:MDNS:HNAME](#)
- ◆ [:LXI:MDNS:SNAME:DESired](#)
- ◆ [:LXI:MDNS:SNAME\[:RESolved\]?](#)
- ◆ [:LXI:RESet](#)
- ◆ [:LXI:REStart](#)

:LXI:IDENtify[:STATE]

Syntax :LXI:IDENtify[:STATE] {ON|1|OFF|0}

:LXI:IDENtify[:STATE]?

Description Turn on or off the LXI Identify indicator on the screen.

Query the on/off status of the LXI Identify indicator on the screen.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

- Explanation**
- The LXI Identify indicator can help you to identify the device related to the LAN address.
 - Sending the [*RST](#) command will turn off the LXI Identify indicator.

Return Format The query returns ON or OFF.

Example

```
:LXI:IDEN ON      /*Turn on the LXI Identify indicator on the screen*/
:LXI:IDEN?        /*Query the on/off status of the LXI Identify indicator on the
                  screen and the query returns ON*/
```

Related Command [*RST](#)

:LXI:MDNS:ENABLE

Syntax :LXI:MDNS:ENABLE {ON|1|OFF|0}

:LXI:MDNS:ENABLE?

Description Enable or disable the multiple DNS system (mDNS).

Query the status of the multiple DNS system (mDNS).

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

Return Format The query returns ON or OFF.

Example :LXI:MDNS:ENAB ON /*Enable the multiple DNS system*/

:LXI:MDNS:ENAB? /*Query the status of the multiple DNS system and the query returns ON*/

:LXI:MDNS:HNAME

Syntax :LXI:MDNS:HNAME[:RESolved]?

Description Query the host name of the mDNS analyzed.

:LXI:MDNS:SNAME:DESired

Syntax :LXI:MDNS:SNAME:DESired <name>

:LXI:MDNS:SNAME:DESired?

Description Set the service name of mDNS.

Query the service name of mDNS.

Parameter	Name	Type	Range	Default
	<name>	ASCII string	Refer to the "Explanation"	rigollan

- Explanation**
- <name> is a string and can include English letters and numbers.
 - This setting is stored in the non-volatile memory and will not change when the instrument is turned off and then turned on again or when the [*RST](#) command is sent.
 - Sending the [:SYSTem:SECurity:IMMediate](#) command will set the service name of mDNS to its default.

Return Format The query returns a string, for example, RIGOL1.

Example :LXI:MDNS:SNAM:DES RIGOL1 /*Set the service name of mDNS to RIGOL1*/

LXI:MDNS:SNAM:DES? /*Query the service name of mDNS and the query returns RIGOL1*/

Related Command [:SYSTem:SECurity:IMMediate](#)

:LXI:MDNS:SNAME[:RESolved]?

Syntax :LXI:MDNS:SNAME[:RESolved]?

Description Query the service name of mDNS analyzed.

:LXI:RESet

Syntax :LXI:RESet

Description Reset the LAN setting to the known operation state, beginning from DHCP. If DHCP fails, AutoIP will be used.

Explanation

- Several seconds are required for the LAN interface to restart (depending on your network) after sending this command.
- If the LAN interface or specific LAN service is disabled, you must restart the interface or service separately as well as turn off and restart the instrument to make the LAN works normally.

:LXI:REStart

Syntax :LXI:REStart

Description Restart the LAN according to the current setting.

Explanation

- Several seconds are required for the LAN interface to restart (depending on your network) after sending this command.
- If the LAN interface or specific LAN service is disabled, you must restart the interface or service separately as well as turn off and restart the instrument to make the LAN works normally.

:MEMory Commands

The :MEMory commands are used to query the storage locations and the state files stored in the internal non-volatile memory of the instrument, query whether state file is stored in the specified storage location, delete, lock and unlock the state files in the internal memory, query and modify the filenames of the state files stored as well as set the power-on configuration.

Command List:

- ◆ [:MEMory:NSTates?](#)
- ◆ [:MEMory:STAtE:CATalog?](#)
- ◆ [:MEMory:STAtE:DELeTe](#)
- ◆ [:MEMory:STAtE:LOCK](#)
- ◆ [:MEMory:STAtE:NAME](#)
- ◆ [:MEMory:STAtE:RECall:AUTO](#)
- ◆ [:MEMory:STAtE:VALid?](#)

:MEMory:NSTates?

Syntax :MEMory:NSTates?

Description Query the number of storage locations for the state files in the non-volatile memory of the internal memory of the instrument.

Return Format The query returns 10.

:MEMory:STAtE:CATalog?

Syntax :MEMory:STAtE:CATalog?

Description Query the state files stored in the internal non-volatile memory of the instrument.

Explanation The internal non-volatile memory of the instrument provides 10 state file storage locations.

Return Format The query returns a string consisting of 10 parts (represent the filenames of the files stored in locations 1 to 10 respectively) separated by commas, for example, "Scpi1.RSF","Scpi2.RSF","0.RSF","1.RSF","012.RSF","", "33.RSF","", "", ""; wherein, the contents in the double quotation marks are the filenames of the files stored in the corresponding locations; the query only returns a pair of double quotation marks if no file is stored in the corresponding location.

:MEMory:STATe:DElete

Syntax :MEMory:STATe:DElete
{USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10}

Description Delete the state file stored in the specified location in the internal non-volatile memory of the instrument.

Parameter	Name	Type	Range	Default
	{USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10	None

Explanation

- The internal non-volatile memory of the instrument provides 10 state file storage locations numbered USER1 to USER10 which representing the state files stored in the specified locations respectively.
- This command is valid only when the specified storage location contains a state file and the file is not locked ([:MEMory:STATe:LOCK](#)). If the file stored in the specified storage location is locked, please first unlock the file.

Example :MEM:STAT:DEL USER1 /*Delete the state file stored in the location 1 in the internal non-volatile memory of the instrument */

Related Command [:MEMory:STATe:LOCK](#)

:MEMory:STATe:LOCK

Syntax :MEMory:STATe:LOCK
 {USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10},
 {ON|1|OFF|0}

:MEMory:STATe:LOCK?
 {USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10}

Description Lock or unlock the state file stored in the specified storage location in the internal non-volatile memory of the instrument.

Query whether the state file stored in the specified storage location in the internal non-volatile memory of the instrument is locked.

Parameter

Name	Type	Range	Default
{USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10	None
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation

- The internal non-volatile memory of the instrument provides 10 state file storage locations numbered USER1 to USER10 which representing the state files stored in the specified locations respectively.
- You can modify the filename of the locked file in the internal non-volatile memory of the instrument ([:MEMory:STATe:NAME](#)) but you cannot delete the locked file ([:MEMory:STATe:LOCK](#)). To delete the locked file, please first unlock it.

Return Format The query returns ON or OFF.

Example Assume that storage location 1 in the internal non-volatile memory of the instrument contains a state file.

```
:MEM:STAT:LOCK USER1,ON /*Lock the state file stored in storage location 1 in
                           the internal non-volatile memory of the
                           instrument*/
```

```
:MEM:STAT:LOCK? USER1 /*Query whether the state file stored in storage
                        location 1 in the internal non-volatile memory of
                        the instrument is locked and the query returns
                        ON*/
```

Related Commands [:MEMory:STATe:NAME](#)
[:MEMory:STATe:LOCK](#)

:MEMory:STATe:NAME

Syntax :MEMory:STATe:NAME {0|1|2|3|4|5|6|7|8|9}[,<name>]

:MEMory:STATe:NAME? {0|1|2|3|4|5|6|7|8|9}

Description Modify the filename of the state file stored in the specified storage location of the internal non-volatile memory of the instrument.

Query the filename of the state file stored in the specified storage location of the internal non-volatile memory of the instrument.

Parameter

Name	Type	Range	Default
{0 1 2 3 4 5 6 7 8 9}	Discrete	0 1 2 3 4 5 6 7 8 9	None
<name>	ASCII string	Refer to the "Explanation"	NULL

- Explanation**
- The internal non-volatile memory of the instrument provides 10 state file storage locations. The parameters 0 to 9 represent the state files in storage locations 1 to 10 respectively.
 - <name> is the specified filename and cannot exceed 9 characters. It can contain Chinese characters, English uppercase characters and numbers; wherein, a Chinese character occupies 2 characters. If the parameter is omitted, the filename is empty.
 - This command is valid only when the specified storage location contains a state file ([:MEMory:STATe:VALid?](#)).

Return Format The query returns a string enclosed in double quotation marks, for example, "123.RSF"; wherein, 123 is the filename and .RSF is the filename suffix of the state file.

Example

```
:MEM:STAT:VAL? USER2 /*Query whether storage location 2 in the internal
                        non-volatile memory of the instrument contains a
                        state file and the query returns 1*/

:MEM:STAT:NAME 1,123 /* Modify the filename of the state file stored in storage
                      location 2 of the internal non-volatile memory of the
                      instrument to 123.RSF*/

:MEM:STAT:NAME? 1 /*Query the filename of the state file stored in storage
                  location 2 of the internal non-volatile memory of the
                  instrument and the query returns "123.RSF"*/
```

Related Command [:MEMory:STATe:VALid?](#)

:MEMory:STATe:RECall:AUTO

Syntax :MEMory:STATe:RECall:AUTO {ON|1|OFF|0}

:MEMory:STATe:RECall:AUTO?

Description Set the instrument configuration to be used at the next power-on to last (ON or 1) or default (OFF or 0).

Query the instrument configuration to be used at the next power-on.

Parameter	Name	Type	Range	Default
	{ ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation

- Last (ON or 1): the instrument uses the system configuration (include all the system parameters and states except the channel on/off state) used before the last power-off.
- Default (OFF or 0): the instrument uses the factory default at power-on except the parameters that will not be affected by a factory reset (refer to “**Appendix B: Factory Setting**”).

Return Format The query returns ON or OFF.

Example :MEM:STAT:RECall:AUTO ON /*Set the instrument configuration to be used at the next power-on to last*/

:MEM:STAT:RECall:AUTO? /*Query the instrument configuration to be used at the next power-on and the query returns ON*/

:MEMory:STATe:VALid?

Syntax :MEMory:STATe:VALid?
{USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10}

Description Query whether the specified storage location in the internal non-volatile memory of the instrument contains a state file.

Parameter	Name	Type	Range	Default
	{USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10}	Discrete	USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10	None

Explanation The internal non-volatile memory of the instrument provides 10 state file storage locations numbered USER1 to USER10 which representing the state files stored in the specified locations respectively.

Return Format The query returns 1 or 0; wherein, 1 denotes that the specified storage location contains a state file and 0 denotes that the specified storage location does not contain a state file.

:MMEMory Commands

The :MMEMory commands are used to query and set the related information of the external memory, including querying the files and folders in the external memory, setting the current directory, copying the file in the current directory to the specified directory, loading the file in the external memory, creating a new folder and storing a file in the external memory.

Command List:

- ◆ [:MMEMory:CATalog\[:ALL\]?](#)
- ◆ [:MMEMory:CATalog:DATA:ARbitrary?](#)
- ◆ [:MMEMory:CATalog:STATe?](#)
- ◆ [:MMEMory:CDIRectory](#)
- ◆ [:MMEMory:COpy](#)
- ◆ [:MMEMory:DELeTe](#)
- ◆ [:MMEMory:LOAD\[:ALL\]](#)
- ◆ [:MMEMory:LOAD:DATA](#)
- ◆ [:MMEMory:LOAD:STATe](#)
- ◆ [:MMEMory:MDIRectory](#)
- ◆ [:MMEMory:RDIRectory?](#)
- ◆ [:MMEMory:RDIRectory](#)
- ◆ [:MMEMory:STORe\[:ALL\]](#)
- ◆ [:MMEMory:STORe:DATA](#)
- ◆ [:MMEMory:STORe:STATe](#)

:MMEMory:CATalog[:ALL]?

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

Description Query all the files and folders in the current directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory in the external memory	"D:\\"

- Explanation**
- This command is only applicable to the external memory.
 - <folder> is a valid directory in the external memory, including the D disk and the folders in the D disk. It is a string enclosed in double quotation marks, for example, "D:\\" and "D:\Rigol".

Return Format The query returns a string in the following format: space used,space available,"size,property,name",.....; wherein, the units of the space used and space available are byte, the property of the file is empty and the size is the space that it occupies, the property of the folder is DIR and the size is the sum of the number of the files and folders in the folder plus 1. For example, 28672,4102361088,"3,DIR,Rigol","80,,Rigol1.RAF","1360,,Rigol0.RSF" denotes that for the external memory currently connected to the instrument, its space used is 28672 bytes and the space available is 4102361088 bytes; it contains 1 folder (Rigol) and the folder contains 2 files or folders; it contains 2 files of which the size of the arbitrary waveform file (Rigol1.RAF) is 80 bytes and the size of the state file (Rigol0.RSF) is 1360 bytes.

Example Assume that the current directory is D:\.

```
:MMEM:CAT? /*Query all the files and folders in the external memory and the
query returns
28672,4102361088,"3,DIR,Rigol","80,,Rigol1.RAF","1360,,Rigol
0.RSF"*/
```

:MMEMory:CATalog:DATA:ARBitrary?

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

Description Query the arbitrary waveform file under the current operation directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory in the external memory	"D:\\"

- Explanation**
- This command is only applicable to the external memory.
 - <folder> is a valid directory in the external memory, including the D disk and the folders in the D disk. It is a string enclosed in double quotation marks, for example, "D:\\" and "D:\Rigol".

Return Format The query returns a string in the following format: space used,space available, "size,property,name",.....; wherein, the units of the space used and space available are byte, the property of the file is empty and the size is the space it occupies. For example, 28672,4102361088,"80,,Rigol1.RAF" denotes that for the external memory currently connected to the instrument, its space used is 28672 bytes and the space available is 4102361088 bytes; it contains an arbitrary waveform file (Rigol1.RAF) and its size is 80 bytes.

Example Assume that the current directory is D:\,
 :MMEM:CAT:DATA:ARB? /*Query the arbitrary waveform file in the external
 memory directory and the query returns
 28672,4102361088,"80,,Rigol1.RAF"*/

:MMEMory:CATalog:STATe?

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

Description Query the state file under the current operation directory.

Parameter

Name	Type	Range	Default
<folder>	ASCII string	Valid directory in the external memory	"D:\\"

- Explanation**
- This command is only applicable to the external memory.
 - <folder> is a valid directory in the external memory, including the D disk and the folders in the D disk. It is a string enclosed in double quotation marks, for example, "D:\\" and "D:\Rigol".

Return Format The query returns a string in the following format: space used,space available, "size,property,name",.....; wherein, the units of the space used and space available are byte, the property of the file is empty and the size is the space it occupies. For example, 28672,4102361088,"1360,,Rigol0.RSF" denotes that for the external memory currently connected to the instrument, its space used is 28672 bytes and the space available is 4102361088 bytes; it contains an state file (Rigol0.RSF) and its size is 1360 bytes.

Example Assume that the current directory is D:\,
 :MMEM:CAT:STAT? /*Query the state file in the external memory directory and the
 query returns
 28672,4102361088,"1360,,Rigol0.RSF"*/

:MMEMory:CDIRectory

Syntax :MMEMory:CDIRectory <directory_name>

:MMEMory:CDIRectory?

Description Set the current directory.

Query the current directory.

Parameter	Name	Type	Range	Default
	<directory_name>	ASCII string	Valid directory in the external memory	"D:\\"

Explanation ➤ This command is only applicable to the external memory.

➤ <folder> is a valid directory in the external memory, including the D disk and the folders in the D disk. It is a string enclosed in double quotation marks, for example, "D:\\" and "D:\Rigol".

Return Format The query returns a string enclosed in double quotation marks and the content in the double quotation marks is the current directory, for example, "D:\\".

Example :MMEM:CDIR "D:\\" /*Set the current directory to the D disk (external memory)*/

:MMEM:CDIR? /*Query the current directory and the query returns "D:\\"*/

:MMEMory:COPY

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

Description Copy the file under the current directory in the external memory to the specified directory in the external memory (not the current directory).

Parameter	Name	Type	Range	Default
	<directory_name>	ASCII string	Valid directory in the external memory	None
	<file_name>	ASCII string	Filename of the file under the current directory of the external memory	None

Explanation ➤ This command is only applicable to the external memory.

➤ <folder> is a valid directory in the external memory, including the D disk and the folders in the D disk. It is a string enclosed in double quotation marks, for example, "D:\\" and "D:\Rigol".

Example Assume that the current directory is D:\,

:MMEM:COPY "D:\Rigol","Rigol1.RAF" /*Copy the file Rigol1.RAF under the external memory directory to "D:\Rigol" (the Rigol folder in D disk)*/

:MMEMory:DElete

Syntax :MMEMory:DElete <file_name>

Description Delete the specified file or empty folder in the current directory of the external memory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	The filename of the file or the folder name of the empty folder in the current directory of the external memory	None

- Return Format**
- This command is only applicable to the external memory.
 - <file_name> is the filename of the file or the folder name of the empty folder in the current directory of the external memory and it is a string enclosed in double quotation marks, for example, "Rigol1.RAF".

Example Assume that the current directory is D:\,
 :MMEM:DEL "Rigol1.RAF" /*Delete the file Rigol1.RAF in the external memory (D:\)*/
 (D:\)*/

:MMEMory:LOAD[:ALL]

Syntax :MMEMory:LOAD[:ALL] <file_name>

Description Load the specified state file or arbitrary waveform file in the current directory of the external memory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII string	The filename of the state file or the arbitrary waveform file in the current directory of the external memory	None

- Explanation**
- This command is only applicable to the external memory.
 - <file_name> is the filename of the state file or the arbitrary waveform file in the current directory of the external memory and it is a string enclosed in double quotation marks, for example, "Rigol0.RSF".
 - If the file to be loaded is arbitrary waveform file, it will be loaded into the current channel.

Example Assume that the current directory is D:\.
 :MMEM:LOAD "Rigol0.RSF" /*Load the file Rigol0.RSF in the external memory (D:\)*/
 (D:\)*/

:MMEMory:LOAD:DATA

Syntax :MMEMory:LOAD:DATA[1|2] <file_name>

Description Load the specified arbitrary waveform file in the current directory of the external memory into the specified channel.

Parameter	Name	Type	Range	Default
	[1 2]	Discrete	1 2	1
	<file_name>	ASCII string	The filename of the arbitrary waveform file in the current directory of the external memory	None

- Explanation**
- This command is only applicable to the external memory.
 - [1|2] denotes the channel (CH1 or CH2) into which will the specified arbitrary waveform file in the current directory of the external memory be loaded. When it is omitted, the file will be loaded into CH1.
 - <file_name> is the filename of the arbitrary waveform file in the specified directory of the external memory and it is a string enclosed in double quotation marks, for example, "Rigol4.RAF".

Example Assume that the current directory is D:\Rigol,
 :MMEM:LOAD:DATA "Rigol4.RAF" /*Load the arbitrary waveform file Rigol4.RAF in the
 current directory of the external memory
 (D:\Rigol) into the current channel*/

:MMEMory:LOAD:STATE

Syntax :MMEMory:LOAD:STATE <file_name>

Description Load the specified state file in the current directory of the external memory.

Parameter	Name	Type	Range	Default
	<file_name>	ASCII string	The filename of the state file in the current directory of the external memory	None

- Explanation**
- This command is only applicable to the external memory.
 - <file_name> is the filename of the state file in the current directory of the external memory and it is a string enclosed in double quotation marks, for example, "Rigol0.RSF".

Example Assume that the current directory is D:\.
 :MMEM:LOAD "Rigol0.RSF" /*Load the state file Rigol0.RSF in the external memory
 (D:\)*/

:MMEMory:MDIRectory

Syntax :MMEMory:MDIRectory <dir_name>

Description Create a folder in the current directory of the external memory with the specified name.

Parameter	Name	Type	Range	Default
	<dir_name>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- This command is only applicable to the external memory.
 - <dir_name> is a string enclosed in double quotation marks. The content in the double quotation marks is the name of the folder to be created and cannot exceed 9 characters (can be Chinese characters, English uppercase characters and numbers; wherein, a Chinese character occupies 2 characters).
 - If D disk already contains a folder with the same name, the system prompts a remote command error.

Example Assume that the current directory is D:\,
 :MMEM:MDIR "RIGOL1" /*Create a folder named "RIGOL1" in D disk*/

:MMEMory:RDIRectory?

Syntax :MMEMory:RDIRectory?

Description Query the disk drive available.

Return Format The query returns a string in the form of "the number of disk drives available,"the names of the disk drives available:"", for example, "1,"D:"" which denotes that there is a disk drive available named D:. If there is no disk drive available currently, the query returns "0,"NULL"".

:MMEMory:RDIRectory

Syntax :MMEMory:RDIRectory <folder>

Description Delete the specified directory (empty folder) in the external memory.

Parameter	Name	Type	Range	Default
	<folder>	ASCII string	Folder name of the empty folder in the external memory	None

Example Assume that the external memory contains an empty folder named 111,
 :MMEM:RDIR "111" /*Delete the empty folder 111 in the external memory*/

:MMEMory:STORe[:ALL]

Syntax :MMEMory:STORe[:ALL] <file_name>

Description Store the current instrument state or the arbitrary waveform data of the current channel into the current directory of the external memory in state file or arbitrary waveform file form with the specified name.

Parameter	Name	Type	Range	Default
	<file_name>	ASCII string	Filename of the specified state file or arbitrary waveform file	None

Explanation

- This command is only applicable to the external memory.
- <file_name> is a string enclosed in double quotation marks and the content in the double quotation marks is the filename of the specified state file or arbitrary waveform file (include the file type suffix .RSF or .RAF). The filename cannot exceed 9 characters and can be Chinese characters, English characters and numbers; wherein, a Chinese character occupies 2 characters.

Example Assume that the current directory is D:\,
 :MMEM:STOR "R00.RSF" /*Store the current instrument state into D disk in the state file form with the filename R00.RSF*/

:MMEMory:STORe:DATA

Syntax :MMEMory:STORe:DATA[1|2] <file_name>

Description Store the arbitrary waveform data of the specified channel into the current directory of the external memory in arbitrary waveform file form with the specified filename.

Parameter	Name	Type	Range	Default
	[1 2]	Discrete	1 2	1
	<file_name>	ASCII string	Filename of the specified arbitrary waveform file	None

Explanation

- This command is only applicable to the external memory.
- <file_name> is a string enclosed in double quotation marks and the content in the double quotation marks is the filename of the specified arbitrary waveform file (include the file type suffix .RAF). The filename cannot exceed 9 characters and can be Chinese characters, English characters and numbers; wherein, a Chinese character occupies 2 characters.

Example Assume that the current directory is D:\,
 :MMEM:STOR:DATA "R11.RAF" /*Store the arbitrary waveform data of the current channel into D disk in arbitrary waveform file form with the filename R11.RAF*/

:MMEMory:STORe:STATe

Syntax :MMEMory:STORe:STATe <file_name>

Description Store the current instrument state into the current directory of the external memory in state file form with the specified filename.

Parameter	Name	Type	Range	Default
	<file_name>	ASCII string	Refer to the "Explanation"	None

Explanation

- This command is only applicable to the external memory.
- <file_name> is a string enclosed in double quotation marks and the content in the double quotation marks is the filename of the specified state file (include the file type suffix .RSF). The filename cannot exceed 9 characters and can be Chinese characters, English characters and numbers; wherein, a Chinese character occupies 2 characters.

Example Assume that the current directory is D:\,

```
:MMEM:STOR:STAT "R22.RSF" /*Store the current instrument state into D disk in
state file form with the filename R22.RSF*/
```

:OUTPut Commands

The :OUTPut commands is used to set and query the information related to the channel output and sync signal, including setting and querying the channel output state, output polarity, output impedance, output mode and gate polarity as well as setting and querying the output state, output polarity and delay time of the sync signal.

Command List:

- ◆ [:OUTPut\[<n>\]:GATe:POLarity](#)
- ◆ [:OUTPut\[<n>\]:IMPedance](#)
- ◆ [:OUTPut\[<n>\]:LOAD](#)
- ◆ [:OUTPut\[<n>\]:MODE](#)
- ◆ [:OUTPut\[<n>\]:POLarity](#)
- ◆ [:OUTPut\[<n>\]\[:STATe\]](#)
- ◆ [:OUTPut\[<n>\]:SYNC:DELay](#)
- ◆ [:OUTPut\[<n>\]:SYNC:POLarity](#)
- ◆ [:OUTPut\[<n>\]:SYNC\[:STATe\]](#)

:OUTPut[<n>]:GATe:POLarity

Syntax :OUTPut[<n>]:GATe:POLarity {POSitive|NEGative}
:OUTPut[<n>]:GATe:POLarity?

Description Set the gate polarity of the specified channel in the gated mode to POSitive or NEGative.

Query the gate polarity of the specified channel in the gated mode.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - In the gated mode ([:OUTPut\[<n>\]:MODE](#)), the output state of the output connector of the specified channel is controlled by the gated signal received by the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel.
Positive: when the gated signal is high level, the channel output connector outputs signal.
Negative: when the gated signal is low level, the channel output connector outputs signal.

Return Format The query returns POSITIVE or NEGATIVE.

Example :OUTP1:GAT:POL NEG /*Set the gate polarity of CH1 in the gated mode to negative*/
:OUTP1:GAT:POL? /*Query the gate polarity of CH1 in the gated mode and the query returns NEGATIVE*/

Related Command [:OUTPut\[<n>\]:MODE](#)

:OUTPut[<n>]:IMPedance**:OUTPut[<n>]:LOAD**

Syntax :OUTPut[<n>]:IMPedance {<ohms>|INFinity|MINimum|MAXimum}
 :OUTPut[<n>]:LOAD {<ohms>|INFinity|MINimum|MAXimum}
 :OUTPut[<n>]:IMPedance? [MINimum|MAXimum]
 :OUTPut[<n>]:LOAD? [MINimum|MAXimum]

Description Set the output impedance of the output connector of the specified channel.

Query the output impedance of the output connector of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<ohms>	Integer	1Ω to 10kΩ	50Ω

- Explanation**
- When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - <ohms> denotes setting the output impedance of the output connector of the specified channel to a specified value within the range available; INFinity denotes setting the output impedance of the output connector of the specified channel to HighZ.
 - The output impedance setting affects the output amplitude and DC offset. If the actual load is different from the specified value, the voltage level displayed will not match the voltage level of the item under test. To ensure correct voltage level, make sure that the load impedance setting matches the actual load.

Return Format The query returns the output impedance in scientific notation with 7 effective digits, for example, 1.000000E+02 which denotes that the output impedance is 100Ω. If the output impedance of the output connector of the specified channel is set to INFinity, the query returns 9.900000E+37.

Example

```
:OUTP1:IMP INF /*Set the output impedance of the output connector of CH1 to HighZ*/
:OUTP1:IMP? /*Query the output impedance of the output connector of CH1 and the query returns 9.900000E+37*/
:OUTP1:LOAD 100 /*Set the output impedance of the output connector of CH1 to 100Ω*/
:OUTP1:LOAD? /*Query the output impedance of the output connector of CH1 and the query returns 1.000000E+02*/
```

:OUTPut[<n>]:MODE

Syntax :OUTPut[<n>]:MODE {NORMal|GATed}

:OUTPut[<n>]:MODE?

Description Set the output mode of the output connector of the specified channel to normal (NORMal) or gated (GATed).

Query the output mode of the output connector of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	{NORMal GATed}	Discrete	NORMal GATed	NORMal

- Explanation**
- When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - In the gated mode, the output state of the output connector of the specified channel is controlled by the gated signal received by the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. You can send the [:OUTPut\[<n>\]:GATe:POLarity](#) command to set the gate polarity to “Positive” or “Negative”.
Positive: when the gated signal is high level, the channel output connector outputs signal.
Negative: when the gated signal is low level, the channel output connector outputs signal.

Return Format The query returns NORMAL or GATED.

Example :OUTP1:MODE GAT /*Set the output mode of the output connector of CH1 to gated*/

:OUTP1:MODE? /*Query the output mode of the output connector of CH1 and the query returns GATED*/

Related Command [:OUTPut\[<n>\]:GATe:POLarity](#)

:OUTPut[<n>]:POLarity

Syntax :OUTPut[<n>]:POLarity {NORMAL|INVERTed}

:OUTPut[<n>]:POLarity?

Description Set the output polarity of the specified channel to normal (NORMAL) or inverted (INVERTed).

Query the output polarity of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{NORMAL INVERTed}	Discrete	NORMAL INVERTed	NORMAL

- Explanation**
- When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - The output polarity of the channel refers to that the signal on the output connector of the channel is normal (NORMAL) output or inverted (INVERTed) output. In the normal mode, the instrument outputs normal waveform and in the inverted mode, the waveform is inverted and then outputted.
 - The waveform is inverted relative to the offset voltage. After the waveform is inverted, the offset voltage remains unchanged and the sync signal related to the waveform is not inverted.

Return Format The query returns NORMAL or INVERTED.

Example :OUTP1:POL NORM /*Set the output polarity of CH1 to normal*/
 :OUTP1:POL? /*Query the output polarity of CH1 and the query returns NORMAL*/

:OUTPut[<n>][:STATe]

Syntax :OUTPut[<n>][:STATe] {ON|1|OFF|0}

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

Description Turn on or off the output of the specified channel.

Query the output status of the specified channel.

Parameter

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

Explanation When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example :OUTP1? /*Query the output status of CH1 and the query returns OFF*/
 :OUTP1 ON /*Turn on the output of CH1*/
 :OUTP1? /*Query the output status of CH1 and the query returns ON*/

:OUTPut[<n>]:SYNC:DElay

Syntax :OUTPut[<n>]:SYNC:DElay {<delay>|MINimum|MAXimum}

:OUTPut[<n>]:SYNC:DElay? [MINimum|MAXimum]

Description Set the output delay time of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<delay>	Real	0s to the carrier period	0s

- Explanation**
- The output delay time of the sync signal refers to the output delay time of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel relative to the output signal of the output connector at the front panel.
 - When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - When the modulation ([\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)), sweep ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) function is enabled, the delay setting is invalid.

Return Format The query returns the delay time of the sync signal in scientific notation with 7 effective digits, for example, 1.000000E-03 which denotes that the delay time of the sync signal is 1ms (namely 0.001s).

Example :OUTP1:SYNC:DEL 0.001 /*Set the output delay time of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of CH1 at the rear panel to 1ms (namely 0.001s)*/

:OUTP1:SYNC:DEL? /*Query the output delay time of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of CH1 at the rear panel and the query returns 1.000000E-03*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:OUTPut[<n>]:SYNC:POLarity

Syntax :OUTPut[<n>]:SYNC:POLarity {POSitive|NEGative}

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

Description Set the output polarity of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel to normal (POSitive) or inverted (NEGative).

Query the output polarity of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - The output polarity of the sync signal refers to that the sync signal on the **[Mod/Trig/FSK/Sync]** connector of the channel at the rear panel is normal (POSitive) output or inverted (NEGative) output. In the normal mode, the instrument outputs the sync signal normally and in the inverted mode, the sync signal is inverted and then outputted.
 - After the waveform is inverted ([:OUTPut\[<n>\]:POLarity](#)), the sync signal related to the waveform will not be inverted.

Return Format The query returns POS or NEG.

Example :OUTP1:SYNC:POL POS /*Set the output polarity of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of CH1 at the rear panel to normal */

:OUTP1:SYNC:POL? /*Query the output polarity of the sync signal on the **[Mod/Trig/FSK/Sync]** connector of CH1 at the rear panel and the query returns POS*/

Related Command [:OUTPut\[<n>\]:POLarity](#)

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

Syntax :OUTPut[<n>]:SYNC[:STATe] {ON|1|OFF|0}
 :OUTPut[<n>]:SYNC[:STATe]?

Description Enable or disable the sync signal outputted from the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel.

Query the output status of the sync signal outputted from the **[Mod/Trig/FSK/Sync]** connector of the specified channel at the rear panel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

- Explanation**
- DG1000Z can output the sync signals of the basic waveform (except noise), arbitrary waveform (except DC), harmonic, sweep waveform, burst and modulated waveform from a single channel or both of the two channels at the same time. The sync signals are outputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel.
 - When [<n>] is omitted, the commands set and query the related parameters of CH1 by default.
 - When the carrier frequency is greater than 30MHz, the sync signal will be outputted in frequency dividing output mode.
 - If the sync signal is disabled, the mark signal used in the sweep will also be disabled.

Return Format The query returns ON or OFF.

Example

```
:OUTP1:SYNC 1 /*Enable the sync signal outputted from the
                [Mod/Trig/FSK/Sync] connector of CH1 at the rear
                panel*/

:OUTP1:SYNC? /*Query the output status of the sync signal outputted from
              the [Mod/Trig/FSK/Sync] connector of CH1 at the rear
              panel and the query returns ON*/

:OUTP1:SYNC OFF /*Disable the sync signal outputted from the
                 [Mod/Trig/FSK/Sync] connector of CH1 at the rear
                 panel*/

:OUTP1:SYNC? /*Query the output status of the sync signal outputted from
              the [Mod/Trig/FSK/Sync] connector of CH1 at the rear
              panel and the query returns OFF*/
```

:PA Commands

The :PA commands are used to set and query the related information when the external power amplifier (PA) is used, including setting and querying the on/off status, gain, output polarity and offset of the PA as well as saving the working status of the PA to the internal memory of the instrument.

Command List:

- ◆ [:PA:GAIN](#)
- ◆ [:PA:OFFSet\[:STATe\]](#)
- ◆ [:PA:OFFSet:VALUe](#)
- ◆ [:PA:OUTPut:POLarity](#)
- ◆ [:PA:SAVE](#)
- ◆ [:PA\[:STATe\]](#)

:PA:GAIN

Syntax :PA:GAIN {1X|10X}
:PA:GAIN?

Description Set the gain of the signal amplification at the output terminal of the PA to 1X or 10X.
Query the gain of the signal amplification at the output terminal of the PA.

Parameter

Name	Type	Range	Default
{1X 10X}	Discrete	1X 10X	1X

Explanation 1X denotes outputting the signal without any gain. 10X denotes amplifying the signal for 10 times and then outputting it.

Return Format The query returns 1X or 10X.

Example :PA:GAIN 10X /*Set the gain of the signal amplification at the output terminal of the PA to 10X*/
:PA:GAIN? /*Query the gain of the signal amplification at the output terminal of the PA and the query returns 10X*/

:PA:OFFSet[:STATe]

Syntax :PA:OFFSet[:STATe] {ON|1|OFF|0}

:PA:OFFSet[:STATe]?

Description Turn on or off the output offset at the output terminal of the PA.

Query the on/off status of the output offset at the output terminal of the PA.

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation You can send the [:PA:OFFSet:VALUe](#) command to set the output offset at the output terminal of the PA.

Return Format The query returns ON or OFF.

Example :PA:OFFS ON /*Turn on the output offset at the output terminal of the PA*/

:PA:OFFS? /*Query the on/off status of the output offset at the output terminal of the PA and the query returns ON*/

Related Command [:PA:OFFSet:VALUe](#)

:PA:OFFSet:VALUe

Syntax :PA:OFFSet:VALUe {<value>|MINimum|MAXimum}

:PA:OFFSet:VALUe? [MINimum|MAXimum]

Description Set the output offset at the output terminal of the PA.

Query the output offset at the output terminal of the PA.

Parameter	Name	Type	Range	Default
	<value>	Real	-12V to 12V	0V

Explanation You can send the [:PA:OFFSet\[:STATe\]](#) command to turn on or off the output offset at the output terminal of the PA.

Return Format The query returns the output offset in scientific notation with 7 effective digits, for example, 1.234500E+00 (the output offset is 1.2345V).

Example :PA:OFFS:VALU 1.2345 /*Set the output offset at the output terminal of the PA to 1.2345V*/

:PA:OFFS:VALU? /*Query the output offset at the output terminal of the PA and the query returns 1.234500E+00*/

Related Command [:PA:OFFSet\[:STATe\]](#)

:PA:OUTPut:POLarity

Syntax :PA:OUTPut:POLarity {NORMAL|INVerted}

:PA:OUTPut:POLarity?

Description Set the output polarity of the signal at the output terminal of the PA to normal (NORMAL) or inverted (INVerted).

Query the output polarity of the signal at the output terminal of the PA.

Parameter

Name	Type	Range	Default
{NORMAL INVerted}	Discrete	NORMAL INVerted	NORMAL

Explanation The output polarity of the signal at the output terminal of the PA refers to whether the signal at the output terminal of the PA is outputted in normal (NORMAL) mode or inverted (INVerted) mode. In the normal mode, the signal is outputted normally; in the inverted mode, the signal is inverted and then outputted.

Return Format The query returns NORMAL or INVERTED.

Example :PA:OUTP:POL NORM /*Set the output polarity of the signal at the output terminal of the PA to NORMAL*/
:PA:OUTP:POL? /*Query the output polarity of the signal at the output terminal of the PA and the query returns NORMAL*/

:PA:SAVE

Syntax :PA:SAVE

Description Save the current working state of the PA into the internal memory of the instrument.

Explanation The instrument will load the working state stored automatically when the PA is turned on the next time.

:PA[:STATe]

Syntax :PA[:STATe] {ON|1|OFF|0}

:PA[:STATe]?

Description Turn on or off the external power amplifier.

Query the on/off status of the external power amplifier.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

Explanation When the external power amplifier is turned on, the PA amplifies the input signal (namely the output signal of the signal generator) and then outputs the signal. When it is turned off, there is no output from the PA.

Return Format The query returns ON or OFF.

Example :PA ON /*Turn on the external power amplifier*/
:PA? /*Query the on/off status of the external power amplifier and the query returns ON*/

:ROSCillator Commands

The :ROSCillator commands are used to set the system clock source and the query the system clock source currently selected.

Command List:

- ◆ [:ROSCillator:SOURce](#)
- ◆ [:ROSCillator:SOURce:CURREnt?](#)

:ROSCillator:SOURce

Syntax :ROSCillator:SOURce {INTernal|EXTernal}

Description Set the system clock source to internal source (INTernal) or external source (EXTernal).

Parameter	Name	Type	Range	Default
	{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z provides a 10MHz internal clock source and can also receive the external clock source inputted from the **[10MHz In/Out]** connector at the rear panel. Besides, it can also output clock source for other devices via the **[10MHz In/Out]** connector.
 - When the external clock source (EXTernal) is selected, the system detects whether there is valid external clock signal inputted from the **[10MHz In/Out]** connector at the rear panel. If not, the prompt message "Not detect a valid external clock!" will be displayed and the system will switch to internal clock source automatically.
 - You can send the [:ROSCillator:SOURce:CURREnt?](#) command to query the clock source currently selected.
 - You can use the clock source to realize the synchronization of two or more instruments. When two instruments are synchronized, the "Align Phase" function is not available (the "Align Phase" function is used to adjust the phase relation between two output channels of the same instrument and cannot change the phase relation between the output channels of two instruments). You can change the phase relation between two instruments by changing the start phase of each output channel ([\[:SOURce\[<n>\]\]:PHASe\[:ADJust\]](#)).

Example :ROSC:SOUR INT /*Set the system clock source to internal source*/

Related Commands [:ROSCillator:SOURce:CURREnt?](#)
[\[:SOURce\[<n>\]\]:PHASe\[:ADJust\]](#)

:ROSCillator:SOURce:CURRent?

Syntax :ROSCillator:SOURce:CURRent?

Description Query the system clock source currently selected.

Explanation You can send the [:ROSCillator:SOURce](#) command to set the system clock source to internal or external.

Return Format The query returns INT or EXT.

Example :ROSC:SOUR:CURR? /*Query the system clock source currently selected and the query returns INT*/

Related Command [:ROSCillator:SOURce](#)

:SOURce Commands

The :SOURce commands are used to set and query the channel parameters, the related parameters of the modulation, sweep and burst functions, the coupling and waveform summing functions as well as turn on and off the corresponding function.

The frequency ranges available for the different models and different waveforms of DG1000Z series are as shown in the table below.

Table 2-1 Frequency ranges available for the different models and different waveforms of DG1000Z series

Frequency Characteristic	DG1022Z	DG1032Z	DG1062Z
Sine	1μHz to 25MHz	1μHz to 30MHz	1μHz to 60MHz
Square	1μHz to 25MHz	1μHz to 15MHz	1μHz to 25MHz
Ramp	1μHz to 500kHz	1μHz to 500kHz	1μHz to 1MHz
Pulse	1μHz to 15MHz	1μHz to 15MHz	1μHz to 25MHz
Harmonic	1μHz to 10MHz	1μHz to 10MHz	1μHz to 20MHz
Noise (-3dB)	25MHz bandwidth	30MHz bandwidth	60MHz bandwidth
Arbitrary Waveform	1μHz to 10MHz	1μHz to 10MHz	1μHz to 20MHz

Command List:

:SOURce:APPLy Commands

- ◆ [\[:SOURce\[<n>\]\]:APPLy?](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:ARBitrary](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:DC](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:HARMonic](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:NOISe](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:PULSe](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:RAMP](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:SINusoid](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:SQUare](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:TRIangle](#)
- ◆ [\[:SOURce\[<n>\]\]:APPLy:USER](#)

:SOURce:BURSt Commands

- ◆ [\[:SOURce\[<n>\]\]:BURSt:GATE:POLarity](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:INTernal:PERiod](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:MODE](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:NCYCles](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:PHASe](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:TDELay](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:TRIGger\[:IMMediate\]](#)

- ◆ [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SLOPe](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]:BURSt:TRIGger:TRIGOut](#)

[:SOURce:FREQuency Commands](#)

- ◆ [\[:SOURce\[<n>\]\]:FREQuency:CENTer](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency\[:FIXed\]](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:SPAN](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:STARt](#)
- ◆ [\[:SOURce\[<n>\]\]:FREQuency:STOP](#)

[:SOURce:FUNCTion Commands](#)

- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:ARBitrary:MODE](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:ARBitrary:SRATe](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:DCYCLe](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:HOLD](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:PERiod](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:TRANSition\[:BOTH\]](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:TRANSition:LEADIng](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:TRANSition:TRAILing](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:PULSe:WIDTh](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:RAMP:SYMMetry](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion\[:SHAPE\]](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:SQUare:DCYCLe](#)
- ◆ [\[:SOURce\[<n>\]\]:FUNCTion:SQUare:PERiod](#)

[:SOURce:HARMonic Commands](#)

- ◆ [\[:SOURce\[<n>\]\]:HARMonic:AMPL](#)
- ◆ [\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)
- ◆ [\[:SOURce\[<n>\]\]:HARMonic:PHASe](#)
- ◆ [\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]:HARMonic:TYPe](#)
- ◆ [\[:SOURce\[<n>\]\]:HARMonic:USER](#)

:SOURce:MARKer Commands

- ◆ [\[:SOURce\[<n>\]\]:MARKer:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]:MARKer\[:STATe\]](#)

:SOURce[:MOD]:AM Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM\[:DEPT h\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM:DSSC](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM:INTernal:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM:INTernal:FUNCTion](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:AM:STATe](#)

:SOURce[:MOD]:ASKey Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:INTernal\[:RATE\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:POLarity](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:STATe](#)

:SOURce[:MOD]:FM Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FM\[:DEViation\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FM:INTernal:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FM:INTernal:FUNCTion](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FM:STATe](#)

:SOURce[:MOD]:FSKey Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:INTernal:RATE](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:POLarity](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:STATe](#)

:SOURce[:MOD]:PM Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PM\[:DEViation\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PM:INTernal:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PM:INTernal:FUNCTion](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PM:STATe](#)

:SOURce[:MOD]:PSKey Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:INTErnal:RATE](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:POLarity](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:STATe](#)

:SOURce[:MOD]:PWM Commands

- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]:DCYCLE](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]\[:WIDTh\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM:INTErnal:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM:INTErnal:FUNCTion](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]\[:MOD\]:PWM:STATe](#)

:SOURce:MOD Commands

- ◆ [\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]:MOD:TYPE](#)

:SOURce:PERiod Command

- ◆ [\[:SOURce\[<n>\]\]:PERiod\[:FIXed\]](#)

:SOURce:PHASe Commands

- ◆ [\[:SOURce\[<n>\]\]:PHASe\[:ADJust\]](#)
- ◆ [\[:SOURce\[<n>\]\]:PHASe:INITiate](#)
- ◆ [\[:SOURce\[<n>\]\]:PHASe:SYNChronize](#)

:SOURce:PULSe Commands

- ◆ [\[:SOURce\[<n>\]\]:PULSe:DCYCLE](#)
- ◆ [\[:SOURce\[<n>\]\]:PULSe:HOLD](#)
- ◆ [\[:SOURce\[<n>\]\]:PULSe:TRANSition\[:LEADing\]](#)
- ◆ [\[:SOURce\[<n>\]\]:PULSe:TRANSition:TRAILing](#)
- ◆ [\[:SOURce\[<n>\]\]:PULSe:WIDTh](#)

:SOURce:SUM Commands

- ◆ [\[:SOURce\[<n>\]\]:SUM:AMPLitude](#)
- ◆ [\[:SOURce\[<n>\]\]:SUM:INTErnal:FREQuency](#)
- ◆ [\[:SOURce\[<n>\]\]:SUM:INTErnal:FUNCTion](#)
- ◆ [\[:SOURce\[<n>\]\]:SUM\[:STATe\]](#)

:SOURce:SWEEp Commands

- ◆ [\[:SOURce\[<n>\]\]:SWEEp:HTIME:START](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:HTIME\[:STOP\]](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:RTIME](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:SPACing](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:STATe](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:STEP](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:TIME](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:TRIGger\[:IMMediate\]](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:TRIGger:SLOPe](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:TRIGger:SOURce](#)
- ◆ [\[:SOURce\[<n>\]\]:SWEEp:TRIGger:TRIGOut](#)

:SOURce:TRACe Commands

- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:CATalog?](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:COPI](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DAC16](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DAC](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA\[:DATA\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DELeTe\[:NAME\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOAD](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOCK\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:POINts](#)
- ◆ [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:VALue](#)

:SOURce:TRACK Command

- ◆ [\[:SOURce\[<n>\]\]:TRACK](#)

:SOURce:VOLTagE Comamnds

- ◆ [\[:SOURce\[<n>\]\]:VOLTagE:COUPle\[:STATe\]](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE\[:LEVel\]\[:IMMediate\]\[:AMPLitude\]](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE\[:LEVel\]\[:IMMediate\]:HIGH](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE\[:LEVel\]\[:IMMediate\]:LOW](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE\[:LEVel\]\[:IMMediate\]:OFFSet](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE:RANGe:AUTO](#)
- ◆ [\[:SOURce\[<n>\]\]:VOLTagE:UNIT](#)

:SOURce:APPLy Commands

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

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

Description Query the waveform type as well as the frequency, amplitude, offset and phase of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1

- Explanation**
- When [[:SOURce[<n>]]] or [<n>] is omitted, the command queries the related parameters of CH1 by default.
 - The channel waveform types and the corresponding returned waveform names are as shown in the table below.

Sine	Square	Ramp	Pulse	Noise	Arbitrary Waveform	
					DC	Except DC
SIN	SQU	RAMP	PULSE	NOISE	DC	USER

Return Format The query returns a string enclosed in double quotation marks. The return value consists of 5 parts separated by commas; wherein, the first part is the waveform name of the specified channel and the rest 4 parts are the frequency, amplitude, offset and phase (in scientific notation form with 7 effective digits and the default units are Hz, Vpp, V_{DC} and ° respectively; the absent item is replaced by DEF) of the waveform of the specified channel respectively. For example, "SQU,1.000000E+03,2.000000E+00,3.000000E+00,4.000000E+00" which denotes that the current waveform is square, the frequency is 1kHz, the amplitude is 2Vpp, the offset is 3V_{DC} and the start phase is 4°.

Example SOUR1:APPL? /*Query the waveform type as well as the frequency, amplitude, offset and phase of CH1 and the query returns
"SQU,1.000000E+03,2.000000E+00,3.000000E+00,4.000000E+00"*/

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

Syntax [:SOURce[<n>]]:APPLy:ARBitrary
 [{<sample_rate>|DEFault|MINimum|MAXimum}
 [, {<amplitude>|DEFault|MINimum|MAXimum}[, {<offset>|DEFault|MINimum|MAXimum}]]]

Description Set the waveform of the specified channel to arbitrary waveform with the specified sample rate, amplitude, offset and start phase (in sample rate output mode).

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<sample_rate>	Real	1uSa/s to 60MSa/s	20MSa/s
<amplitude>	Real	Refer to the "Explanation"	5Vpp
<offset>	Real	Refer to the "Explanation"	0V _{DC}

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - This command only selects and sets the arbitrary waveform parameters of the channel and does not set the arbitrary waveform type. The default arbitrary waveform is Sinc. You can send the [\[:SOURce\[<n>\]\]:FUNCTION\[:SHAPE\]](#) command to select the desired arbitrary waveform for specified channel.
 - The range of <amplitude> is limited by the "Impedance" ([\[:OUTPut\[<n>\]:IMPedance\]](#) or [\[:OUTPut\[<n>\]:LOAD\]](#)) setting. The range of <offset> is limited by the "Impedance" and "Amplitude/High Level" settings.

Example :SOUR1:APPL:ARB 100,1,2 /*Set the waveform of CH1 to arbitrary waveform with 100Sa/s sample rate, 1Vpp amplitude and 2V_{DC} offset*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)
[\[:SOURce\[<n>\]\]:FUNCTION\[:SHAPE\]](#)

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

Syntax [:SOURce[<n>]]:APPLy:DC [{<frequency>|DEF},{<amplitude>|DEF}[, {<offset>|DEFault|MINimum|MAXimum}]]]

Description Set the waveform of the specified channel to DC with the specified offset.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<offset>	Real	Refer to the "Explanation"	0V _{DC}

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - <frequency> and <amplitude> are not applicable to the DC function but they must be specified as a placeholder.
 - The range of <offset> is limited by the "Impedance" (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) setting.

Return Format Set the waveform of the specified channel to DC with the specified offset.

Example :SOUR1:APPL:DC 1,1,2 /*Set the waveform of CH1 to DC with 2V_{DC} offset*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)

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

Syntax [[:SOURce[<n>]]:APPLy:HARMonic
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]
]]]

Description Enable the harmonic function of the specified channel and set the fundamental waveform (sine) parameters (frequency, amplitude, offset and phase).

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<freq>	Real	1uHz to 20MHz	1kHz
<amp>	Real	Refer to the "Explanation"	5Vpp
<offset>	Real	Refer to the "Explanation"	0V _{DC}
<phase>	Real	0° to 360°	0°

- Explanation**
- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of <amp> is limited by the "Impedance" (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and "Frequency/Period" settings. The range of <offset> is limited by the "Impedance" and "Amplitude/High Level" settings.
 - When this command is executed, the instrument uses the default harmonic parameters or the harmonic parameters set at the last time. You can send the [[:SOURce[<n>]]:HARMonic series commands to set the desired harmonic parameters and enable or disable the harmonic function.

Example :SOUR1:APPL:HARM 100,1,2,3 /*Enable the harmonic function of CH1 and set the fundamental waveform (sine) parameters to 100Hz frequency, 1Vpp amplitude, 2V_{DC} offset and 3° start phase*/

Related Commands :OUTPut[<n>]:IMPedance
 :OUTPut[<n>]:LOAD
 [[:SOURce[<n>]]:HARMonic

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

Syntax [:SOURce[<n>]]:APPLy:NOISe
[<amp> | DEFault | MINimum | MAXimum [, <offset> | DEFault | MINimum | MAXimum]]

Description Set the waveform of the specified channel to noise with the specified amplitude and offset.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<amp>	Real	Refer to the “Explanation”	5Vpp
	<offset>	Real	Refer to the “Explanation”	0V _{DC}

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- The range of <amp> is limited by the “Impedance” (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) setting. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:NOIS 1,2 /*Set the waveform of CH1 to noise with 1Vpp amplitude and 2V_{DC} offset*/

Related Commands :OUTPut[<n>]:IMPedance
:OUTPut[<n>]:LOAD

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

Syntax [:SOURce[<n>]]:APPLy:PULSe
[<freq> | DEFault | MINimum | MAXimum [, <amp> | DEFault | MINimum | MAXimum [, <offset> | DEFault | MINimum | MAXimum [, <phase> | DEFault | MINimum | MAXimum]]]]

Description Set the waveform of the specified channel to pulse with the specified frequency, amplitude, offset and phase.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<freq>	Real	1uHz to 25MHz	1kHz
	<amp>	Real	Refer to the “Explanation”	5Vpp
	<offset>	Real	Refer to the “Explanation”	0V _{DC}
	<phase>	Real	0° to 360°	0°

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- The range of <amp> is limited by the “Impedance” (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and “Frequency/Period” settings. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:PULS 100,3,2,1 /*Set the waveform of CH1 to pulse waveform with 100Hz frequency, 3Vpp amplitude, 2V_{DC} offset and 1° start phase*/

Related Commands :OUTPut[<n>]:IMPedance
:OUTPut[<n>]:LOAD

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

Syntax [:SOURce[<n>]]:APPLy: RAMP
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]]]]

Description Set the waveform of the specified channel to ramp waveform with the specified frequency, amplitude, offset and phase.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<freq>	Real	1uHz to 1MHz	1kHz
<amp>	Real	Refer to the “Explanation”	5Vpp
<offset>	Real	Refer to the “Explanation”	0V _{DC}
<phase>	Real	0° to 360°	0°

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- The range of <amp> is limited by the “Impedance” (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and “Frequency/Period” settings. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:RAMP 100,1,2,3 /*Set the waveform of CH1 to ramp waveform with 100Hz frequency, 1Vpp amplitude, 2V_{DC} offset and 3° start phase*/

Related Commands :OUTPut[<n>]:IMPedance
 :OUTPut[<n>]:LOAD

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

Syntax [:SOURce[<n>]]:APPLy:SINusoid
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]]]]

Description Set the waveform of the specified channel to sine waveform with the specified frequency, amplitude, offset and phase.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<freq>	Real	1uHz to 60MHz	1kHz
	<amp>	Real	Refer to the “Explanation”	5Vpp
	<offset>	Real	Refer to the “Explanation”	0V _{DC}
	<phase>	Real	0° to 360°	0°

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of <amp> is limited by the “Impedance” ([:OUTPut\[<n>\]:IMPedance](#) or [:OUTPut\[<n>\]:LOAD](#)) and “Frequency/Period” settings. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:SIN 100,3,2,1 /*Set the waveform of CH1 to sine waveform with 100Hz frequency, 3Vpp amplitude, 2V_{DC} offset and 1° start phase*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)

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

Syntax [:SOURce[<n>]]:APPLy:SQUare
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]]]]

Description Set the waveform of the specified channel to square waveform with the specified frequency, amplitude, offset and phase.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<freq>	Real	1uHz to 25MHz	1kHz
<amp>	Real	Refer to the “Explanation”	5Vpp
<offset>	Real	Refer to the “Explanation”	0V _{DC}
<phase>	Real	0° to 360°	0°

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of <amp> is limited by the “Impedance” ([:OUTPut\[<n>\]:IMPedance](#) or [:OUTPut\[<n>\]:LOAD](#)) and “Frequency/Period” settings. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:SQU 100,1,2,3 /*Set the waveform of CH1 to square with 100Hz frequency, 1Vpp amplitude, 2V_{DC} offset and 3° start phase*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)

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

Syntax [:SOURce[<n>]]:APPLy:TRIangle
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]]]]

Description Set the waveform of the specified channel to triangle waveform with the specified frequency, amplitude, offset and phase.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<freq>	Real	1uHz to 1MHz	1kHz
<amp>	Real	Refer to the “Explanation”	5Vpp
<offset>	Real	Refer to the “Explanation”	0V _{DC}
<phase>	Real	0° to 360°	0°

- Explanation**
- The triangle waveform is ramp waveform with 100% symmetry.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of <amp> is limited by the “Impedance” (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and “Frequency/Period” settings. The range of <offset> is limited by the “Impedance” and “Amplitude/High Level” settings.

Example :SOUR1:APPL:TRI 100,1,2,3 /*Set the waveform of CH1 to triangle waveform with 100Hz frequency, 1Vpp amplitude, 2V_{DC} offset and 3° start phase*/

Related Commands :OUTPut[<n>]:IMPedance
 :OUTPut[<n>]:LOAD

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

Syntax [:SOURce[<n>]]:APPLy:USER
 [<freq>|DEFault|MINimum|MAXimum[,<amp>|DEFault|MINimum|MAXimum
 [,<offset>|DEFault|MINimum|MAXimum[,<phase>|DEFault|MINimum|MAXimum]]]]

Description Set the waveform of the specified channel to arbitrary waveform (in frequency output mode) with the specified frequency, amplitude, offset and phase.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<freq>	Real	1uHz to 20MHz	1kHz
<amp>	Real	Refer to the "Explanation"	5Vpp
<offset>	Real	Refer to the "Explanation"	0V _{DC}
<phase>	Real	0° to 360°	0°

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - This command only sets the arbitrary waveform parameters of the channel and does not set the arbitrary waveform type. The default arbitrary waveform is Sinc. You can send the [\[:SOURce\[<n>\]\]:FUNCTION\[:SHAPE\]](#) command to set the waveform of the specified channel to the desired arbitrary waveform.
 - The range of <amp> is limited by the "Impedance" ([:OUTPut\[<n>\]:IMPedance](#) or [:OUTPut\[<n>\]:LOAD](#)) and "Frequency/Period" settings. The range of <offset> is limited by the "Impedance" and "Amplitude/High Level" settings.

Example :SOUR1:APPL:USER 100,1,2,3 /*Set the waveform of CH1 to arbitrary waveform (in frequency output mode) with 100Hz frequency, 1Vpp amplitude, 2V_{DC} offset and 3° start phase*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)
[\[:SOURce\[<n>\]\]:FUNCTION\[:SHAPE\]](#)

:SOURce:BURSt Commands

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

Syntax [:SOURce[<n>]]:BURSt:GATE:POLarity {NORMal|INVerted}

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

Description Set the gate polarity of the gated burst of the specified channel to positive (NORMal) or negative (INVerted).

Query the gate polarity of the gated burst of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{NORMal INVerted}	Discrete	NORMal INVerted	NORMal

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The gate polarity is only applicable to the gated burst mode ([\[:SOURce\[<n>\]\]:BURSt:MODE](#)). The signal generator controls the burst output according to the level of the external signal (namely the gated signal) inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel.
 - Positive (NORMal): the gated signal is true (false) when the external signal level is high (low); Negative (INVerted): the gated signal is true (false) when the external signal level is low (high).
 - The signal generator outputs a continuous waveform when the gated signal is "True"; the signal generator finishes the current waveform period and then stops when the gated signal is "False". For noise waveform, the instrument stops immediately when the gated signal changes to "False".

Return Format The query returns NORM or INV.

Example

```
:SOUR1:BURS:GATE:POL NORM /*Set the gate polarity of the gated burst of
                             CH1 to positive*/

:SOUR1:BURS:GATE:POL? /*Query the gate polarity of the gated burst of
                       CH1 and the query returns NORM*/
```

Related Command [\[:SOURce\[<n>\]\]:BURSt:MODE](#)

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

Syntax [:SOURce[<n>]]:BURSt:INTernal:PERiod {<period>|MINimum|MAXimum}
 [:SOURce[<n>]]:BURSt:INTernal:PERiod? [MINimum|MAXimum]

Description Set the internal burst period of the N cycle burst of the specified channel.
 Query the internal burst period of the N cycle burst of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<period>	Real	2.016 6us to 500s	10ms

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The burst period is only applicable to the N cycle burst mode ([\[:SOURce\[<n>\]\]:BURSt:MODE](#)) in internal trigger and is defined as the time from the start of a burst to the start of the next burst.
 - The relation of the burst period, waveform period (the period of the burst function (such as sine and square)) and the number of cycles of bursts is as follows.

$$P_{burst} \geq P_{waveform} \times N_{cycle} + 2us$$

Wherein,

P_{burst} —burst period;

$P_{waveform}$ —waveform period;

N_{cycle} —number of cycles.

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

Return Format The query returns the burst period in scientific notation with 7 effective digits, for example, 1.000000E-01 (the burst period is 0.1s).

Example :SOUR1:BURS:INT:PER 0.1 /*Set the internal burst period of the N cycle burst of CH1 to 0.1s*/

:SOUR1:BURS:INT:PER? /*Query the internal burst period of the N cycle burst of CH1 and the query returns 1.000000E-01*/

Related Command [\[:SOURce\[<n>\]\]:BURSt:MODE](#)

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

Syntax [:SOURce[<n>]]:BURSt:MODE {TRIGgered|INFinity|GATed}

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

Description Set the burst type of the specified channel to N cycle (TRIGgered), infinite (INFinity) or gated (GATed).

Query the burst type of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{TRIGgered INFinity GATed}	Discrete	TRIGgered INFinity GATed	TRIGgered

- Explanation**
- DG1000Z can output N cycle, infinite and gated bursts.
 - In the N cycle burst mode, the signal generator outputs waveform with the specified number of cycles when receiving the trigger signal. The waveform functions that support the N cycle burst include sine, square, ramp, pulse and arbitrary waveform (except DC). For the N cycle burst, "Internal", "External" or "Manual" trigger source can be used. Besides, you can set the "Burst Period" (internal trigger), "Delay", "Trigger Input" (external trigger) and "Trigger Output" (internal trigger and manual trigger).
 - The infinite burst is equivalent to setting the number of cycles of the waveform to infinite. The signal generator outputs continuous waveform when receiving the trigger signal. The waveform functions that support infinite burst include sine, square, ramp, pulse and arbitrary waveform (except DC). For the infinite burst, "External" or "Manual" trigger source can be used. Besides, you can set the "Delay", "Trigger Input" (external trigger) and "Trigger Output" (manual trigger).
 - In the gated burst mode, the signal generator controls the waveform output according to the level of the external signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. The waveform functions that support the gated burst include sine, square, ramp, pulse, noise and arbitrary waveform (except DC). For the gated burst, only "External" trigger source can be used.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns TRIG, INF or GAT.

Example

```
:SOUR1:BURS:MODE TRIG    /*Set the burst type of CH1 to N cycle*/
:SOUR1:BURS:MODE?        /*Query the burst type of CH1 and the query
                           returns TRIG*/
```

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

Syntax [[:SOURce[<n>]]:BURSt:NCYCles {<cycles>|MINimum|MAXimum}

[[:SOURce[<n>]]:BURSt:NCYCles? [MINimum|MAXimum]

Description Set the number of cycles of the N cycle burst of the specified channel.

Query the number of cycles of the N cycle burst of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<cycles>	Integer	1 to 1 000 000 (external or manual trigger) 1 to 500 000 (internal trigger)	1

- Explanation**
- In the N cycle burst mode ([\[\[:SOURce\[<n>\]\]:BURSt:MODE](#)), the signal generator outputs the waveform with the specified number of cycles when receiving the trigger signal.
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the number of cycles in scientific notation with 7 effective digits, for example, 1.000000E+01 (the number of cycles is 10).

Example :SOUR1:BURS:NCYC 10 /*Set the number of cycles of the N cycle burst of CH1 to 10*/

:SOUR1:BURS:NCYC? /*Query the number of cycles of the N cycle burst of CH1 and the query returns 1.000000E+01*/

Related Command [\[\[:SOURce\[<n>\]\]:BURSt:MODE](#)

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

Syntax [[:SOURce[<n>]]:BURSt:PHASe {<phase>|MINimum|MAXimum}

[[:SOURce[<n>]]:BURSt:PHASe? [MINimum|MAXimum]

Description Set the start phase of the burst function of the specified channel.

Query the start phase of the burst function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<phase>	Real	0° to 360°	0°

- Explanation** When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the start phase in scientific notation with 7 effective digits, for example, 1.000000E+01 (the start phase is 10°).

Example :SOUR1:BURS:PHAS 10 /*Set the start phase of the burst function of CH1 to 10°*/

:SOUR1:BURS:PHAS? /*Query the start phase of the burst function of CH1 and the query returns 1.000000E+01*/

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

Syntax [:SOURce[<n>]]:BURSt[:STATe] {ON|1|OFF|0}

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

Description Enable or disable the burst function of the specified channel.

Query the on/off status of the burst function of the specified channel.

Parameter

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

- Explanation**
- DG1000Z can output the waveform with the specified number of cycles (namely the burst) from a single channel or both of the two channels at the same time. When the burst function is enabled (the backlight of **Burst** is illuminated), the modulation or sweep function will be disabled automatically (if it is currently enabled). At this point, the signal generator outputs the burst waveform from the corresponding channel (if it is currently turned on) according to the current configuration.
 - To avoid a large quantity of waveform changes, please enable the burst function after configuring the other burst parameters.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example

```
:SOUR1:BURS ON      /*Enable the burst function of CH1*/
:SOUR1:BURS?        /*Query the on/off status of the burst function of CH1 and the
                    query returns ON*/
```

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

Syntax [[:SOURce[<n>]]:BURSt:TDElay {<delay>|MINimum|MAXimum}

[[:SOURce[<n>]]:BURSt:TDElay? [MINimum|MAXimum]

Description Set the burst delay of the N cycle burst or infinite burst of the specified channel.

Query the burst delay of the N cycle burst or infinite burst of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<delay>	Real	Refer to the "Explanation"	0s

- Explanation**
- The burst delay is only applicable to the N cycle burst and infinite burst modes ([\[:SOURce\[<n>\]\]:BURSt:MODE](#)) and it refers to the time from when the signal generator receives the trigger signal to when the instrument begins to output the N cycle burst or infinite burst.
 - For the N cycle burst or infinite burst in the external trigger or manual trigger mode ([\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)), the range of <delay> is 0s to 100s.
 - For the N cycle burst in the internal trigger mode, the range of <delay> is 0s to $(P_{burst} - P_{waveform} \times N_{cycle} - 2\mu s)$ and it should be equal to or lower than 100s.

Wherein,

P_{burst} —burst period;

$P_{waveform}$ —waveform period (namely the period of the burst function (such as sine and square));

N_{cycle} —number of the cycles of burst.

- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the burst delay in scientific notation with 7 effective digits, for example, 1.000000E-01 (the burst delay is 0.1s).

Example :SOUR1:BURS:TDEL 0.1 /*Set the burst delay of the N cycle burst or infinite burst of CH1 to 0.1s*/

:SOUR1:BURS:TDEL? /*Query the burst delay of the N cycle burst or infinite burst of CH1 and the query returns 1.000000E-01*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt:MODE](#)
[\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)

[[:SOURce[<n>]]:BURSt:TRIGger[:IMMediate]

Syntax [:SOURce[<n>]]:BURSt:TRIGger[:IMMediate]

Description Trigger a burst output immediately on the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1

- Explanation**
- This command is only applicable to the burst mode in manual trigger ([\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)). If the output of the corresponding channel is not turned on ([:OUTPut\[<n>\]::STATe](#)), the trigger will be ignored.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system generates a trigger on CH1 by default.

Example :SOUR1:BURS:TRIG /*Trigger a burst output immediately on CH1*/

Related Commands [:OUTPut\[<n>\]::STATe](#)
[\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)

[[:SOURce[<n>]]:BURSt:TRIGger:SLOPe

Syntax [:SOURce[<n>]]:BURSt:TRIGger:SLOPe {POSitive|NEGative}
 [:SOURce[<n>]]:BURSt:TRIGger:SLOPe?

Description Set the edge type of the trigger input signal in the burst mode of the specified channel to rising edge (POSitive) or falling edge (NEGative).

Query the edge type of the trigger input signal in the burst mode of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- This command is only applicable to the burst mode (N cycle, infinite or gated) in external trigger ([\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)). When external trigger is selected, the signal generator receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel and initiates a burst output each time a TTL pulse with the specified polarity is received.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns POS or NEG.

Example :SOUR1:BURS:TRIG:SLOP NEG /*Set CH1 to trigger on the falling edge of the trigger input signal*/
 :SOUR1:BURS:TRIG:SLOP? /*Query the edge type of the trigger input signal of CH1 and the query returns NEG*/

Related Command [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)

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

Syntax [:SOURce[<n>]]:BURSt:TRIGger:SOURce {INTernal|EXTernal|MANual}

[:SOURce[<n>]]:BURSt:TRIGger:SOURce?

Description Set the trigger source of the burst mode of the specified channel to internal (INTernal), external (EXTernal) or manual (MANual).

Query the trigger source of the burst mode of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal MANual}	Discrete	INTernal EXTernal MANual	INTernal

Explanation

- The trigger source of the burst can be internal, external or manual. The signal generator initiates a burst output each time a trigger signal is received and then waits for the next trigger signal.
- Only the N cycle burst ([\[:SOURce\[<n>\]\]:BURSt:MODE](#)) supports internal trigger. When internal trigger is selected, the frequency of the N cycle burst is determined by the "Burst Period" ([\[:SOURce\[<n>\]\]:BURSt:INTernal:PERiod](#)). You can also set the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to output trigger signal with the specified edge type (rising edge or falling edge) or turn off the trigger signal output ([\[:SOURce\[<n>\]\]:BURSt:TRIGger:TRIGOut](#)).
- The N cycle, infinite and gated bursts all supports external trigger. When external trigger is selected, the signal generator receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector corresponding to the specified channel at the rear panel and initiates a burst output each time a TTL pulse with the specified polarity is received. You can specify the edge type of the trigger input signal (rising edge or falling edge).
- The N cycle and infinite bursts support manual trigger. When manual trigger is selected and the output of the corresponding channel is turned on, the instrument outputs N cycle burst or infinite burst when the [*TRG, :TRIGger\[<n>\]:IMMediate](#) or [\[:SOURce\[<n>\]\]:BURSt:TRIGger:IMMediate](#) command is sent. If the output of the corresponding channel is not turned on, the trigger will be ignored. You can also set the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to output trigger signal with the specified edge type (rising edge or falling edge) or turn off the trigger signal output.

Return Format The query returns INT, EXT or MAN.

Example :SOUR1:BURS:TRIG:SOUR EXT /*Set the trigger source of the burst mode of CH1 to external*/

:SOUR1:BURS:TRIG:SOUR? /*Query the trigger source of the burst mode of CH1 and the query returns EXT*/

Related Commands

[\[:SOURce\[<n>\]\]:BURSt:INTernal:PERiod](#)

[\[:SOURce\[<n>\]\]:BURSt:MODE](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger:IMMediate](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger:TRIGOut](#)

[*TRG](#)

[:TRIGger\[<n>\]:IMMediate](#)

[:SOURce[<n>]]:BURSt:TRIGger:TRIGOut

Syntax [:SOURce[<n>]]:BURSt:TRIGger:TRIGOut {POSitive|NEGative|OFF}

[:SOURce[<n>]]:BURSt:TRIGger:TRIGOut?

Description Set the edge type of the trigger output signal in the burst mode of the specified channel to rising edge (POSitive) or falling edge (NEGative) or disable the trigger output signal.

Query the type of the trigger output signal in the burst mode of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative OFF}	Discrete	POSitive NEGative OFF	OFF

- Explanation**
- This command is applicable to the burst mode (N cycle, infinite or gated, [\[:SOURce\[<n>\] \]:BURSt:MODE](#)) in internal or manual trigger ([\[:SOURce\[<n>\] \]:BURSt:TRIGger:SOURce](#)). When internal or manual trigger is selected, you can set the instrument to output the trigger signal with the specified edge (rising edge or falling edge) from the corresponding **[Mod/Trig/FSK/Sync]** connector at the rear panel or turn off the trigger signal output.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns POS, NEG or OFF.

Example :SOUR:BURS:TRIG:TRIGO POS /*Set the edge type of the trigger output signal in the burst mode of CH1 to rising edge*/

:SOUR:BURS:TRIG:TRIGO? /*Query the type of the trigger output signal in the burst mode of CH1 and the query returns POS*/

Related Commands [\[:SOURce\[<n>\] \]:BURSt:MODE](#)
[\[:SOURce\[<n>\] \]:BURSt:TRIGger:SOURce](#)

:SOURce:FREQuency Commands

[[:SOURce[<n>]]:FREQuency:CENTer

Syntax [:SOURce[<n>]]:FREQuency:CENTer {<frequency>|MINimum|MAXimum}

[[:SOURce[<n>]]:FREQuency:CENTer? [MINimum|MAXimum]

Description Set the center frequency of the sweep function of the specified channel.

Query the center frequency of the sweep function of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	Refer to the "Explanation"	550Hz

- Explanation**
- You can set the sweep boundaries via the center frequency and frequency span ([\[:SOURce\[<n>\]\]:FREQuency:SPAN](#)). The ranges of the center frequency and frequency span of different sweep waveforms are different and the center frequency and frequency span affect each other. Define the minimum frequency of the current waveform as $F_{\min}$, the maximum frequency as $F_{\max}$, $F_m = (F_{\min} + F_{\max}) / 2$. The range of the center frequency (defined as F_{center}) is $F_{\min}$ to $F_{\max}$. The range of the frequency span (defined as F_{span}) is affected by the center frequency. When the center frequency is lower than F_m , the range of the frequency span is $\pm 2 \times (F_{center} - F_{\min})$; when the center frequency is greater than F_m , the range of the frequency span is $\pm 2 \times (F_{\max} - F_{center})$.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The start frequency, stop frequency, center frequency and frequency span fulfills the following relation.

$$F_{center} = (F_{start} + F_{stop}) / 2; \quad F_{span} = (F_{stop} - F_{start})$$

Wherein,

F_{center} —center frequency;

F_{span} —frequency span;

F_{start} —start frequency;

F_{stop} —stop frequency.

- After the "Center Frequency" is modified, the signal generator will output the sweep waveform from the specified "Start Frequency". In large-scale sweep, the amplitude characteristic of the output signal might change.

Return Format The query returns the center frequency in scientific notation with 7 effective digits, for example, 5.000000E+02 (the center frequency is 500Hz).

Example :SOUR1:FREQ:CENT 500 /*Set the center frequency of the sweep function of CH1 to 500Hz*/

:SOUR1:FREQ:CENT? /*Query the center frequency of the sweep function of CH1 and the query returns 5.000000E+02*/

Related Command [\[:SOURce\[<n>\]\]:FREQuency:SPAN](#)

[:SOURce[<n>]]:FREQuency:COUPle:MODE

Syntax [:SOURce[<n>]]:FREQuency:COUPle:MODE {OFFSet|RATio}

[:SOURce[<n>]]:FREQuency:COUPle:MODE?

Description Set the frequency coupling mode to frequency deviation (OFFSet) or frequency ratio (RATio).

Query the frequency coupling mode.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{OFFSet RATio}	Discrete	OFFSet RATio	RATio

- Explanation**
- Frequency deviation mode: the frequencies of CH1 and CH2 fulfills certain deviation relation: $F_{CH2} = F_{CH1} + F_{Dev}$ (the reference source is CH1); $F_{CH1} = F_{CH2} - F_{Dev}$ (the reference source is CH2). Wherein, F_{CH1} is the frequency of CH1, F_{CH2} is the frequency of CH2 and F_{Dev} is the specified frequency deviation.
 - Frequency ratio mode: the frequencies of CH1 and CH2 fulfills certain ratio relation: $F_{CH2} = F_{CH1} * F_{Ratio}$ (the reference source is CH1); $F_{CH1} = F_{CH2} / F_{Ratio}$ (the reference source is CH2). Wherein, F_{CH1} is the frequency of CH1, F_{CH2} is the frequency of CH2 and F_{Ratio} is the specified frequency ratio.
 - After the frequency coupling, the instrument will adjust the frequency upper limit or lower limit of the other channel to avoid parameter overrange when the frequency of any of CH1 and CH2 exceeds the frequency upper limit or lower limit of the channel.
 - Please select the desired frequency coupling mode and set the corresponding frequency deviation ([\[:SOURce\[<n> \]\]:FREQuency:COUPle:OFFSet](#)) or frequency ration ([\[:SOURce\[<n> \]\]:FREQuency:COUPle:RATio](#)) before enabling the frequency coupling function ([\[:SOURce\[<n> \]\]:FREQuency:COUPle\[:STATE\]](#)). You cannot set the frequency coupling mode and the frequency deviation/ratio after the frequency coupling function is enabled.
 - You can also send the [:COUpling:FREQuency:MODE](#) command to set and query the frequency coupling mode.

Return Format The query returns OFFSET or RATIO.

Example :FREQ:COUP:MODE OFFS /*Set the frequency coupling mode to frequency deviation*/
 :FREQ:COUP:MODE? /*Query the frequency coupling mode and the query returns OFFSET*/

Related Commands [:COUpling:FREQuency:MODE](#)
[\[:SOURce\[<n> \]\]:FREQuency:COUPle:OFFSet](#)
[\[:SOURce\[<n> \]\]:FREQuency:COUPle:RATio](#)
[\[:SOURce\[<n> \]\]:FREQuency:COUPle\[:STATE\]](#)

[[:SOURce[<n>]]:FREQuency:COUPle:OFFSet

Syntax [:SOURce[<n>]]:FREQuency:COUPle:OFFSet <frequency>
 [:SOURce[<n>]]:FREQuency:COUPle:OFFSet?

Description Set the frequency deviation in the frequency coupling.

Query the frequency deviation in the frequency coupling.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	-59.999 999 999 999MHz to 59.999 999 999 999MHz	0

- Explanation**
- Please select the desired frequency coupling mode ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)) and set the corresponding frequency deviation or frequency ratio ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)) before enabling the frequency coupling function ([\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)). You cannot set the frequency coupling mode and the frequency deviation/ratio after the frequency coupling function is enabled.
 - When the frequency coupling function is disabled, sending this command can set the frequency deviation if the current frequency coupling mode is frequency deviation; sending this command can select the frequency deviation coupling mode and set the frequency deviation if the current frequency coupling mode is frequency ratio.
 - You can also send the [:COUPling:FREQuency:DEViation](#) command to set and query the frequency deviation in the frequency coupling of the specified channel.

Return Format The query returns the frequency deviation in scientific notation with 7 effective digits, for example, 1.000000E+02 (the frequency deviation in the frequency coupling is 100Hz).

Example :FREQ:COUP:OFFS 100 /*Set the frequency deviation in the frequency coupling to 100Hz*/
 :FREQ:COUP:OFFS? /*Query the frequency deviation in the frequency coupling and the query returns 1.000000E+02*/

Related Commands [:COUPling:FREQuency:DEViation](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)

[[:SOURce[<n>]]:FREQuency:COUPle:RATio

Syntax [[:SOURce[<n>]]:FREQuency:COUPle:RATio <ratio>

[[:SOURce[<n>]]:FREQuency:COUPle:RATio?

Description Set the frequency ratio in the frequency coupling.

Query the frequency ratio in the frequency coupling.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<ratio>	Real	0.000 001 to 1 000 000	1

- Explanation**
- Please select the desired frequency coupling mode ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)) and set the corresponding frequency deviation ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)) or frequency ratio before enabling the frequency coupling function ([\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)). You cannot set the frequency coupling mode and the frequency deviation/ratio after the frequency coupling function is enabled.
 - When the frequency coupling function is disabled, sending this command can set the frequency ratio if the current frequency coupling mode is frequency ratio; sending this command can select the frequency ratio coupling mode and set the frequency ratio if the current frequency coupling mode is frequency deviation.
 - You can also send the [:COUPling:FREQuency:RATio](#) command to set and query the frequency ratio in the frequency coupling of the specified channel.

Return Format The query returns the frequency ratio in scientific notation with 7 effective digits, for example, 1.001230E+02 (the frequency ratio in the frequency coupling is 100.123).

Example

```
:FREQ:COUP:RAT 100.123      /*Set the frequency ratio in the frequency coupling to
                               100.123*/

:FREQ:COUP:RAT?             /*Query the frequency ratio in the frequency coupling
                               and the query returns 1.001230E+02*/
```

Related Commands

- [:COUPling:FREQuency:RATio](#)
- [\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)
- [\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)
- [\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)

[[:SOURce[<n>]]:FREQuency:COUPle[:STATe]

Syntax [:SOURce[<n>]]:FREQuency:COUPle[:STATe] {ON|1|OFF|0}
 [:SOURce[<n>]]:FREQuency:COUPle[:STATe]?

Description Turn on or off the frequency coupling function.

Query the on/off status the frequency coupling function.

Parameter

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

- Explanation**
- When the frequency coupling function is turned off, you can select the frequency coupling mode and set the corresponding frequency deviation or ratio. After the frequency coupling function is turned on, CH1 and CH2 are the reference source of each other; when the frequency of one channel (this channel is the reference source) is changed, the frequency of the other channel will be adjusted automatically and the channel will always keep the specified frequency deviation or ratio with the reference channel.
 - Please select the desired frequency coupling mode ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)) and set the corresponding frequency deviation ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)) or frequency ration ([\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)) before enabling the frequency coupling function. You cannot set the frequency coupling mode and the frequency deviation/ratio after the frequency coupling function is enabled.
 - You can also send the [:COUPling:FREQuency\[:STATe\]](#) command to set or query the status of the frequency coupling function.

Return Format The query returns ON or OFF.

Example :FREQ:COUP ON /*Turn on the frequency coupling function */
 :FREQ:COUP? /*Query the on/off status the frequency coupling function and the query returns ON*/

Related Commands [:COUPling:FREQuency\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)
[\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)

[:SOURce[<n>]]:FREQuency[:FIXed]

Syntax [:SOURce[<n>]]:FREQuency[:FIXed] {<frequency>|MINimum|MAXimum}
 [:SOURce[<n>]]:FREQuency[:FIXed]? [MINimum|MAXimum]

Description Set the frequency of the waveform (basic waveforms and arbitrary waveform) of the specified channel.

Query the frequency of the waveform (basic waveforms and arbitrary waveform) of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	Refer to Table 2-1	1kHz

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the frequency value in the command is greater than the corresponding frequency upper limit or lower than the corresponding frequency lower limit, the waveform frequency of the specified channel will be set to the frequency upper limit or lower limit.
 - When the waveform type of the specified channel is changed, the instrument still uses the frequency if the frequency is valid for the new waveform type; the instrument will display prompt message and set the frequency to the frequency upper limit of the new waveform type automatically if the frequency is invalid for the new waveform type.

Return Format The query returns the waveform frequency in scientific notation with 7 effective digits, for example, 1.000000E+02 (the waveform frequency is 100Hz).

Example :SOUR1:FREQ 100 /*Set the waveform frequency of CH1 to 100Hz*/
 :SOUR1:FREQ? /*Query the waveform frequency of CH1 and the query returns 1.000000E+02*/

[[:SOURce[<n>]]:FREQuency:SPAN

Syntax [:SOURce[<n>]]:FREQuency:SPAN {<frequency>|MINimum|MAXimum}

[:SOURce[<n>]]:FREQuency:SPAN? [MINimum|MAXimum]

Description Set the frequency span of the sweep function of the specified channel.

Query the frequency span of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	The frequency range of the current waveform of the specified channel	900Hz

Explanation

- You can set the sweep boundaries via the center frequency and frequency span ([\[:SOURce\[<n>\]\]:FREQuency:SPAN](#)). The ranges of the center frequency and frequency span of different sweep waveforms are different and the center frequency and frequency span affect each other. Define the minimum frequency of the current waveform as $F_{\min}$, the maximum frequency as $F_{\max}$, $F_m = (F_{\min} + F_{\max}) / 2$. The range of the center frequency (defined as F_{center}) is $F_{\min}$ to $F_{\max}$. The range of the frequency span (defined as F_{span}) is affected by the center frequency. When the center frequency is lower than F_m , the range of the frequency span is $\pm 2 \times (F_{center} - F_{\min})$; when the center frequency is greater than F_m , the range of the frequency span is $\pm 2 \times (F_{\max} - F_{center})$.

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

- The start frequency, stop frequency, center frequency and frequency span fulfills the following relation.

$$F_{center} = (F_{start} + F_{stop}) / 2; F_{span} = (F_{stop} - F_{start})$$

Wherein,

F_{center} —center frequency;

F_{span} —frequency span;

F_{start} —start frequency;

F_{stop} —stop frequency.

- After the “Frequency Span” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”. In large-scale sweep, the amplitude characteristic of the output signal might change.

Return Format The query returns the frequency span in scientific notation with 7 effective digits, for example, 8.000000E+02 (the frequency span is 800Hz).

Example :SOUR1:FREQ:SPAN 800 /*Set the frequency span of the sweep function of CH1 to 800Hz*/

:SOUR1:FREQ:SPAN? /*Query the frequency span of the sweep function of CH1 and the query returns 8.000000E+02*/

Related Command [\[:SOURce\[<n>\]\]:FREQuency:CENTer](#)

[[:SOURce[<n>]]:FREQuency:STARt

Syntax [:SOURce[<n>]]:FREQuency:STARt {<frequency>|MINimum|MAXimum}

[:SOURce[<n>]]:FREQuency:STARt? [MINimum|MAXimum]

Description Set the start frequency of the sweep function of the specified channel.

Query the start frequency of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	The frequency range of the current waveform of the specified channel	100Hz

- Explanation**
- The start frequency and stop frequency ([\[:SOURce\[<n>\]\]:FREQuency:STOP](#)) is the frequency upper limit and lower limit of the frequency sweep. The signal generator always sweeps from the start frequency to the stop frequency and then returns to the start frequency. When the start frequency is lower than the stop frequency, the signal generator sweeps from low frequency to high frequency; when the start frequency is greater than the stop frequency, the signal generator sweeps from high frequency to low frequency; when the start frequency is equal to the stop frequency, the signal generator outputs at the fixed frequency.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The sine, square, ramp and arbitrary waveform (except DC) can generate sweep output and the range of the start frequency <frequency> differs for different sweep waveform.
 - The start frequency, stop frequency, center frequency and frequency span fulfills the following relation.

$$F_{center} = (|F_{start} + F_{stop}|); \quad F_{span} = (|F_{stop} - F_{start}|)$$

Wherein,

F_{center} —center frequency;

F_{span} —frequency span;

F_{start} —start frequency;

F_{stop} —stop frequency.

- After the “Start Frequency” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”. In large-scale sweep, the amplitude characteristic of the output signal might change.

Return Format The query returns the start frequency in scientific notation with 7 effective digits, for example, 1.000000E+02 (the start frequency is 100Hz).

Example :SOUR1:FREQ:STAR 100 /*Set the start frequency of the sweep function of CH1 to 100Hz*/

:SOUR1:FREQ:STAR? /*Query the start frequency of the sweep function of CH1 and the query returns 1.000000E+02*/

Related Command [\[:SOURce\[<n>\]\]:FREQuency:STOP](#)

[[:SOURce[<n>]]:FREQuency:STOP

Syntax [:SOURce[<n>]]:FREQuency:STOP {<frequency>|MINimum|MAXimum}
 [:SOURce[<n>]]:FREQuency:STOP? [MINimum|MAXimum]

Description Set the stop frequency of the sweep function of the specified channel.
 Query the stop frequency of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	The frequency range of the current waveform of the specified channel	1kHz

- Explanation**
- The start frequency ([\[:SOURce\[<n>\]\]:FREQuency:START](#)) and stop frequency is the frequency upper limit and lower limit of the frequency sweep. The signal generator always sweeps from the start frequency to the stop frequency and then returns to the start frequency. When the start frequency is lower than the stop frequency, the signal generator sweeps from low frequency to high frequency; when the start frequency is greater than the stop frequency, the signal generator sweeps from high frequency to low frequency; when the start frequency is equal to the stop frequency, the signal generator outputs at the fixed frequency.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The sine, square, ramp and arbitrary waveform (except DC) can generate sweep output and the range of the stop frequency <frequency> differs for different sweep waveform.
 - The start frequency, stop frequency, center frequency and frequency span fulfills the following relation.

$$F_{center} = (F_{start} + F_{stop}) / 2; \quad F_{span} = (F_{stop} - F_{start}) / 2$$

Wherein,

F_{center} —center frequency;

F_{span} —frequency span;

F_{start} —start frequency;

F_{stop} —stop frequency.

- After the “Stop Frequency” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”. In large-scale sweep, the amplitude characteristic of the output signal might change.

Return Format The query returns the stop frequency in scientific notation with 7 effective digits, for example, 9.000000E+02 (the stop frequency is 900Hz).

Example :SOUR1:FREQ:STOP 900 /*Set the stop frequency of the sweep function of CH1 to 900Hz*/
 :SOUR1:FREQ:STOP? /*Query the stop frequency of the sweep function of CH1 and the query returns 9.000000E+02*/

Related Command [\[:SOURce\[<n>\]\]:FREQuency:START](#)

:SOURce:FUNCTION Commands

[[:SOURce[<n>]]:FUNCTION:ARBitrary:MODE

Syntax [:SOURce[<n>]]:FUNCTION:ARBitrary:MODE {FREQ|SRATe}

[:SOURce[<n>]]:FUNCTION:ARBitrary:MODE?

Description Set the arbitrary waveform output mode of the specified channel to frequency (FREQ) or sample rate (SRATe) output mode.

Query the arbitrary waveform output mode of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{FREQ SRATe}	Discrete	FREQ SRATe	FREQ

- Explanation**
- DG1000Z supports two output modes: frequency output mode and sample rate output mode.
 - In the frequency output mode, users can set the output frequency or period of the arbitrary waveform but cannot set the sample rate. The instrument outputs the arbitrary waveform made up of certain points selected according to the current output frequency.
 - In the sample rate output mode, users can set the sample rate (namely number of points outputted per second) but cannot set the frequency or period. The instrument outputs the arbitrary waveform point by point according to the current sample rate.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns FREQ or SRATE.

Example

```
:SOUR1:FUNC:ARB:MODE FREQ    /*Set the arbitrary waveform output mode of
                                CH1 to frequency output*/

:SOUR1:FUNC:ARB:MODE?        /*Query the arbitrary waveform output mode
                                of CH1 and the query returns FREQ*/
```

[[:SOURce[<n>]]:FUNCtion:ARBitrary:SRATe

Syntax [:SOURce[<n>]]:FUNCtion:ARBitrary:SRATe {<srate>|MINimum|MAXimum}
 [:SOURce[<n>]]:FUNCtion:ARBitrary:SRATe? [MINimum|MAXimum]

Description Set the sample rate of the arbitrary waveform of the specified channel.

Query the sample rate of the arbitrary waveform of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<srate>	Real	1uSa/s to 60MSa/s	20MSa/s

- Explanation**
- The sample rate is the number of points outputted per second. The instrument outputs the arbitrary waveform point by point according to the current sample rate.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the sample rate of the arbitrary waveform in scientific notation with 7 effective digits, for example, 1.000000E+02 (the sample rate of the arbitrary waveform is 100Sa/s)

Example :SOUR1:FUNC:ARB:SRAT 100 /*Set the sample rate of the arbitrary waveform of CH1 to 100Sa/s*/
 :SOUR1:FUNC:ARB:SRAT? /*Query the sample rate of the arbitrary waveform of CH1 and the query returns 1.000000E+02*/

[:SOURce[<n>]]:FUNCTION:PULSe:DCYCLE

Syntax [:SOURce[<n>]]:FUNCTION:PULSe:DCYCLE { <percent> | MINimum | MAXimum }

[:SOURce[<n>]]:FUNCTION:PULSe:DCYCLE? [MINimum | MAXimum]

Description Set the pulse duty cycle of the specified channel.

Query the pulse duty cycle of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<percent>	Discrete	0.001% to 99.999%	50%

- Explanation**
- The pulse duty cycle is defined as the percentage that the pulse width ([\[:SOURce\[<n> \]\]:FUNCTION:PULSe:WIDTH](#)) takes up in the pulse period ([\[:SOURce\[<n> \]\]:FUNCTION:PULSe:PERiod](#)).
 - The range of the pulse duty cycle is limited by the “minimum pulse width” and “pulse period” (for the ranges of the “minimum pulse width” and “pulse period”, please refer to the “Signal Characteristics” of the “Specifications” in *DG1000Z User’s Guide*). The actual range of the pulse duty cycle is

$$100 \times P_{wmin} \div P_{pulse} \leq P_{dcycle} < 100 \times (1 - 2 \times P_{wmin} \div P_{pulse})$$

Wherein,

P_{dcycle} — pulse duty cycle;

P_{wmin} — minimum pulse width;

P_{pulse} — pulse period.

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the pulse duty cycle in scientific notation with 7 effective digits, for example, 4.500000E+01 (the pulse duty cycle is 45%).

Example

```
:SOUR1:FUNC:PULS:DCYC 45      /*Set the pulse duty cycle of CH1 to 45%*/
:SOUR1:FUNC:PULS:DCYC?        /*Query the pulse duty cycle of CH1 and the query
                                returns 4.500000E+01*/
```

Related Commands [\[:SOURce\[<n> \]\]:FUNCTION:PULSe:PERiod](#)
[\[:SOURce\[<n> \]\]:FUNCTION:PULSe:WIDTH](#)

[[:SOURce[<n>]]:FUNCtion:PULSe:HOLD

Syntax [[:SOURce[<n>]]:FUNCtion:PULSe:HOLD {WIDTh|DCYClE}

[[:SOURce[<n>]]:FUNCtion:PULSe:HOLD?

Description Set the highlighted item of the specified channel to pulse width (WIDTh) or pulse duty cycle (DCYClE).

Query the item (pulse width or pulse duty cycle) highlighted of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{WIDTh DCYClE}	Discrete	WIDTh DCYClE	DCYClE

Return Format The query returns WIDT or DUTY.

Example :SOUR1:FUNC:PULS:HOLD WIDT /*Set the highlighted item of CH1 to pulse width*/

:SOUR1:FUNC:PULS:HOLD? /*Query the item (pulse width or pulse duty cycle) highlighted of CH1 and the query returns WIDT*/

[[:SOURce[<n>]]:FUNCtion:PULSe:PERiod

Syntax [[:SOURce[<n>]]:FUNCtion:PULSe:PERiod {<seconds>|MINimum|MAXimum}

[[:SOURce[<n>]]:FUNCtion:PULSe:PERiod? [MINimum|MAXimum]

Description Set the pulse period of the specified channel.

Query the pulse period of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	40ns to 1Ms (DG1062Z) 66.6ns to 1Ms (DG1032Z)	1ms

Explanation

- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- When the waveform type of the specified channel is changed ([[:SOURce[<n>]]:APPLY?), the instrument still uses the period if the period is valid for the new waveform type; the instrument displays prompt message and sets the period to the period lower limit of the new waveform type automatically if the period is invalid for the new waveform type.

Return Format The query returns the pulse period in scientific notation with 7 effective digits, for example, 1.000000E-01 (the pulse period is 0.1s).

Example :SOUR1:FUNC:PULS:PER 0.1 /*Set the pulse period of CH1 to 0.1s*/

:SOUR1:FUNC:PULS:PER? /*Query the pulse period of CH1 and the query returns 1.000000E-01*/

Related Command [[:SOURce[<n>]]:APPLY?

[:SOURce[<n>]]:FUNCTION:PULSe:TRANsition[:BOTH]

Syntax [:SOURce[<n>]]:FUNCTION:PULSe:TRANsition[:BOTH]
{ <seconds> | MINimum | MAXimum }

Description Set the pulse rise time and fall time of the specified channel to the same specified value.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<seconds>	Real	10ns to $0.625 \times$ pulse width	20ns

- Explanation**
- The rise time is defined as the time required for the pulse amplitude to rise from 10% to 90%; the fall time is defined as the time required for the pulse amplitude to fall from 90% to 10%.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The ranges of the rise time and fall time are limited by the current waveform frequency and pulse width. When the specified value exceeds the limits, the instrument will adjust the edge time automatically to make it match the specified pulse width.

Example :SOUR1:FUNC:PULS:TRAN 0.000000035 /*Set the pulse rise time and fall time of CH1 to 35ns*/

[:SOURce[<n>]]:FUNCTION:PULSe:TRANsition:LEADing

Syntax [:SOURce[<n>]]:FUNCTION:PULSe:TRANsition:LEADing
{ <seconds> | MINimum | MAXimum }

[:SOURce[<n>]]:FUNCTION:PULSe:TRANsition:LEADing? [MINimum|MAXimum]

Description Set the pulse rise time of the specified channel.

Query the pulse rise time of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<seconds>	Real	10ns to $0.625 \times$ pulse width	20ns

- Explanation**
- The rise time is defined as the time required for the pulse amplitude to rise from 10% to 90%.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the rise time is limited by the current waveform frequency and pulse width. When the specified value exceeds the limits, DG1000Z will adjust the edge time automatically to make it match the specified pulse width.

Return Format The query returns the pulse rise time in scientific notation with 7 effective digits, for example, 3.500000E-08 (the pulse rise time is 35ns).

Example :SOUR1:FUNC:PULS:TRAN:LEAD 0.000000035 /*Set the pulse rise time of CH1 to 35ns*/

:SOUR1:FUNC:PULS:TRAN:LEAD? /*Query the pulse rise time of CH1 and the query returns 3.500000E-08*/

[[:SOURce[<n>]]:FUNCtion:PULSe:TRANSition:TRAILing

Syntax [:SOURce[<n>]]:FUNCtion:PULSe:TRANSition:TRAILing
{<seconds>|MINimum|MAXimum}

[:SOURce[<n>]]:FUNCtion:PULSe:TRANSition:TRAILing? [MINimum|MAXimum]

Description Set the pulse fall time of the specified channel.

Query the pulse fall time of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	10ns to 0.625× pulse width	20ns

- Explanation**
- The fall time is defined as the time required for the pulse amplitude to fall from 90% to 10%.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the fall time is limited by the current waveform frequency and pulse width. When the specified value exceeds the limits, DG1000Z will adjust the edge time automatically to make it match the specified pulse width.

Return Format The query returns the pulse fall time in scientific notation with 7 effective digits, for example, 3.500000E-08 (the pulse fall time is 35ns).

Example

```
:SOUR1:FUNC:PULS:TRAN:TRA 0.000000035 /*Set the pulse fall time of CH1 to 35ns*/
:SOUR1:FUNC:PULS:TRAN:TRA? /*Query the pulse fall time of CH1 and the query returns 3.500000E-08*/
```

[[:SOURce[<n>]]:FUNCTION:PULSe:WIDTh

Syntax [[:SOURce[<n>]]:FUNCTION:PULSe:WIDTh {<seconds>|MINimum|MAXimum}

[[:SOURce[<n>]]:FUNCTION:PULSe:WIDTh? [MINimum|MAXimum]

Description Set the pulse width of the specified channel.

Query the pulse width of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	16ns to 999.999 982 118 590 6ks	500us

- Explanation**
- The pulse width is defined as the time interval between 50% of the amplitude of a pulse rising edge to 50% of the amplitude of the next pulse falling edge.
 - The range of the pulse width is limited by the “minimum pulse width” and “pulse period” (for the ranges of the “minimum pulse width” and “pulse period”, please refer to the “Signal Characteristics” of the “Specifications” in *DG1000Z User's Guide*). The actual range of the pulse width is

$$P_{wmin} \leq P_{width} < P_{pulse} - 2 \times P_{wmin}$$

Wherein,

P_{width} — pulse width;

P_{wmin} — minimum pulse width;

P_{pulse} — pulse period.

- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the pulse width in scientific notation with 7 effective digits, for example, 1.000000E-02 (the pulse width is 10ms, namely 0.01s).

Example

```
:SOUR1:FUNC:PULS:WIDT 0.01 /*Set the pulse width of CH1 to 10ms (namely 0.01s)*/
:SOUR1:FUNC:PULS:WIDT? /*Query the pulse width of CH1 and the query returns 1.000000E-02*/
```

[[:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry

Syntax [:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry {<symmetry>|MINimum|MAXimum}
 [:SOURce[<n>]]:FUNCtion:RAMP:SYMMetry? [MINimum|MAXimum]

Description Set the ramp symmetry of the specified channel.

Query the ramp symmetry of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<symmetry>	Real	0% to 100%	50%

- Explanation**
- The symmetry is defined as the percentage that the rising period of the ramp waveform takes up in the period.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the symmetry in scientific notation with 7 effective digits, for example, 5.500000E+01 (the ramp symmetry is 55%).

Example

```
:SOUR1:FUNC:RAMP:SYMM 55 /*Set the ramp symmetry of CH1 to 55%*/
:SOUR1:FUNC:RAMP:SYMM? /*Query the ramp symmetry of CH1 and the query
returns 5.500000E+01*/
```

[:SOURce[<n>]] :FUNCTION[:SHAPE]

Syntax [:SOURce[<n>]] :FUNCTION[:SHAPE] <name>

[:SOURce[<n>]] :FUNCTION[:SHAPE]?

Description Set the waveform type of the specified channel.

Query the waveform type of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<name>	Discrete	Refer to the "Explanation"	None

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- <name> can be various basic waveforms, harmonic waveform and arbitrary waveform. Its range is

SINusoid|SQUare|RAMP|PULSe|NOISe|USER|HARMonic| DC|KAISER|
 ROUNDPM|SINC|NEGRAMP|ATTALT|AMPALT|STAIRDN|STAIRUP|STAIRUD|CPULSE|
 PPULSE|NPULSE|TRAPEZIA|ROUNDFHALF|ABSSINE|ABSSINEHALF|SINETRA|
 SINEVER|EXPRISE|EXP FALL|TAN|COT|SQRT|X2DATA|GAUSS|HAVERSINE|LORENTZ
 |DIRICHLET|GAUSSPULSE|AIRY|CARDIAC|QUAKE|GAMMA|VOICE|TV|COMBIN|
 BANDLIMITED|STEPRESP|BUTTERWORTH|CHEBYSHEV1|CHEBYSHEV2|BOXCAR|
 BARLETT|TRIANG|BLACKMAN|HAMMING|HANNING|DUALTONE|ACOS|ACOSH|
 ACOTCON|ACOTPRO|ACOTHCON|ACOTHPRO|ACSCCON|ACSCPRO|ACSCHCON|
 ACSCHPRO|ASECCON|ASECPRO|ASECH|ASIN|ASINH|ATAN|ATANH|BESSELJ|
 BESSELY|CAUCHY|COSH|COSINT|COTHCON|COTHPRO|CSCCON|CSCPRO|
 CSCHCON|CSCHPRO|CUBIC|ERF|ERFC|ERFCINV|ERFINV|LAGUERRE|LAPLACE|
 LEGEND|LOG|LOGNORMAL|MAXWELL|RAYLEIGH|RECIPCON|RECIPPRO|SECCON|
 SECPRO|SECH|SINH|SININT|TANH|VERSIERA|WEIBULL|BARTHANN|BLACKMANH|
 BOHMANWIN|CHEBWIN|FLATTOPWIN|NUTTALLWIN|PARZENWIN|TAYLORWIN|
 TUKEYWIN|CWPUSLE|LFPULSE|LFMPULSE|EOG|EEG|EMG|PULSIOLOGRAM|TENS1|
 TENS2|TENS3|SURGE|DAMPEDOSC|SWINGOSC|RADAR|THREEAM|THREEFM|
 THREPEM|THREPEWM|THREPEFM|RESSPEED|MCNOSIE|PAHCUR|RIPPLE|
 ISO76372TP1|ISO76372TP2A|ISO76372TP2B|ISO76372TP3A|ISO76372TP3B|
 ISO76372TP4|ISO76372TP5A|ISO76372TP5B|ISO167502SP|ISO167502VR|SCR|
 IGNITION|NIMHDISCHARGE|GATEVIBR.

Return Format The query returns a string, for example, SQU.

Example

```
:SOUR1:FUNC SQU      /*Set the waveform type of CH1 to square*/
:SOUR1:FUNC?         /*Query the waveform type of CH1 and the query returns SQU*/
```

[[:SOURce[<n>]]:FUNCTION:SQUare:DCYcle

Syntax [:SOURce[<n>]]:FUNCTION:SQUare:DCYcle {<percent>|MINimum|MAXimum}
 [:SOURce[<n>]]:FUNCTION:SQUare:DCYcle? [MINimum|MAXimum]

Description Set the square duty cycle of the specified channel.

Query the square duty cycle of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<percent>	Real	Limited by the waveform frequency	50%

- Explanation**
- Duty cycle is defined as the percentage that the duration of the high level of the square waveform takes up in the period.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the square duty cycle in scientific notation with 7 effective digits, for example, 4.500000E+01 (the square duty cycle is 45%).

Example :SOUR1:FUNC:SQU:DCYC 45 /*Set the square duty cycle of CH1 to 45%*/
 :SOUR1:FUNC:SQU:DCYC? /*Query the square duty cycle of CH1 and the query returns 4.500000E+01*/

[[:SOURce[<n>]]:FUNCTION:SQUare:PERiod

Syntax [:SOURce[<n>]]:FUNCTION:SQUare:PERiod {<seconds>|MINimum|MAXimum}
 [:SOURce[<n>]]:FUNCTION:SQUare:PERiod? [{MINimum|MAXimum}]

Description Set the square period of the specified channel.

Query the square period of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	40ns to 1Ms (DG1062Z) 66.6ns to 1Ms (DG1032Z)	1ms

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - When the waveform type of the specified channel is changed ([\[:SOURce\[<n>\]\]:APPLY?](#)), the instrument still uses the period if the period is valid for the new waveform type; the instrument displays prompt message and sets the period to the period lower limit of the new waveform type automatically if the period is invalid for the new waveform type.

Return Format The query returns the square period in scientific notation with 7 effective digits, for example, 1.000000E+00 (the square period is 1s).

Example :SOUR1:FUNC:SQU:PER 1 /*Set the square period of CH1 to 1s*/
 :SOUR1:FUNC:SQU:PER? /*Query the square period of CH1 and the query returns 1.000000E+00*/

Related Command [\[:SOURce\[<n>\]\]:APPLY?](#)

:SOURce:HARMonic Commands

[[:SOURce[<n>]]:HARMonic:AMPL

Syntax [:SOURce[<n>]]:HARMonic:AMPL <sn>,{<value>|MINimum|MAXimum}

[:SOURce[<n>]]:HARMonic:AMPL? <sn>[,MINimum|MAXimum]

Description Set the amplitude of the specified order of harmonic in the harmonic function of the specified channel.

Query the amplitude of the specified order of harmonic in the harmonic function of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<sn>	Integer	2 to 8	2
	<value>	Real	0Vpp to the amplitude upper limit of the specified channel	1.264 7Vpp

Explanation ➤ When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

➤ The amplitude upper limit of the specified channel is limited by the “Impedance” (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and “frequency/period” (:SOURce[<n>]:FREQuency[:FIXed] or :SOURce[<n>]:PERiod[:FIXed]) settings.

Return Format The query returns the harmonic amplitude in scientific notation with 7 effective digits, for example, 1.000000E+00 (the harmonic amplitude is 1Vpp).

Example :SOUR1:HARM:AMPL 5,1 /*Set the amplitude of the fifth order of harmonic of CH1 to 1Vpp*/

:SOUR1:HARM:AMPL? 5 /*Query the amplitude of the fifth order of harmonic of CH1 and the query returns 1.000000E+00*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)
[\[:SOURce\[<n>\]\]:FREQuency\[:FIXed\]](#)
[\[:SOURce\[<n>\]\]:PERiod\[:FIXed\]](#)

[[:SOURce[<n>]]:HARMonic:ORDEr

Syntax [[:SOURce[<n>]]:HARMonic:ORDEr {<value>|MINimum|MAXimum}

[[:SOURce[<n>]]:HARMonic:ORDEr? [MINimum|MAXimum]

Description Set the highest order of harmonic that can be outputted in the harmonic function of the specified channel.

Query the highest order of harmonic that can be outputted in the harmonic function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<value>	Integer	2 to 8	2

- Explanation**
- When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the highest order of harmonic is limited by the maximum output frequency of the instrument (defined as $F_{out\ max}$) and the current fundamental waveform frequency (defined as F_{fund}). The actual range is the integers from 2 to $(F_{out\ max} \div F_{fund})$.

Return Format The query returns the highest order of harmonic in scientific notation with 7 effective digits, for example, 3.000000E+00 (the highest order of harmonic is 3).

Example

```
:SOUR1:HARM:ORDE 3      /*Set the highest order of harmonic that can be
                           outputted of CH1 to 3*/

:SOUR1:HARM:ORDE?       /*Query the highest order of harmonic that can be
                           outputted of CH1 and the query returns
                           3.000000E+00*/
```

[[:SOURce[<n>]]:HARMonic:PHASe

Syntax [:SOURce[<n>]]:HARMonic:PHASe <sn>,{<value>|MINimum|MAXimum}
 [:SOURce[<n>]]:HARMonic:PHASe? <sn>[,MINimum|MAXimum]

Description Set the phase of the specified order of harmonic in the harmonic function of the specified channel.

Query the phase of the specified order of harmonic in the harmonic function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<sn>	Integer	2 to 8	2
<value>	Real	0° to 360°	0.000°

Explanation When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the harmonic phase in scientific notation with 7 effective digits, for example, 1.000000E+01 (the harmonic phase is 10°).

Example :SOUR1:HARM:PHAS 5,10 /*Set the phase of the fifth order of harmonic of CH1 to 10°*/
 :SOUR1:HARM:PHAS? 5 /*Query the phase of the fifth order of harmonic of CH1 and the query returns 1.000000E+01*/

[[:SOURce[<n>]]:HARMonic[:STATe]

Syntax [:SOURce[<n>]]:HARMonic[:STATe] {ON|1|OFF|0}
 [:SOURce[<n>]]:HARMonic[:STATe]?

Description Turn on or off the harmonic function of the specified channel.

Query the on/off status of the harmonic function of the specified channel.

Parameter

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

Explanation ➤ DG1000Z can be used as a harmonic waveform generator and can output harmonic with the specified order ([\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)), amplitude ([\[:SOURce\[<n>\]\]:HARMonic:AMPL](#)) and phase ([\[:SOURce\[<n>\]\]:HARMonic:PHASe](#)).
 ➤ When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example :SOUR1:HARM ON /*Turn on the harmonic function of CH1*/
 :SOUR1:HARM? /*Query the on/off status of the harmonic function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:HARMonic:AMPL](#)
[\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)
[\[:SOURce\[<n>\]\]:HARMonic:PHASe](#)

[[:SOURce[<n>]]:HARMonic:TYPE

Syntax [:SOURce[<n>]]:HARMonic:TYPE {EVEN|ODD|ALL|USER}

[:SOURce[<n>]]:HARMonic:TYPE?

Description Set the harmonic type of the specified channel to even harmonic (EVEN), odd harmonic (ODD), all harmonic (ALL) or user-defined harmonic (USER).

Query the harmonic type of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{EVEN ODD ALL USER}	Discrete	EVEN ODD ALL USER	EVEN

- Explanation**
- Even harmonic (EVEN): the instrument outputs the fundamental waveform and the even orders of harmonics.
 - Odd harmonic (ODD): the instrument outputs the fundamental waveform and the odd orders of harmonics.
 - All harmonic (ALL): the instrument outputs the fundamental waveform and all the orders of harmonics.
 - User-defined harmonic (USER): users can define the orders of the harmonics outputted and the highest order is 8.
The output states of the 8 orders of harmonics are represented by 8-bit binary data. The leftmost bit represents the fundamental waveform; it is fixed at X and cannot be modified. The rest 7 bits correspond to the second order of harmonic to the eighth order of harmonic from left to right. 1 denotes turning on the output of the corresponding order of harmonic and 0 denotes turning off the output of the corresponding order of harmonic. For example, set the 8-bit data to X001 0001 which denotes outputting the fundamental waveform, forth order of harmonic and eighth order of harmonic.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The harmonic actually outputted is limited by the highest order of harmonic currently specified ([\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)) and the harmonic type.

Return Format The query returns EVEN, ODD, ALL or USER.

Example :SOUR1:HARM:TYP ODD /*Set the harmonic type of CH1 to odd harmonic*/
:SOUR1:HARM:TYP? /*Query the harmonic type of CH1 and the query returns ODD*/

Related Command [\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)

[[:SOURce[<n>]]:HARMonic:USER

Syntax [:SOURce[<n>]]:HARMonic:USER <user>

[:SOURce[<n>]]:HARMonic:USER?

Description Set the user-defined harmonic output of the specified channel.

Query the user-defined harmonic output of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<user>	ASCII string	X0000000 to X11111111	X0000000

- Explanation**
- In the user-defined harmonic ([\[:SOURce\[<n>\]\]:HARMonic:TYPE](#)), users can define the orders of the harmonics to be outputted and the highest order is 8. The output states of the 8 orders of harmonics are represented by 8-bit binary data. The leftmost bit represents the fundamental waveform; it is fixed at X and cannot be modified. The rest 7 bits correspond to the second order of harmonic to the eighth order of harmonic from left to right. 1 denotes turning on the output of the corresponding order of harmonic, 0 denotes turning off the output of the corresponding order of harmonic. For example, set the 8-bit data to X001 0001 which denotes outputting the fundamental waveform, forth order of harmonic and eighth order of harmonic.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns a string between X0000000 and X11111111. For example, X0010001.

Example :SOUR1:HARM:USER X0010001 /*Set the user-defined harmonic of CH1 to output the fundamental waveform, forth order of harmonic and eighth order of harmonic*/

:SOUR1:HARM:USER? /*Query the user-defined harmonic output of CH1 and the query returns X0010001*/

Related Command [\[:SOURce\[<n>\]\]:HARMonic:TYPE](#)

:SOURce:MARKer Commands

[[:SOURce[<n>]]:MARKer:FREQuency

Syntax [[:SOURce[<n>]]:MARKer:FREQuency {<frequency>|MINimum|MAXimum}

[[:SOURce[<n>]]:MARKer:FREQuency? [MINimum|MAXimum]

Description Set the mark frequency of the specified channel.

Query the mark frequency of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	Refer to the "Explanation"	550Hz

- Explanation**
- For step sweep (the sweep points determined by the start frequency, stop frequency and number of steps are $f_1, f_2, \dots, f_n, f_{n+1}, \dots$), if the mark frequency is one of the sweep point values, the sync signal is TTL high level at the start of the sweep and will change to low level at the mark frequency point. If the mark frequency is not any of the sweep point values, the sync signal will change to low level at the sweep point which is closest to the mark frequency.
 - When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of <frequency> is limited by the "Start Frequency" ([\[\[:SOURce\[<n>\]\]:FREQuency:START\]](#)) and "Stop Frequency" ([\[\[:SOURce\[<n>\]\]:FREQuency:STOP\]](#)). It must be between the start frequency and stop frequency.
 - After the "Mark Frequency" is modified, the signal generator will output the sweep waveform from the specified "Start Frequency".

Return Format The query returns the mark frequency in scientific notation with 7 effective digits, for example, 5.000000E+02 (the mark frequency is 500Hz).

Example

```
:SOUR1:MARK:FREQ 500    /*Set the mark frequency of CH1 to 500Hz*/
:SOUR1:MARK:FREQ?       /*Query the mark frequency of CH1 and the query
                           returns 5.000000E+02*/
```

Related Commands [\[\[:SOURce\[<n>\]\]:FREQuency:START\]](#)
[\[\[:SOURce\[<n>\]\]:FREQuency:STOP\]](#)

[:SOURce[<n>]]:MARKer[:STATe]

Syntax [:SOURce[<n>]]:MARKer[:STATe] {ON|1|OFF|0}

[:SOURce[<n>]]:MARKer[:STATe]?

Description Enable or disable the frequency mark function of the specified channel.

Query the on/off status of the frequency mark function of the specified channel.

Parameter

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

- Explanation**
- The sync signal outputted from the **[CH1/Sync/Ext Mod/Trig/FSK]** connector corresponding to the specified channel at the rear panel always changes from low level to high level at the start of each sweep. The sync signal changes from high level to low level at the center frequency point when the “Mark” function is disabled or at the specified mark frequency point when the “Mark” function is enabled.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example

```
:SOUR1:MARK ON      /*Enable the frequency mark function of CH1*/
:SOUR1:MARK?        /*Query the on/off status of the frequency mark function of
                     CH1 and the query returns ON*/
```

:SOURce[:MOD]:AM Commands

[[:SOURce[<n>]][:MOD]:AM[:DEPTH]

Syntax [:SOURce[<n>]][:MOD]:AM[:DEPTH] {<depth>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:AM[:DEPTH]? [MINimum|MAXimum]

Description Set the AM modulation depth of the specified channel.

Query the AM modulation depth of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<depth>	Real	0% to 120%	100%

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - Modulation depth expressed as a percentage indicates the amplitude variation degree. In 0% modulation depth, the output amplitude is half of the carrier waveform amplitude. In 100% modulation depth, the output amplitude is equal to the carrier waveform amplitude. In greater than 100% modulation depth, the output amplitude of the instrument would not exceed 10Vpp (50Ω load).
 - When external modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce](#)) is selected, the output amplitude of the instrument is controlled by the ±5V signal level of the **[CH1/Sync/Ext Mod/Trig/FSK]** connector of the corresponding channel at the rear panel. For example, if the modulation depth is set to 100%, the output amplitude will be the maximum when the modulating signal is +5V and the minimum when the modulating signal is -5V.

Return Format The query returns the AM modulation depth in scientific notation with 7 effective digits, for example, 5.000000E+01 (the AM modulation depth is 50%).

Example

```
:SOUR1:AM 50      /*Set the AM modulation depth of CH1 to 50%*/
:SOUR1:AM?        /*Query the AM modulation depth of CH1 and the query returns
                    5.000000E+01*/
```

Related Command [\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce](#)

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

Syntax [:SOURce[<n>]][:MOD]:AM:DSSC {ON|1|OFF|0}

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

Description Turn on or off the AM carrier waveform suppression function of the specified channel.

Query the on/off status of the AM carrier waveform suppression function of the specified channel.

Parameter

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

- Explanation**
- DG1000Z supports the normal amplitude modulation and double sideband suppressed carrier (DSB-SC) amplitude modulation. In the normal amplitude modulation, the modulated waveform contains the carrier waveform components. As the carrier waveform components carry no information, the modulation is less efficient. In order to improve the modulation efficiency, the carrier waveform components are suppressed on the base of the normal amplitude modulation. At this point, all the modulated waveform carry information. This method is called double sideband suppressed carrier modulation.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example

```
:SOUR1:AM:DSSC ON      /*Turn on the AM carrier waveform suppression function
                        of CH1*/

:SOUR1:AM:DSSC?        /*Query the on/off status of the AM carrier waveform
                        suppression function of CH1 and the query returns
                        ON*/
```

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

Syntax [[:SOURce[<n>]][:MOD]:AM:INTernal:FREQuency
{<frequency>|MINimum|MAXimum}

[[:SOURce[<n>]][:MOD]:AM:INTernal:FREQuency? [MINimum|MAXimum]

Description Set the AM modulation frequency of the specified channel.

Query the AM modulation frequency of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source ([\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce\]](#)).
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the AM modulation frequency in scientific notation with 7 effective digits, for example, 1.500000E+02 (the AM modulation frequency is 150Hz).

Example :SOUR1:AM:INT:FREQ 150 /*Set the AM modulation frequency of CH1 to 150Hz*/
:SOUR1:AM:INT:FREQ? /*Query the AM modulation frequency of CH1 and the query returns 1.500000E+02*/

Related Command [\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce\]](#)

[[:SOURce[<n>]][:MOD]:AM:INTernal:FUNction]

Syntax [[:SOURce[<n>]][:MOD]:AM:INTernal:FUNction <name>
[[:SOURce[<n>]][:MOD]:AM:INTernal:FUNction?

Description Set the AM modulation waveform of the specified channel.

Query the AM modulation waveform of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<name>	Discrete	SINusoid SQUare TRIangle RAMP NRAMP NOISe USER	SINusoid

- Explanation**
- This command is only applicable to the internal modulation source.
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - SQUare: 50% duty cycle; TRIangle: 50% symmetry; RAMP: 100% symmetry; NRAMP: 0% symmetry; USER: the arbitrary waveform selected of the specified channel.

Return Format The query returns SIN, SQU, TRI, RAMP, NRAMP, NOIS or USER.

Example :SOUR1:AM:INT:FUNC SQU /*Set the AM modulation waveform of CH1 to square*/
:SOUR1:AM:INT:FUNC? /*Query the AM modulation waveform of CH1 and the query returns SQU*/

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

Syntax [:SOURce[<n>]] [:MOD] :AM :SOURce { INTernal | EXTernal }

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

Description Set the AM modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the AM modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{ INTernal EXTernal }	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal modulation source is selected, the modulation waveform can be SINusoid, SQUare, TRIangle, RAMP, NRAMP, NOISe or USER and the default is SINusoid. NOISe can be used as modulation waveform but cannot be used as carrier waveform.
 - When external modulation source is selected, the signal generator receives the external modulating signal from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. At this point, the amplitude of the modulated waveform is controlled by the ± 5 V signal level of the connector. For example, if the modulation depth is set to 100%, the output amplitude will be the maximum when the modulating signal is +5V and the minimum when the modulating signal is -5V.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example

```
:SOUR1:AM:SOUR EXT /*Set the AM modulation source of CH1 to external
modulation source*/

:SOUR1:AM:SOUR? /*Query the AM modulation source of CH1 and the query
returns EXT*/
```

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

Syntax [:SOURce[<n>]][:MOD]:AM:STATe {ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:AM:STATe?

Description Turn on or off the AM modulation function of the specified channel.

Query the on/off status of the AM modulation function of the specified channel.

Parameter

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

- Explanation**
- AM (Amplitude Modulation): the amplitude of the carrier waveform changes with the transient voltage of the modulating waveform.
 - The AM carrier waveform could be Sine, Square, Ramp or Arbitrary waveform (except DC). The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude, offset and start phase) of the carrier waveform will influence the AM modulated waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)) is currently enabled, the modulation function cannot be turned on (namely the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:AM:STAT ON /*Turn on the AM modulation function of CH1*/
 :SOUR1:AM:STAT? /*Query the on/off status of the AM modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:ASKey Commands

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

Syntax [:SOURce[<n>]][:MOD]:ASKey:AMPLitude {<amplitude>|MINimum|MAXimum}
[:SOURce[<n>]][:MOD]:ASKey:AMPLitude? [MINimum|MAXimum]

Description Set the ASK modulation amplitude of the specified channel.

Query the ASK modulation amplitude of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<amplitude>	Real	0Vpp to 10Vpp (HighZ)	2Vpp

- Explanation**
- In ASK modulation, the signal generator shifts its output amplitude between two preset amplitudes (the carrier amplitude and modulation amplitude).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the ASK modulation amplitude in scientific notation with 7 effective digits, for example, 1.000000E+00 (the ASK modulation amplitude is 1Vpp).

Example

```
:SOUR1:ASK:AMPL 1      /*Set the ASK modulation amplitude of CH1 to 1Vpp*/
:SOUR1:ASK:AMPL?       /*Query the ASK modulation amplitude of CH1 and the
                        query returns 1.000000E+00*/
```

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

Syntax [:SOURce[<n>]][:MOD]:ASKey:INTernal[:RATE]
{<frequency>|MINimum|MAXimum}
[:SOURce[<n>]][:MOD]:ASKey:INTernal[:RATE]? [MINimum|MAXimum]

Description Set the ASK modulation rate of the specified channel.

Query the ASK modulation rate of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source. The ASK modulation rate refers to the frequency at which the output amplitude “shifts” between the carrier amplitude and modulation amplitude.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the ASK modulation rate in scientific notation with 7 effective digits, for example, 1.500000E+02 (the ASK modulation rate is 150Hz).

Example

```
:SOUR1:ASK:INT 150     /*Set the ASK modulation rate of CH1 to 150Hz*/
:SOUR1:ASK:INT?        /*Query the ASK modulation rate of CH1 and the query
                        returns 1.500000E+02*/
```

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

Syntax [:SOURce[<n>]][:MOD]:ASKey:POLarity {POSitive|NEGative}

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

Description Set the ASK modulation polarity of the specified channel to positive (POSitive) or negative (NEGative).

Query the ASK modulation polarity of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- In internal modulation ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:SOURce](#)), the signal generator would output the lower of the carrier amplitude and modulation amplitude ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)) when the modulating waveform is logic low level and output the greater when the modulating waveform is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.
- In external modulation ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:SOURce](#)), the signal generator would output the lower of the carrier amplitude and modulation amplitude ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)) when the external input signal is logic low level and output the greater when the external input signal is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.

Return Format The query returns POS or NEG.

Example :SOUR1:ASK:POL POS /*Set the ASK modulation polarity of CH1 to positive*/
 :SOUR1:ASK:POL? /*Query the ASK modulation polarity of CH1 and the query returns POS*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:SOURce](#)

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

Syntax [:SOURce[<n>]][:MOD]:ASKey:SOURce {INTernal|EXTernal}

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

Description Set the ASK modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the ASK modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal source is selected, the modulating waveform is set to square with 50% duty cycle, and the frequency at which the output amplitude “shifts” between the carrier amplitude and modulation amplitude ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)) is determined by the modulation rate.
 - When external source is selected, the signal generator receives the external modulating signal from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. For the connector, controlling ASK modulation externally is different from controlling AM/FM/PM modulations externally. In ASK modulation, you can set the modulation polarity ([\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:POLarity](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:ASK:SOUR EXT /*Set the ASK modulation source of CH1 to external modulation source*/

:SOUR1:ASK:SOUR? /*Query the ASK modulation source of CH1 and the query returns EXT*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:POLarity](#)

[[:SOURce[<n>]][:MOD]:ASKKey:STATe

Syntax [:SOURce[<n>]][:MOD]:ASKKey:STATe { ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:ASKKey:STATe?

Description Turn on or off the ASK modulation function of the specified channel.

Query the on/off status of the ASK modulation function of the specified channel.

Parameter

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

- Explanation**
- ASK (Amplitude Shift Keying): the signal generator shifts the output amplitude between two preset amplitudes (the carrier amplitude and modulation amplitude).
 - The ASK carrier waveform could be Sine, Square, Ramp or Arbitrary waveform (except DC). The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude, offset and start phase) of the carrier waveform will influence the ASK modulated waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function is currently enabled ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)), the modulation function cannot be turned on (namely the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:ASK:STAT ON /*Turn on the ASK modulation function of CH1*/
 :SOUR1:ASK:STAT? /*Query the on/off status of the ASK modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:FM Commands

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

Syntax [:SOURce[<n>]][:MOD]:FM[:DEViation] {<deviation>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:FM[:DEViation]? [MINimum|MAXimum]

Description Set the FM frequency deviation of the specified channel.

Query the FM frequency deviation of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<deviation>	Real	Refer to the "Explanation"	1kHz

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The frequency deviation is the deviation of the modulating waveform frequency ([\[:SOURce\[<n>\]\]\[:MOD\]:FM:INTERNAL:FREQUENCY](#)) relative to the carrier frequency. The frequency deviation must be lower than or equal to the carrier frequency. The sum of the frequency deviation and carrier frequency must be lower than or equal to the sum of the current carrier frequency upper limit and 1kHz.
 - If Sine is currently selected as the carrier waveform, the carrier amplitude will be limited at 2Vpp when the sum of the frequency deviation and carrier frequency is greater than the current carrier frequency upper limit.
 - When external modulation source is selected ([\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)), the frequency deviation is controlled by the $\pm 5V$ signal level of the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. Positive signal level corresponds to frequency increase and negative signal level corresponds to frequency decrease. Lower level will generate less deviation. For example, if the frequency deviation is set to 1kHz, +5V signal level corresponds to a 1kHz increase of frequency and -5V signal level corresponds to a 1kHz decrease of frequency.

Return Format The query returns the frequency deviation in scientific notation with 7 effective digits, for example, 1.000000E+02 (the frequency deviation is 100Hz).

Example :SOUR1:FM 100 /*Set the FM frequency deviation of CH1 to 100Hz*/
 :SOUR1:FM? /*Query the FM frequency deviation of CH1 and the query returns 1.000000E+02*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:FM:INTERNAL:FREQUENCY](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)

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

Syntax [:SOURce[<n>]][:MOD]:FM:INTernal:FREQuency
{<frequency>|MINimum|MAXimum}

[:SOURce[<n>]][:MOD]:FM:INTernal:FREQuency? [MINimum|MAXimum]

Description Set the FM modulation frequency of the specified channel.

Query the FM modulation frequency of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the FM modulation frequency in scientific notation with 7 effective digits, for example, 1.500000E+02 (the FM modulation frequency is 150Hz).

Example

```
:SOUR1:FM:INT:FREQ 150      /*Set the FM modulation frequency of CH1 to 150Hz*/
:SOUR1:FM:INT:FREQ?         /*Query the FM modulation frequency of CH1 and the
                             query returns 1.500000E+02*/
```

Related Command [\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)

[[:SOURce[<n>]][:MOD]:FM:INTernal:FUNCTion

Syntax [[:SOURce[<n>]][:MOD]:FM:INTernal:FUNCTion <name>

[[:SOURce[<n>]][:MOD]:FM:INTernal:FUNCTion?

Description Set the FM modulation waveform of the specified channel.

Query the FM modulation waveform of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<name>	Discrete	SINusoid SQUare TRIangle RAMP NRAMP NOISe USER	SINusoid

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)).
 - When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - SQUare: 50% duty cycle; TRIangle: 50% symmetry; RAMP: 100% symmetry; NRAMP: 0% symmetry; USER: the arbitrary waveform selected of the specified channel.

Return Format The query returns SIN, SQU, TRI, RAMP, NRAMP, NOIS or USER.

Example

```
:SOUR1:FM:INT:FUNC SQU      /*Set the FM modulation waveform of CH1 to
                               square*/

:SOUR1:FM:INT:FUNC?         /*Query the FM modulation waveform of CH1 and
                               the query returns SQU*/
```

Related Command [\[:SOURce\[<n>\]\]\[:MOD\]:FM:SOURce](#)

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

Syntax [:SOURce[<n>]][:MOD]:FM:SOURce {INTernal|EXTernal}
 [:SOURce[<n>]][:MOD]:FM:SOURce?

Description Set the FM modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the FM modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal modulation source is selected, the modulation waveform can be SINusoid, SQUare, TRIangle, RAMP, NRAMP, NOISe or USER and the default is SINusoid. NOISe can be used as modulation waveform but cannot be used as carrier waveform.
 - When external modulation source is selected, the signal generator receives the external modulating signal from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. At this point, the frequency deviation of the modulated waveform is controlled by the ± 5 V signal level of the connector. For example, if the frequency deviation is set to 1kHz, +5V signal level corresponds to a 1kHz increase of frequency and -5V signal level corresponds to a 1kHz decrease of frequency.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:FM:SOUR EXT /*Set the FM modulation source of CH1 to external modulation source*/
 :SOUR1:FM:SOUR? /*Query the FM modulation source of CH1 and the query returns EXT*/

[[:SOURce[<n>]][:MOD]:FM:STATe

Syntax [:SOURce[<n>]][:MOD]:FM:STATe {ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:FM:STATe?

Description Turn on or off the FM modulation function of the specified channel.
 Query the on/off status of the FM modulation function of the specified channel.

Parameter

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

- Explanation**
- FM (Frequency Modulation): the frequency of the carrier waveform changes with the transient voltage of the modulating waveform.
 - The FM carrier waveform could be Sine, Square, Ramp or Arbitrary waveform (except DC). The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude, offset and start phase) of the carrier waveform will influence the FM modulated waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function is currently enabled ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)), the modulation function cannot be turned on (namely the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:FM:STAT ON /*Turn on the FM modulation function of CH1*/
 :SOUR1:FM:STAT? /*Query the on/off status of the FM modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:FSKey Commands

[[:SOURce[<n>]][:MOD]:FSKey[:FREQUENCY]

Syntax [:SOURce[<n>]][:MOD]:FSKey[:FREQUENCY] {<frequency>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:FSKey[:FREQUENCY]? [MINimum|MAXimum]

Description Set the FSK hop frequency of the specified channel.

Query the FSK hop frequency of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	Frequency range of the specified channel	10kHz

Explanation

- In FSK modulation, the signal generator shifts the output frequency between two preset frequencies (the carrier frequency and hop frequency).
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the FSK hop frequency in scientific notation with 7 effective digits, for example, 5.000000E+03 (the FSK hop frequency is 5kHz).

Example

```
:SOUR1:FSK 5000      /*Set the FSK hop frequency of CH1 to 5kHz*/
:SOUR1:FSK?          /*Query the FSK hop frequency of CH1 and the query
                      returns 5.000000E+03*/
```

[[:SOURce[<n>]][:MOD]:FSKey:INTernal:RATE

Syntax [:SOURce[<n>]][:MOD]:FSKey:INTernal:RATE {<rate>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:FSKey:INTernal:RATE? [MINimum|MAXimum]

Description Set the FSK modulation rate of the specified channel.

Query the FSK modulation rate of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<rate>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)). The FSK modulation rate refers to the frequency at which the output frequency “shifts” between the carrier frequency and hop frequency ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the FSK modulation rate in scientific notation with 7 effective digits, for example, 1.500000E+02 (the FSK modulation rate is 150Hz).

Example :SOUR1:FSK:INT:RATE 150 /*Set the FSK modulation rate of CH1 to 150Hz*/
 :SOUR1:FSK:INT:RATE? /*Query the FSK modulation rate of CH1 and the query returns 1.500000E+02*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)

[[:SOURce[<n>]][:MOD]:FSKey:POLarity

Syntax [:SOURce[<n>]][:MOD]:FSKey:POLarity {POSitive|NEGative}
 [:SOURce[<n>]][:MOD]:FSKey:POLarity?

Description Set the FSK modulation polarity of the specified channel to positive (POSitive) or negative (NEGative).

Query the FSK modulation polarity of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - In internal modulation ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)), the signal generator would output the carrier frequency when the modulating waveform is logic low level and output the hop frequency ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)) when the modulating waveform is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.
 - In external modulation ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)), the signal generator would output the carrier frequency when the external input signal is logic low level and output the hop frequency when the external input signal is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.

Return Format The query returns POS or NEG.

Example :SOUR1:FSK:POL POS /*Set the FSK modulation polarity of CH1 to positive*/
 :SOUR1:FSK:POL? /*Query the FSK modulation polarity of CH1 and the query returns POS*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:SOURce](#)

[:SOURce[<n>]][:MOD]:FSKey:SOURce

Syntax [:SOURce[<n>]][:MOD]:FSKey:SOURce { INTernal|EXTernal }

[:SOURce[<n>]][:MOD]:FSKey:SOURce?

Description Set the FSK modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the FSK modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal source is selected, the modulating waveform is set to square with 50% duty cycle, and the frequency at which the output frequency “shifts” between carrier frequency and hop frequency ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)) is determined by the modulation rate ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:INTernal:RATE](#)).
 - When external source is selected, the signal generator receives the external modulating signal from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel. For the connector, controlling FSK modulation externally is different from controlling AM/FM/PM modulations externally. In FSK modulation, you can set the modulation polarity ([\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:POLarity](#)).
 - When [\[:SOURce\[<n>\]\]](#) or [\[<n>\]](#) is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:FSK:SOUR EXT /*Set the FSK modulation source of CH1 to external modulation source*/

:SOUR1:FSK:SOUR? /*Query the FSK modulation source of CH1 and the query returns EXT*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:FSKey\[:FREQuency\]](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:INTernal:RATE](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:FSKey:POLarity](#)

[[:SOURce[<n>]][:MOD]:FSKey:STATe

Syntax [:SOURce[<n>]][:MOD]:FSKey:STATe {ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:FSKey:STATe?

Description Turn on or off the FSK modulation function of the specified channel.

Query the on/off status of the FSK modulation function of the specified channel.

Parameter

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

Explanation

- FSK (Frequency Shift Keying): the signal generator shifts the output frequency between two preset frequencies (the carrier frequency and hop frequency).
- The FSK carrier waveform could be Sine, Square, Ramp or Arbitrary waveform (except DC). The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude, offset and start phase) of the carrier waveform will influence the FSK modulated waveform.
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
- If the harmonic function is currently enabled ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)), the modulation function cannot be turned on (the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:FSK:STAT ON /*Turn on the FSK modulation function of CH1*/
 :SOUR1:FSK:STAT? /*Query the on/off status of the FSK modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:PM Commands

[[:SOURce[<n>]][:MOD]:PM[:DEViation]

Syntax [[:SOURce[<n>]][:MOD]:PM[:DEViation] {<deviation>|MINimum|MAXimum}
 [[:SOURce[<n>]][:MOD]:PM[:DEViation]? [MINimum|MAXimum]

Description Set the PM phase deviation of the specified channel.

Query the PM phase deviation of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<deviation>	Real	0° to 360°	90°

- Explanation**
- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - Phase deviation is the deviation of the modulating waveform phase relative to the carrier waveform phase.
 - When external modulation source is selected ([\[\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce\]](#)), the phase deviation is controlled by the $\pm 5V$ signal level from the corresponding **[Mod/Trig/FSK/Sync]** connector at the rear panel. For example, if the phase deviation is set to 180°, +5V signal level corresponds to a 180° phase variation. The lower the external signal level, the less deviation would be generated.

Return Format The query returns the PM phase deviation in scientific notation with 7 effective digits, for example, 5.000000E+01 (the PM phase deviation is 50°).

Example :SOUR1:PM 50 /*Set the PM phase deviation of CH1 to 50°*/
 :SOUR1:PM? /*Query the PM phase deviation of CH1 and the query returns 5.000000E+01*/

Related Command [\[\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce\]](#)

[[:SOURce[<n>]][:MOD]:PM:INTernal:FREQuency]

Syntax [:SOURce[<n>]][:MOD]:PM:INTernal:FREQuency
{<frequency>|MINimum|MAXimum}

[:SOURce[<n>]][:MOD]:PM:INTernal:FREQuency? [MINimum|MAXimum]

Description Set the PM modulation frequency of the specified channel.

Query the PM modulation frequency of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the PM modulation frequency in scientific notation with 7 effective digits, for example, 1.500000E+02 (the PM modulation frequency is 150Hz).

Example :SOUR1:PM:INT:FREQ 150 /*Set the PM modulation frequency of CH1 to 150Hz*/
:SOUR1:PM:INT:FREQ? /*Query the PM modulation frequency of CH1 and the query returns 1.500000E+02*/

Related Command [\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce](#)

[:SOURce[<n>]][:MOD]:PM:INTernal:FUNCTion

Syntax [:SOURce[<n>]][:MOD]:PM:INTernal:FUNCTion <name>

[:SOURce[<n>]][:MOD]:PM:INTernal:FUNCTion?

Description Set the PM modulation waveform of the specified channel.

Query the PM modulation waveform of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<name>	Discrete	SINusoid SQUare TRIangle RAMP NRAMP NOISe USER	SINusoid

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - SQUare: 50% duty cycle; TRIangle: 50% symmetry; RAMP: 100% symmetry; NRAMP: 0% symmetry; USER: the arbitrary waveform selected of the specified channel.

Return Format The query returns SIN, SQU, TRI, RAMP, NRAMP, NOIS or USER.

Example

```
:SOUR1:PM:INT:FUNC SQU      /*Set the PM modulation waveform of CH1 to
                               square*/
:SOUR1:PM:INT:FUNC?         /*Query the PM modulation waveform of CH1 and
                               the query returns SQU*/
```

Related Command [\[:SOURce\[<n>\]\]\[:MOD\]:PM:SOURce](#)

[[:SOURce[<n>]][:MOD]:PM:SOURce

Syntax [:SOURce[<n>]][:MOD]:PM:SOURce {INTernal|EXTernal}

[:SOURce[<n>]][:MOD]:PM:SOURce?

Description Set the PM modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the PM modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

Explanation

- DG1000Z can receive the modulation waveform from the internal or external modulation source.
- When internal modulation source is selected, the modulation waveform can be SINusoid, SQUare, TRIangle, RAMP, NRAMP, NOISe or USER and the default is SINusoid. NOISe can be used as modulation waveform but cannot be used as carrier waveform.
- When external modulation source is selected, the signal generator receives the external modulating signal from the corresponding **[Mod/Trig/FSK/Sync]** connector at the rear panel. At this point, the phase deviation of the modulated waveform is controlled by the ± 5 V signal level of the connector. For example, if the phase deviation is set to 180° , +5V signal level corresponds to a 180° phase variation. The lower the external signal level, the less deviation would be generated.
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:PM:SOUR EXT /*Set the PM modulation source of CH1 to external modulation source*/

:SOUR1:PM:SOUR? /*Query the FM modulation source of CH1 and the query returns EXT*/

[:SOURce[<n>]][:MOD]:PM:STATe

Syntax [:SOURce[<n>]][:MOD]:PM:STATe {ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:PM:STATe?

Description Turn on or off the PM modulation function of the specified channel.

Query the on/off status of the PM modulation function of the specified channel.

Parameter

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

- Explanation**
- PM (Phase Modulation): the phase of the carrier waveform changes with the transient voltage of the modulating waveform.
 - The PM carrier waveform could be Sine, Square, Ramp or Arbitrary waveform. The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude and offset) of the carrier waveform will influence the PM modulated waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function is currently enabled ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)), the modulation function cannot be turned on (the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:PM:STAT ON /*Turn on the PM modulation function of CH1*/
 :SOUR1:PM:STAT? /*Query the on/off status of the PM modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:PSKey Commands

[[:SOURce[<n>]][:MOD]:PSKey:INTernal:RATE

Syntax [:SOURce[<n>]][:MOD]:PSKey:INTernal:RATE {<rate>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:PSKey:INTernal:RATE? [MINimum|MAXimum]

Description Set the PSK modulation rate of the specified channel.

Query the PSK modulation rate of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<frequency>	Real	2mHz to 1MHz	100Hz

- Explanation**
- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce](#)). The PSK modulation rate refers to the frequency at which the output phase “shifts” between the carrier phase and modulation phase ([\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the PSK modulation rate in scientific notation with 7 effective digits, for example, 1.500000E+02 (the FSK modulation rate is 150Hz).

Example :SOUR1:PSK:INT:RATE 150 /*Set the PSK modulation rate of CH1 to 150Hz*/
 :SOUR1:PSK:INT:RATE? /*Query the PSK modulation rate of CH1 and the query returns 1.500000E+02*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce](#)

[[:SOURce[<n>]][:MOD]:PSKey:PHASe

Syntax [:SOURce[<n>]][:MOD]:PSKey:PHASe {<phase>|MINimum|MAXimum}
 [:SOURce[<n>]][:MOD]:PSKey:PHASe? [MINimum|MAXimum]

Description Set the PSK modulation phase of the specified channel.

Query the PSK modulation phase of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<phase>	Real	0° to 360°	180°

- Explanation**
- In PSK modulation, the signal generator “shifts” the output phase between two preset phases (the carrier phase and modulation phase).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the PSK modulation phase in scientific notation with 7 effective digits, for example, 9.000000E+01 (the PSK modulation phase is 90°).

Example :SOUR1:PSK:PHAS 90 /*Set the PSK modulation phase of CH1 to 90°*/
 :SOUR1:PSK:PHAS? /*Query the PSK modulation phase of CH1 and the query returns 9.000000E+01*/

[[:SOURce[<n>]][:MOD]:PSKey:POLarity]

Syntax [[:SOURce[<n>]][:MOD]:PSKey:POLarity {POSitive|NEGative}

[[:SOURce[<n>]][:MOD]:PSKey:POLarity?

Description Set the PSK modulation polarity of the specified channel to positive (POSitive) or negative (NEGative).

Query the PSK modulation polarity of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - In internal modulation ([\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce\]](#)), the signal generator would output the carrier phase when the modulating waveform is logic low level and output the modulation phase ([\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe\]](#)) when the modulating waveform is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.
 - In external modulation ([\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce\]](#)), the signal generator would output the carrier phase when the external input signal is logic low level and output the modulation phase ([\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe\]](#)) when the external input signal is logic high level if the polarity is set to positive. The situation is the opposite when the polarity is set to negative.

Return Format The query returns POS or NEG.

Example :SOUR1:PSK:POL POS /*Set the PSK modulation polarity of CH1 to positive*/
 :SOUR1:PSK:POL? /*Query the PSK modulation polarity of CH1 and the query returns POS*/

Related Commands [\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe\]](#)
[\[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:SOURce\]](#)

[[:SOURce[<n>]][:MOD]:PSKey:SOURce

Syntax [[:SOURce[<n>]][:MOD]:PSKey:SOURce {INTernal|EXTernal}

[[:SOURce[<n>]][:MOD]:PSKey:SOURce?

Description Set the PSK modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the PSK modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal source is selected, the modulating waveform is set to square with 50% duty cycle, and the frequency at which the output phase “shifts” between carrier phase and modulation phase ([\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe](#)) is determined by the modulation rate ([\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:INTernal:RATE](#)).
 - When external source is selected, the generator receives the external modulating signal from the corresponding **[Mod/Trig/FSK/Sync]** connector at the rear panel. For the connector, controlling PSK modulation externally is different from controlling AM/FM/PM modulations externally. In PSK modulation, you can set the modulation polarity ([\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:POLarity](#)).
 - When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:PSK:SOUR EXT /*Set the PSK modulation source of CH1 to external modulation source*/

:SOUR1:PSK:SOUR? /*Query the PSK modulation source of CH1 and the query returns EXT*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:INTernal:RATE](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:PHASe](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:PSKey:POLarity](#)

[[:SOURce[<n>]][:MOD]:PSKey:STATe

Syntax [[:SOURce[<n>]][:MOD]:PSKey:STATe {ON|1|OFF|0}

[[:SOURce[<n>]][:MOD]:PSKey:STATe?

Description Turn on or off the PSK modulation function of the specified channel.

Query the on/off status of the PSK modulation function of the specified channel.

Parameter

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

- Explanation**
- PSK (Phase Shift Keying): the signal generator shifts the output phase between two preset phases (the carrier phase and modulation phase).
 - The PSK carrier waveform could be Sine, Square, Ramp or Arbitrary waveform (except DC). The default is Sine. Pulse, Noise and DC in the arbitrary waveform could not be used as carrier waveform. The different settings of various parameters (such as the frequency, amplitude, offset and start phase) of the carrier waveform will influence the PSK modulated waveform.
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([[:SOURce[<n>]]:SWEep:STATe) or burst function ([[:SOURce[<n>]]:BURSt[:STATe]) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function is currently enabled ([[:SOURce[<n>]]:HARMonic[:STATe]), the modulation function cannot be turned on (the harmonic cannot be modulated).

Return Format The query returns ON or OFF.

Example :SOUR1:PSK:STAT ON /*Turn on the PSK modulation function of CH1*/
 :SOUR1:PSK:STAT? /*Query the on/off status of the PSK modulation function of CH1 and the query returns ON */

Related Commands [\[\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce[:MOD]:PWM Commands

[[:SOURce[<n>]][:MOD]:PWM[:DEVIation]:DCYCLE

Syntax [:SOURce[<n>]][:MOD]:PWM[:DEVIation]:DCYCLE
{<percent>|MINimum|MAXimum}

[:SOURce[<n>]][:MOD]:PWM[:DEVIation]:DCYCLE? [MINimum|MAXimum]

Description Set the PWM duty cycle deviation of the specified channel.

Query the PWM duty cycle deviation of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<percent>	Real	Refer to the "Explanation"	20%

- Explanation**
- Duty cycle deviation represents the variation (in %) of the modulated waveform duty cycle relative to the original pulse duty cycle.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The duty cycle deviation is limited by the minimum duty cycle and current edge time. The duty cycle deviation cannot exceed the current pulse duty cycle.
 - If the "Duty Cycle" is currently selected in the pulse of the specified channel ([\[:SOURce\[<n>\]\]:PULSe:HOLD](#)), "Duty Dev" is displayed in the interface when the PWM modulation function is enabled; if the "Pulse Width" is currently selected in the pulse of the specified channel, "Width Dev" is displayed in the interface when the PWM modulation function is enabled.

Return Format The query returns the PWM duty cycle deviation in scientific notation with 7 effective digits, for example, 1.500000E+01 (the PWM duty cycle deviation is 15%).

Example

```
:SOUR1:PWM:DCYC 15      /*Set the PWM duty cycle deviation of CH1 to 15%*/
:SOUR1:PWM:DCYC?        /*Query the PWM duty cycle deviation of CH1 and the
                           query returns 1.500000E+01*/
```

Related Command [\[:SOURce\[<n>\]\]:PULSe:HOLD](#)

[[:SOURce[<n>]][:MOD]:PWM[:DEVIation][:WIDTh]

Syntax [:SOURce[<n>]][:MOD]:PWM[:DEVIation][:WIDTh]
 {<deviation>|MINimum|MAXimum}

[:SOURce[<n>]][:MOD]:PWM[:DEVIation][:WIDTh]? [MINimum|MAXimum]

Description Set the PWM width deviation of the specified channel.

Query the PWM width deviation of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<deviation>	Real	Refer to the "Explanation"	200us

- Explanation**
- Width deviation represents the variation of the modulated waveform pulse width relative to the original pulse width.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The width deviation is limited by the minimum pulse width and current edge time. The width deviation cannot exceed the current pulse width.
 - If the "Duty Cycle" is currently selected in the pulse of the specified channel ([\[:SOURce\[<n>\]\]:PULSe:HOLD](#)), "Duty Dev" is displayed in the interface when the PWM modulation function is enabled; if the "Pulse Width" is currently selected in the pulse of the specified channel, "Width Dev" is displayed in the interface when the PWM modulation function is enabled.

Return Format The query returns the PWM width deviation in scientific notation with 7 effective digits, for example, 1.000000E-04 (the PWM width deviation 100us, namely 0.0001s).

Example

```
:SOUR1:PWM 0.0001      /*Set the PWM width deviation of CH1 to 100us (namely
                        0.0001s)*/

:SOUR1:PWM?           /*Query the PWM width deviation of CH1 and the query
                        returns 1.000000E-04*/
```

Related Command [\[:SOURce\[<n>\]\]:PULSe:HOLD](#)

[[:SOURce[<n>]][:MOD]:PWM:INTernal:FREQuency

Syntax [:SOURce[<n>]][:MOD]:PWM:INTernal:FREQuency
{<frequency>|MINimum|MAXimum}

[:SOURce[<n>]][:MOD]:PWM:INTernal:FREQuency? [MINimum|MAXimum]

Description Set the PWM modulation frequency of the specified channel.

Query the PWM modulation frequency of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<frequency>	Real	2mHz to 1MHz	100Hz

Explanation

- This command is only applicable to the internal modulation source ([\[:SOURce\[<n>\]\]\[:MOD\]:PWM:SOURce](#)).
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format

The query returns the PWM modulation frequency in scientific notation with 7 effective digits, for example, 1.500000E+02 (the PWM modulation frequency is 150Hz).

Example

:SOUR1:PWM:INT:FREQ 150 /*Set the PWM modulation frequency of CH1 to 150Hz*/

:SOUR1:PWM:INT:FREQ? /*Query the PWM modulation frequency of CH1 and the query returns 1.500000E+02*/

Related Command

[\[:SOURce\[<n>\]\]\[:MOD\]:PWM:SOURce](#)

[[:SOURce[<n>]][:MOD]:PWM:INTernal:FUNCTion

Syntax [[:SOURce[<n>]][:MOD]:PWM:INTernal:FUNCTion <name>

[[:SOURce[<n>]][:MOD]:PWM:INTernal:FUNCTion?

Description Set the PWM modulation waveform of the specified channel.

Query the PWM modulation waveform of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<name>	Discrete	SINusoid SQUare TRIangle RAMP NRAMP NOISe USER	SINusoid

- Explanation**
- This command is only applicable to the internal modulation source ([[:SOURce[<n>]][:MOD]:PM:SOURce).
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - SQUare: 50% duty cycle; TRIangle: 50% symmetry; RAMP: 100% symmetry; NRAMP: 0% symmetry; USER: the arbitrary waveform selected of the specified channel.

Return Format The query returns SIN, SQU, TRI, RAMP, NRAMP, NOIS or USER.

Example

```
:SOUR1:PWM:INT:FUNC SQU    /*Set the PWM modulation waveform of CH1 to
                             square*/

:SOUR1:PWM:INT:FUNC?       /*Query the PWM modulation waveform of CH1 and
                             the query returns SQU*/
```

Related Command [\[\[:SOURce\[<n>\]\]\[:MOD\]:PWM:SOURce](#)

[[:SOURce[<n>]][:MOD]:PWM:SOURce

Syntax [:SOURce[<n>]][:MOD]:PWM:SOURce {INTernal|EXTernal}

[:SOURce[<n>]][:MOD]:PWM:SOURce?

Description Set the PWM modulation source of the specified channel to internal (INTernal) or external (EXTernal) modulation source.

Query the PWM modulation source of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

- Explanation**
- DG1000Z can receive the modulation waveform from the internal or external modulation source.
 - When internal modulation source is selected, the modulation waveform can be SINusoid, SQUare, TRIangle, RAMP, NRAMp, NOISe or USER and the default is SINusoid. NOISe can be used as modulation waveform but cannot be used as carrier waveform.
 - When external modulation source is selected, the signal generator receives the external modulating signal from the corresponding **[Mod/Trig/FSK/Sync]** connector at the rear panel. At this point, the width deviation ([\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]\[:WIDTh\]](#)) or duty cycle deviation ([\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]\[:DCYClE\]](#)) of the modulated waveform is controlled by the ± 5 V signal level of the connector. For example, if the width deviation is set to 10s, +5V signal level corresponds to a 10s width variation.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT or EXT.

Example :SOUR1:PWM:SOUR EXT /*Set the PWM modulation source of CH1 to external modulation source*/

:SOUR1:PWM:SOUR? /*Query the PWM modulation source of CH1 and the query returns EXT*/

Related Commands [\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]\[:DCYClE\]](#)
[\[:SOURce\[<n>\]\]\[:MOD\]:PWM\[:DEViation\]\[:WIDTh\]](#)

[[:SOURce[<n>]][:MOD]:PWM:STATe

Syntax [:SOURce[<n>]][:MOD]:PWM:STATe {ON|1|OFF|0}
 [:SOURce[<n>]][:MOD]:PWM:STATe?

Description Turn on or off the PWM modulation function of the specified channel.
 Query the on/off status of the PWM modulation function of the specified channel.

Parameter

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

- Explanation**
- PWM (Pulse Width Modulation): the carrier pulse width changes with the transient voltage of the modulating waveform.
 - The PWM carrier waveform can only be pulse and the PWM function can only be turned on when the current waveform of the specified channel is pulse. The different settings of various parameters (such as the frequency, amplitude, DC offset, pulse width and duty cycle) of the carrier waveform will influence the PWM modulated waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.

Return Format The query returns ON or OFF.

Example Assume that the current waveform of CH1 is pulse,
 :SOUR1:PWM:STAT ON /*Turn on the PWM modulation function of CH1*/
 :SOUR1:PWM:STAT? /*Query the on/off status of the PWM modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce:MOD Commands

[[:SOURce[<n>]]:MOD[:STATe]

Syntax [:SOURce[<n>]]:MOD[:STATe] {ON|1|OFF|0}
[:SOURce[<n>]]:MOD[:STATe]?

Description Turn on or off the modulation function of the specified channel.
Query the on/off status of the modulation function of the specified channel.

Parameter

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

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the sweep function ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst function ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) is currently enabled, it will be disabled automatically when the modulation function is turned on.
 - If the harmonic function is currently enabled ([\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)), the modulation function cannot be turned on (namely the harmonic cannot be modulated).
 - The modulation function is not available in the sample rate mode.

Return Format The query returns ON or OFF.

Example :SOUR1:MOD ON /*Turn on the modulation function of CH1*/
:SOUR1:MOD? /*Query the on/off status of the modulation function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

[[:SOURce[<n>]]:MOD:TYPE

Syntax [:SOURce[<n>]]:MOD:TYPE {AM|FM|PM|ASK|FSK|PSK|PWM}

[:SOURce[<n>]]:MOD:TYPE?

Description Set the modulation type of the specified channel.

Query the modulation type of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{AM FM PM ASK FSK PSK PWM}	Discrete	AM FM PM ASK FSK PSK PWM	AM

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - AM (Amplitude Modulation): the amplitude of the carrier waveform changes with the transient voltage of the modulating waveform.
 - FM (Frequency Modulation): the frequency of the carrier waveform changes with the transient voltage of the modulating waveform.
 - PM (Phase Modulation): the phase of the carrier waveform changes with the transient voltage of the modulating waveform.
 - ASK (Amplitude Shift Keying): the signal generator shifts the output amplitude between two preset amplitudes (the carrier amplitude and modulation amplitude).
 - FSK (Frequency Shift Keying): the signal generator shifts the output frequency between two preset frequencies (the carrier frequency and hop frequency).
 - PSK (Phase Shift Keying): the signal generator shifts the output phase between two preset phases (the carrier phase and modulation phase).
 - PWM (Pulse Width Modulation): the carrier pulse width changes with the transient voltage of the modulating waveform.

Return Format The query returns AM, FM, PM, ASK, FSK, PSK or PWM.

Example :SOUR1:MOD:TYPE FM /*Set the modulation type of CH1 to FM*/
 :SOUR1:MOD:TYPE? /*Query the modulation type of CH1 and the query returns FM*/

:SOURce:PERiod Command

[[:SOURce[<n>]]:PERiod[:FIXed]

Syntax [:SOURce[<n>]]:PERiod[:FIXed] {<period>|MINimum|MAXimum}

[:SOURce[<n>]]:PERiod[:FIXed]? [MINimum|MAXimum]

Description Set the waveform period (basic waveforms and arbitrary waveform) of the specified channel.

Query the waveform period (basic waveforms and arbitrary waveform) of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<period>	Real	Refer to the "Explanation"	1ms

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The period and frequency are the reciprocal of each other. For the frequency ranges of different models and different waveforms of DG1000Z series, refer to Table 2-1.
 - If the period in the command is lower than the corresponding period lower limit, the system sets the waveform period of the specified channel to the corresponding period lower limit.
 - When the channel waveform type is changed ([\[:SOURce\[<n>\]\]:APPLY?](#)), the instrument still uses the period if it is valid for the new waveform type; the instrument displays prompt message and set the period to the period lower limit of the new waveform type automatically if the period is invalid for the new waveform type.

Return Format The query returns the waveform period in scientific notation with 7 effective digits, for example, 1.000000E-01 (the waveform period is 0.1s).

Example

```
:SOUR1:PER 0.1      /*Set the waveform period of CH1 to 0.1s*/
:SOUR1:PER?         /*Query the waveform period of CH1 and the query returns
1.000000E-01*/
```

Related Command [\[:SOURce\[<n>\]\]:APPLY?](#)

:SOURce:PHASe Commands

[:SOURce[<n>]]:PHASe[:ADJust]

Syntax [:SOURce[<n>]]:PHASe[:ADJust] {<phase>|MINimum|MAXimum}

[:SOURce[<n>]]:PHASe[:ADJust]? [MINimum|MAXimum]

Description Set the waveform start phase (basic waveforms and arbitrary waveform) of the specified channel.

Query the waveform start phase (basic waveforms and arbitrary waveform) of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<phase>	Real	0° to 360°	0°

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the start phase value in the command is lower than the corresponding start phase lower limit, the system sets the waveform start phase of the specified channel to the start phase lower limit.

Return Format The query returns the waveform start phase in scientific notation with 7 effective digits, for example, 1.000000E+01 (the waveform start phase is 10°).

Example

```
:SOUR1:PHAS 10      /*Set the waveform start phase of CH1 to 10°*/
:SOUR1:PHAS?        /*Query the waveform start phase of CH1 and the query
                      returns 1.000000E+01*/
```

[:SOURce[<n>]]:PHASe:INITiate

[:SOURce[<n>]]:PHASe:SYNChronize

Syntax [:SOURce[<n>]]:PHASe:INITiate

[:SOURce[<n>]]:PHASe:SYNChronize

Description Execute an align phase operation in the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1

- Explanation**
- DG1000Z series dual-channel function/arbitrary waveform generator provides the align phase function. After the align phase operation, the instrument re-configures the two channels to make them output according to the specified frequency and phase.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - When any of the two channel is in the modulation mode ([\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)), the align phase operation is invalid.

Syntax :SOUR1:PHAS:INIT /*Execute an align phase operation in CH1*/

:SOUR2:PHAS:SYNC /*Execute an align phase operation in CH2*/

Related Command [\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)

:SOURce:PULSe Commands

[[:SOURce[<n>]]:PULSe:DCYCLE

Syntax [:SOURce[<n>]]:PULSe:DCYCLE {<percent>|MINimum|MAXimum}

[:SOURce[<n>]]:PULSe:DCYCLE? [MINimum|MAXimum]

Description Set the pulse duty cycle of the specified channel.

Query the pulse duty cycle of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<percent>	Real	0.001% to 99.999%	50%

Explanation ➤ The pulse duty cycle is defined as the percentage that the pulse width ([\[:SOURce\[<n>\]\]:FUNCTION:PULSe:WIDTh](#)) takes up in the pulse period ([\[:SOURce\[<n>\]\]:FUNCTION:PULSe:PERiod](#)). The pulse duty cycle and pulse period are related to each other and modifying any of the parameters will modify the other one automatically.

➤ The range of the pulse duty cycle is limited by the “minimum pulse width” and “pulse period (for the ranges of the “minimum pulse width” and “pulse period”, please refer to the “Signal Characteristics” of the “Specifications” in *DG1000Z User's Guide*). The actual range of the pulse duty cycle is

$$100 \times P_{wmin} \div P_{pulse} \leq P_{dcycle} < 100 \times (1 - 2 \times P_{wmin} \div P_{pulse})$$

Wherein,

P_{dcycle} — pulse duty cycle;

P_{wmin} — minimum pulse width;

P_{pulse} — pulse period.

➤ When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the pulse duty cycle in scientific notation with 7 effective digits, for example, 4.500000E+01 (the pulse duty cycle is 45%).

Example :SOUR1:PULS:DCYC 45 /*Set the pulse duty cycle of CH1 to 45%*/

:SOUR1:PULS:DCYC? /*Query the pulse duty cycle of CH1 and the query returns 4.500000E+01*/

Related Commands [\[:SOURce\[<n>\]\]:FUNCTION:PULSe:PERiod](#)
[\[:SOURce\[<n>\]\]:FUNCTION:PULSe:WIDTh](#)

[:SOURce[<n>]]:PULSe:HOLD

Syntax [:SOURce[<n>]]:PULSe:HOLD {WIDTh|DUTY}

[:SOURce[<n>]]:PULSe:HOLD?

Description Set the highlight item of the specified channel to the pulse width (WIDTh) or pulse duty cycle (DUTY).

Query the item highlighted in the specified channel (the pulse width or pulse duty cycle).

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{WIDTh DUTY}	Discrete	WIDTh DUTY	DUTY

Return Format The query returns WIDT or DUTY.

Example :SOUR1:PULS:HOLD WIDT /*Set the item highlighted in CH1 to pulse width*/
 :SOUR1:PULS:HOLD? /*Query the item highlighted in CH1 and the query returns WIDT*/

[:SOURce[<n>]]:PULSe:TRANSition[:LEADIng]

Syntax [:SOURce[<n>]]:PULSe:TRANSition[:LEADIng] { <seconds> | MINimum | MAXimum }

[:SOURce[<n>]]:PULSe:TRANSition[:LEADIng]? [MINimum | MAXimum]

Description Set the pulse rise time of the specified channel.

Query the pulse rise time of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	10ns to $0.625 \times$ pulse width	20ns

- Explanation**
- The rise time is defined as the time required for the pulse amplitude to rise from 10% to 90%.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the rise time is limited by the current waveform frequency and pulse width. When the specified value exceeds the limits, the instrument will adjust the edge time automatically to make it match the specified pulse width.

Return Format The query returns the pulse rise time in scientific notation with 7 effective digits, for example, 3.500000E-08 (the pulse rise time is 35ns).

Example :SOUR1:PULS:TRAN 0.000000035 /*Set the pulse rise time of CH1 to 35ns*/
 :SOUR1:PULS:TRAN? /*Query the pulse rise time of CH1 and the query returns 3.500000E-08*/

[[:SOURce[<n>]]:PULSe:TRANSition:TRAILing

Syntax [:SOURce[<n>]]:PULSe:TRANSition:TRAILing {<seconds>|MINimum|MAXimum}
 [:SOURce[<n>]]:PULSe:TRANSition:TRAILing? [MINimum|MAXimum]

Description Set the pulse fall time of the specified channel.

Query the pulse fall time of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	10ns to $0.625 \times$ pulse width	20ns

- Explanation**
- The fall time is defined as the time required for the pulse amplitude to fall from 90% to 10%.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the fall time is limited by the current waveform frequency and pulse width. When the specified value exceeds the limits, the instrument will adjust the edge time automatically to make it match the specified pulse width.

Return Format The query returns the pulse fall time in scientific notation with 7 effective digits, for example, 3.500000E-08 (the pulse fall time is 35ns).

Example :SOUR1:PULS:TRAN:TRA 0.000000035 /*Set the pulse fall time of CH1 to 35ns*/
 :SOUR1:PULS:TRAN:TRA? /*Query the pulse rise time of CH1 and the query returns 3.500000E-08*/

[[:SOURce[<n>]]:PULSe:WIDTh

Syntax [:SOURce[<n>]]:PULSe:WIDTh {<seconds>|MINimum|MAXimum}

[:SOURce[<n>]]:PULSe:WIDTh? [MINimum|MAXimum]

Description Set the pulse width of the specified channel.

Query the pulse width of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	16ns to 999.999 982 118 590 6ks	500us

- Explanation**
- The pulse width is defined as the time interval between 50% of the amplitude of a pulse rising edge to 50% of the amplitude of the next pulse falling edge.
 - The range of the pulse width is limited by the “minimum pulse width” and “pulse period (for the ranges of the “minimum pulse width” and “pulse period”, please refer to the “Signal Characteristics” of the “Specifications” in *DG1000Z User's Guide*). The actual range of the pulse width is

$$P_{wmin} \leq P_{width} < P_{pulse} - 2 \times P_{wmin}$$

Wherein,

P_{width} — pulse width;

P_{wmin} — minimum pulse width;

P_{pulse} — pulse period.

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the pulse width in scientific notation with 7 effective digits, for example, 1.000000E-02 (the pulse width is 10ms, namely 0.01s).

Example :SOUR1:FUNC:PULS:WIDTh 0.01 /*Set the pulse width of CH1 to 10ms (namely 0.01s)*/

:SOUR1:FUNC:PULS:WIDTh? /*Query the pulse width of CH1 and the query returns 1.000000E-02*/

:SOURce:SUM Commands

[:SOURce[<n>]]:SUM:AMPLitude

Syntax [:SOURce[<n>]]:SUM:AMPLitude {<amplitude>|MINimum|MAXimum}

[:SOURce[<n>]]:SUM:AMPLitude? [MINimum|MAXimum]

Description Set the sum ratio of the waveform summing function of the specified channel.

Query the sum ratio of the waveform summing function of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<amplitude>	Real	0% to 100%	10%

- Explanation**
- The sum ratio refers to the ratio that the amplitude of the waveform to be summed on the basic waveform relative to that of the basic waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the sum ratio in scientific notation with 7 effective digits, for example, 1.000000E+01 (the sum ratio is 10%).

Example :SOUR1:SUM:AMPL 10 /*Set the sum ratio of the waveform summing function of CH1 to 10%*/

:SOUR1:SUM:AMPL? /*Query the sum ratio of the waveform summing function of CH1 and the query returns 1.000000E+01*/

[:SOURce[<n>]]:SUM:INTernal:FREQuency

Syntax [:SOURce[<n>]]:SUM:INTernal:FREQuency {<frequency>|MAXimum|MINimum}

[:SOURce[<n>]]:SUM:INTernal:FREQuency? [MINimum|MAXimum]

Description Set the sum frequency of the waveform summing function of the specified channel.

Query the sum frequency of the waveform summing function of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	<amplitude>	Real	1uHz to 60MHz	1kHz

- Explanation**
- The sum frequency refers to the frequency of waveform to be summed on the basic waveform.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns the sum frequency in scientific notation with 7 effective digits, for example, 1.000000E+02 (the sum frequency is 100Hz).

Example :SOUR1:SUM:INT:FREQ 100 /*Set the sum frequency of the waveform summing function of CH1 to 100Hz*/

:SOUR1:SUM:INT:FREQ? /*Query the sum frequency of the waveform summing function of CH1 and the query returns 1.000000E+02*/

[[:SOURce[<n>]]:SUM:INTernal:FUNCTion

Syntax [:SOURce[<n>]]:SUM:INTernal:FUNCTion <name>

[:SOURce[<n>]]:SUM:INTernal:FUNCTion?

Description Set the sum source of the waveform summing function of the specified channel.

Query the sum source of the waveform summing function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<name>	Discrete	SIN SQU RAMP NOISe ARB	SIN

- Explanation**
- The sum source refers to the waveform to be summed on the basic waveform and can be sine (SIN), square (SQU), ramp (RAMP), noise (NOISe) or arbitrary waveform (ARB).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns SIN, SQU, RAMP, NOISe or ARB.

Example :SOUR1:SUM:INT:FUNC SQU /*Set the sum source of the waveform summing function of CH1 to square*/

:SOUR1:SUM:INT:FUNC? /*Query the sum source of the waveform summing function of CH1 and the query returns SQU*/

[[:SOURce[<n>]]:SUM[:STATe]

Syntax [:SOURce[<n>]]:SUM[:STATe] {ON|1|OFF|0}
 [:SOURce[<n>]]:SUM[:STATe]?

Description Turn on or off the waveform summing function of the specified channel.

Query the on/off status of the waveform summing function of the specified channel.

Parameter

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

- Explanation**
- Waveform summing refers to summing the specified waveform on the basic waveform and then output the result waveform. This function is only applicable to the basic waveforms (except noise), arbitrary waveforms (except DC) and harmonic waveform. The waveform summing function cannot be enabled when the modulation ([\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)), sweep ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) or burst ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) function is turned on.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns ON or OFF.

Example :SOUR1:SUM ON /*Turn on the waveform summing function of CH1*/
 :SOUR1:SUM? /*Query the on/off status of the waveform summing function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)

:SOURce:SWEep Commands

[[:SOURce[<n>]]:SWEep:HTIME:START

Syntax [[:SOURce[<n>]]:SWEep:HTIME:START {<seconds>|MINimum|MAXimum}

[[:SOURce[<n>]]:SWEep:HTIME:START? [MINimum|MAXimum]

Description Set the start hold of the sweep function of the specified channel.

Query the start hold of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	0s to 500s	0s

- Explanation**
- Start hold is the duration that the output signal outputs with the “Start Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:START](#)) after the sweep starts. After the start hold, the signal generator will output with varying frequency according to the current sweep type.
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - After the “Start Hold” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”.

Return Format The query returns the start hold in scientific notation with 7 effective digits, for example, 1.000000E+00 (the start hold is 1s).

Example :SOUR1:SWE:HTIM:STAR 1 /*Set the start hold of the sweep function of CH1 to 1s*/

:SOUR1:SWE:HTIM:STAR? /*Query the start hold of the sweep function of CH1 and the query returns 1.000000E+00*/

Related Command [\[:SOURce\[<n>\]\]:FREQuency:START](#)

[[:SOURce[<n>]]:SWEep:HTIME[:STOP]

Syntax [:SOURce[<n>]]:SWEep:HTIME[:STOP] {<seconds>|MINimum|MAXimum}
 [:SOURce[<n>]]:SWEep:HTIME[:STOP]? [MINimum|MAXimum]

Description Set the stop hold of the sweep function of the specified channel.

Query the stop hold of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	0s to 500s	0s

- Explanation**
- Stop Hold is the duration that the output signal outputs with the “Stop Frequency” after the signal generator has swept from the “Start Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:START](#)) to the “Stop Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:STOP](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - After the “Stop Hold” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”.

Return Format The query returns the stop hold in scientific notation with 7 effective digits, for example, 1.000000E+00 (the stop hold is 1s).

Example :SOUR1:SWE:HTIM 1 /*Set the stop hold of the sweep function of CH1 to 1s*/
 :SOUR1:SWE:HTIM? /*Query the stop hold of the sweep function of CH1 and the query returns 1.000000E+00*/

Related Commands [\[:SOURce\[<n>\]\]:FREQuency:START](#)
[\[:SOURce\[<n>\]\]:FREQuency:STOP](#)

[[:SOURce[<n>]]:SWEep:RTIME

Syntax [[:SOURce[<n>]]:SWEep:RTIME {<seconds>|MINimum|MAXimum}

[[:SOURce[<n>]]:SWEep:RTIME? [MINimum|MAXimum]

Description Set the return time of the sweep function of the specified channel.

Query the return time of the sweep function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	0s to 500s	0s

- Explanation**
- Return time describes the time in which the output signal returns to the “Start frequency” from the “Stop Frequency” after the signal generator has swept from the “Start Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:START](#)) to the “Stop Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:STOP](#)) and stayed within the “Stop Hold” ([\[:SOURce\[<n>\]\]:SWEep:HTIME\[:STOP\]](#)).
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - After the “Return Time” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”.

Return Format The query returns the return time in scientific notation with 7 effective digits, for example, 1.000000E+00 (the return time is 1s).

Example

```
:SOUR1:SWE:RTIM 1      /*Set the return time of the sweep function of CH1 to 1s*/
:SOUR1:SWE:RTIM?       /*Query the return time of the sweep function of CH1 and
                        the query returns 1.000000E+00*/
```

Related Commands

[\[:SOURce\[<n>\]\]:FREQuency:START](#)
[\[:SOURce\[<n>\]\]:FREQuency:STOP](#)
[\[:SOURce\[<n>\]\]:SWEep:HTIME\[:STOP\]](#)

[[:SOURce[<n>]]:SWEep:SPACing

Syntax [:SOURce[<n>]]:SWEep:SPACing {LINear|LOGarithmic|STEp}

[:SOURce[<n>]]:SWEep:SPACing?

Description Set the sweep type of the specified channel to linear (LINear), log (LOGarithmic) or step (STEp).

Query the sweep type of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{LINear LOGarithmic STEp}	Discrete	LINear LOGarithmic STEp	LINear

Explanation

- DG1000Z provides linear, log and step sweep types.
- In linear sweep, the output frequency of the instrument varies linearly in the way of “several Hertz per second”. The variation is controlled by the “Start Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:STArT](#)), “Stop Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:STOp](#)) and “Sweep Time” ([\[:SOURce\[<n>\]\]:SWEep:TIME](#)). A straight line is displayed on the waveform on the screen, indicating that the output frequency varies linearly.
- In log sweep, the output frequency of the instrument varies in a logarithmic fashion, that is, the output frequency changes in the way of “octave per second” or “decade per second”. The variation is controlled by the “Start Frequency”, “Stop Frequency” and “Sweep Time”. An exponential function curve is displayed on the waveform on the screen, indicating that the output frequency changes in a logarithmic mode.
- In step sweep, the output frequency of the instrument “steps” from the “Start Frequency” to the “Stop Frequency”. The time that the output signal stays on each frequency point is determined by the “Sweep Time” and “Step Number”. A step waveform is displayed on the waveform on the screen, indicating that the output frequency varies in “Step”.
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns LIN, LOG or STE.

Example :SOUR1:SWE:SPAC LIN /*Set the sweep type of CH1 to linear*/
 :SOUR1:SWE:SPAC? /*Query the sweep type of CH1 and the query returns LIN*/

Related Commands [\[:SOURce\[<n>\]\]:FREQuency:STArT](#)
[\[:SOURce\[<n>\]\]:FREQuency:STOp](#)
[\[:SOURce\[<n>\]\]:SWEep:TIME](#)

[:SOURce[<n>]]:SWEep:STATe

Syntax [:SOURce[<n>]]:SWEep:STATe {ON|1|OFF|0}

[:SOURce[<n>]]:SWEep:STATe?

Description Turn on or off the sweep function of the specified channel.

Query the on/off status of the sweep function of the specified channel.

Parameter

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

- Explanation**
- DG1000Z can output sweep waveform from a single channel or both of the two channels at the same time. In the sweep mode, the signal generator outputs from the start frequency to the stop frequency within the specified sweep time.
 - DG1000Z supports linear, log and step sweeps and allow users to set the “Mark” frequency, start hold, stop hold and return time. Besides, it supports internal, external and manual trigger sources and can generate sweep output for sine, square, ramp and arbitrary waveform (except DC) (does not support the sweep signals for the pulse and noise in the basic waveforms).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - If the modulation ([:SOURce[<n>]]:MOD[:STATe]) or burst ([:SOURce[<n>]]:BURSt[:STATe]) function is currently turned on, it will be turned off automatically when the sweep function is turned on.
 - If the harmonic function ([:SOURce[<n>]]:HARMonic[:STATe]) is currently turned on, the sweep function cannot be turned on.

Return Format The query returns ON or OFF.

Example :SOUR1:SWE:STAT ON /*Turn on the sweep function of CH1*/

:SOUR1:SWE:STAT? /*Query the on/off status of the sweep function of CH1 and the query returns ON*/

Related Commands [\[:SOURce\[<n> \]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n> \]\]:HARMonic\[:STATe\]](#)
[\[:SOURce\[<n> \]\]:MOD\[:STATe\]](#)

[[:SOURce[<n>]]:SWEep:STEP

Syntax [[:SOURce[<n>]]:SWEep:STEP {<n>|MINimum|MAXimum}

[[:SOURce[<n>]]:SWEep:STEP? [MINimum|MAXimum]

Description Set the number of steps of the sweep of the specified channel.

Query the number of steps of the sweep of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<n>	Integer	2 to 1024	2

Explanation

- The number of steps refers to the number of steps required for the instrument to sweep from the “Start Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:START](#)) to the “Stop Frequency” ([\[:SOURce\[<n>\]\]:FREQuency:STOP](#)). This command is only applicable to the step sweep ([\[:SOURce\[<n>\]\]:SWEep:SPACing](#)).
- When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format

The query returns the number of steps of the sweep in scientific notation with 7 effective digits, for example, 5.000000E+00 (the number of steps is 5).

Example

:SOUR1:SWE:STEP 5 /*Set the number of steps of the sweep of CH1 to 5*/

:SOUR1:SWE:STEP? /*Query the number of steps of the sweep of CH1 and the query returns 5.000000E+00*/

Related Commands

[\[:SOURce\[<n>\]\]:FREQuency:START](#)

[\[:SOURce\[<n>\]\]:FREQuency:STOP](#)

[\[:SOURce\[<n>\]\]:SWEep:SPACing](#)

[:SOURce[<n>]]:SWEep:TIME

Syntax [:SOURce[<n>]]:SWEep:TIME { <seconds> | MINimum | MAXimum }

[:SOURce[<n>]]:SWEep:TIME? [MINimum | MAXimum]

Description Set the sweep time of the specified channel.

Query the sweep time of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<seconds>	Real	1ms to 500s	1s

- Explanation**
- The sweep time refers to the time required for the instrument to sweep from the “Start Frequency” ([\[:SOURce\[<n> \]\]:FREQuency:START](#)) to the “Stop Frequency” ([\[:SOURce\[<n> \]\]:FREQuency:STOP](#)).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - After the “Sweep Time” is modified, the signal generator will output the sweep waveform from the specified “Start Frequency”.

Return Format The query returns the sweep time in scientific notation with 7 effective digits, for example, 5.000000E+00 (the sweep time is 5s).

Example

```
:SOUR1:SWE:TIME 5      /*Set the sweep time of CH1 to 5s*/
:SOUR1:SWE:TIME?       /*Query the sweep time of CH1 and the query returns
                        5.000000E+00*/
```

Related Commands [\[:SOURce\[<n> \]\]:FREQuency:START](#)
[\[:SOURce\[<n> \]\]:FREQuency:STOP](#)

[:SOURce[<n>]]:SWEep:TRIGger[:IMMediate]

Syntax [:SOURce[<n>]]:SWEep:TRIGger[:IMMediate]

Description Trigger a sweep immediately in the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1

- Explanation**
- This command is only applicable to manual trigger ([\[:SOURce\[<n> \]\]:SWEep:TRIGger:SOURce](#)) and is only valid when the output of the corresponding channel is turned on.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Example :SOUR1:SWE:TRIG /*Trigger a sweep immediately in CH1*/

Related Commands [:OUTPut\[<n> \]\[:STATe\]](#)
[\[:SOURce\[<n> \]\]:SWEep:TRIGger:SOURce](#)

[[:SOURce[<n>]]:SWEep:TRIGger:SLOPe

Syntax [[:SOURce[<n>]]:SWEep:TRIGger:SLOPe {POSitive|NEGative}

[[:SOURce[<n>]]:SWEep:TRIGger:SLOPe?

Description Set the edge type of the trigger input signal of the specified channel to rising edge (POSitive) or falling edge (NEGative).

Query the edge type of the trigger input signal of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- Set the edge type of the trigger input signal, namely select the instrument to trigger on the rising edge or falling edge of the trigger input signal.
 - This command is only applicable to external trigger ([\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#)). In external trigger, the instrument receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel and initiates a sweep each time a TTL pulse with the specified polarity is received.
 - When [[:SOURce[<n>]]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns POS or NEG.

Example

```
:SOUR1:SWE:TRIG:SLOP POS    /*Set the edge type of the trigger input signal of
                               CH1 to rising edge*/

:SOUR1:SWE:TRIG:SLOP?       /*Query the edge type of the trigger input signal
                               of CH1 and the query returns POS*/
```

Related Commands [\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#)

[[:SOURce[<n>]]:SWEep:TRIGger:SOURce

Syntax [:SOURce[<n>]]:SWEep:TRIGger:SOURce {INTernal|EXTernal|MANual}

[:SOURce[<n>]]:SWEep:TRIGger:SOURce?

Description Set the trigger source of the sweep of the specified channel to internal source (INTernal), external source (EXTernal) or manual source (MANual).

Query the trigger source of the sweep of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{INTernal EXTernal MANual}	Discrete	INTernal EXTernal MANual	INTernal

- Explanation**
- In internal trigger, the signal generator outputs continuous sweep waveform. The trigger period is determined by the specified sweep time ([\[:SOURce\[<n>\]\]:SWEep:TIME](#)), return time ([\[:SOURce\[<n>\]\]:SWEep:RTIME](#)), start hold ([\[:SOURce\[<n>\]\]:SWEep:HTIME:START](#)) and stop hold ([\[:SOURce\[<n>\]\]:SWEep:HTIME\[:STOP\]](#)). You can also set the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to output trigger signal with the specified edge ([\[:SOURce\[<n>\]\]:SWEep:TRIGger:TRIGOut](#)).
 - In external trigger, the signal generator receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel and initiates a sweep each time a TTL pulse with the specified polarity ([\[:SOURce\[<n>\]\]:SWEep:TRIGger:SLOPe](#)) is received.
 - In manual trigger, the instrument initiates a sweep in the corresponding channel immediately each time the trigger command ([\[:SOURce\[<n>\]\]:SWEep:TRIGger\[:IMMediate\]](#)) is send (the trigger command is only valid when the output of the specified channel is turned on).
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT, EXT or MAN.

Example :SOUR1:SWE:TRIG:SOUR INT /*Set the trigger source of the sweep of CH1 to internal*/

:SOUR1:SWE:TRIG:SOUR? /*Query the trigger source of the sweep of CH1 and the query returns INT*/

Related Commands

[\[:SOURce\[<n>\]\]:SWEep:HTIME:START](#)

[\[:SOURce\[<n>\]\]:SWEep:HTIME\[:STOP\]](#)

[\[:SOURce\[<n>\]\]:SWEep:RTIME](#)

[\[:SOURce\[<n>\]\]:SWEep:TIME](#)

[\[:SOURce\[<n>\]\]:SWEep:TRIGger\[:IMMediate\]](#)

[\[:SOURce\[<n>\]\]:SWEep:TRIGger:SLOPe](#)

[\[:SOURce\[<n>\]\]:SWEep:TRIGger:TRIGOut](#)

[[:SOURce[<n>]]:SWEep:TRIGger:TRIGOut

Syntax [:SOURce[<n>]]:SWEep:TRIGger:TRIGOut {POSitive|NEGative|OFF}
 [:SOURce[<n>]]:SWEep:TRIGger:TRIGOut?

Description Set the edge type of the trigger output signal in the sweep mode of the specified channel to rising edge (POSitive) or falling edge (NEGative) or turn off the trigger output signal (OFF).

Query the type of the trigger output signal in the sweep mode of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative OFF}	Discrete	POSitive NEGative OFF	POSitive

Explanation

- Set the edge type of the trigger output signal, namely select the output signal of the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to change from low level to high level (POSitive) or from high level to low level (NEGative) at the start of the sweep.
- This command is only applicable to internal or manual trigger ([\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#)).
- When “Leading” is selected, the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel outputs the trigger signal. The trigger signal, which is the same as the sync signal, changes from low level to high level at the start of each sweep (that is, trigger at the rising edge) and returns to low level at the center frequency point or at the specified mark frequency point.
- When “Trailing” is selected, the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel outputs the trigger signal which changes from high level to low level at the start of each sweep (that is, trigger at the falling edge) and returns to high level at the center frequency point or at the specified mark frequency point.
- When the trigger output is turned off, the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel outputs the sync signal which changes from low level to high level at the start of each sweep and returns to low level at the center frequency point or at the specified mark frequency point.
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns POS, NEG or OFF.

Example :SOUR1:SWE:TRIG:TRIGO POS /*Set the edge type of the trigger output signal of CH1 to rising edge*/
 :SOUR1:SWE:TRIG:TRIGO? /*Query the edge type of the trigger output signal of CH1 and the query returns POS*/

Related Command [\[:SOURce\[<n>\]\]:SWEep:TRIGger:SOURce](#)

:SOURce:TRACe Commands

[[:SOURce[<n>]][:TRACe]:DATA:CATalog?

Syntax [[:SOURce[<n>]][:TRACe]:DATA:CATalog?

Description Query the arbitrary waveform data files currently stored.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1

Return Format The query returns a string consisting of 10 parts separated by commas which represent the arbitrary waveform data files in the corresponding storage locations respectively. Each part is a string enclosed in double quotation marks and the content enclosed in the double quotation marks is the filename of the arbitrary waveform data file. The content enclosed in the double quotation marks is empty if the specified storage location does not contain arbitrary waveform data file. For example, "000.RAF", "330.RAF", "", "", "", "", "", "", "", "".

[[:SOURce[<n>]][:TRACe]:DATA:COPY

Syntax [[:SOURce[<n>]][:TRACe]:DATA:COPY <trace_name>,VOLATILE

Description Copy the arbitrary waveform data file stored to the volatile memory of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<trace_name>	ASCII string	Filenames of the arbitrary waveform data files stored	None

Explanation When [[:SOURce[<n>]] or [<n>] is omitted, the file will be copied to the volatile memory of CH1 by default.

Example :SOUR1:DATA:COPY 000.RAF,VOLATILE /*Copy the arbitrary waveform data file 000.RAF stored to the volatile memory of CH1*/

[[:SOURce[<n>]][:TRACe]:DATA:DAC16

Syntax [[:SOURce[<n>]][:TRACe]:DATA:DAC16 VOLATILE,<flag>,<data>

Description Download waveform table to the DDRII internal memory.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<flag>	ASCII string	Refer to the “Explanation”	None
<data>			

- Explanation**
- The command consists of two parts; wherein, the first part is the command string ([[:SOURce[<n>]][:TRACe]:DATA:DAC16 VOLATILE,<flag>,) and the second part is the binary data (<data>).
 - <flag> denotes the data transimission status and can be set to CON or END; Wherein, CON denotes that there is still data package after this one; END denotes that this is the last data package and the data transimission finishes.
 - <data> denotes the binary data to be downloaded, the length of the data is 16Bytes (8pts) to 32kBytes (16kpts).
 - <data> is a binary data block start with #. For example, #516384 binary data, the number 5 behind # denotes that the data length information (16384) occupies 5 characters; 16384 denotes the number of bytes of the binary data following it. The range of each binary data is from 0000 to 3FFF. Each waveform point occupies 2 bytes, therefore the number of bytes must be an even number.
 - When <flag> in the command is set to END, the instrument switches to arbitrary waveform output automatically.

[:SOURce[<n>]] [:TRACe] :DATA :DAC

Syntax [:SOURce[<n>]] [:TRACe] :DATA :DAC
VOLATILE, [<binary_block_data> | <value> , <value> , <value>]

Description Download the binary data block or decimal DAC values to the volatile memory of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<binary_block_data>	ASCII string	Refer to the "Explanation"	None
<value>			

Explanation

- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
- <binary_block_data> is the binary data to be downloaded, the length of the data is 16Bytes (8pts) to 32kBytes (16kpts). <binary_block_data> is a binary data block start with #. For example, #516384 binary data, the number 5 behind # denotes that the data length information (16384) occupies 5 characters; 16384 denotes the number of bytes of the binary data following it. The range of each binary data is from 0000 to 3FFF. Each waveform point occupies 2 bytes, therefore the number of bytes must be an even number.
- <value> denotes the decimal DAC values to be downloaded and the range is from 0 to 16383. Wherein, 0 and 16383 correspond to the minimum and maximum of the amplitude respectively. For example, 0 corresponds to -2.5V and 16383 corresponds to 2.5V if the amplitude is set to 5Vpp and the offset is set to 0V_{DC}. The number of the waveform points ranges from 8pts to 16384pts. For example, sending VOLATILE,0,16383,8192,0,16383 command denotes sending 5 data points.
- When the number of data points in the command is between 8pts and 8kpts (include 8kpts), if the instrument is currently in the frequency output mode, the instrument will extend the number of data points to 8192 automatically using the average interpolation mode; if the instrument is in the sample rate output mode, the number of data points remains unchanged.
- When the number of data points in the command is between 8kpts (not include 8kpts) and 16kpts, the instrument will select the sample rate output mode automatically and the number of data points remains unchanged.
- After sending the command, the instrument switches the specified channel to output volatile waveform automatically and modifies the number of editable points at the same time. You can edit the data sent using this command in local mode.

[[:SOURce[<n>]][:TRACe]:DATA[:DATA]

Syntax [[:SOURce[<n>]][:TRACe]:DATA[:DATA] VOLATILE,<value>{,<value>.....}

Description Download the floating voltage to the volatile memory of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<value>	Real	-1 to +1	None

- Explanation**
- When [[:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - <value> denotes the floating voltage, -1 and 1 correspond to the maximum and minimum values of the waveform respectively. For example, if the amplitude is set to 5Vpp and the offset is set to 0V_{DC}, 1 corresponds to 2.5V and -1 corresponds to -2.5V. This command overwrites the last waveform in the volatile memory (no error will be generated).
 - 8 to 16384 (16k) points can be downloaded each time.
 - After the command is sent, the instrument switches the specified channel to output the volatile waveform automatically as well as modifies the interpolation mode and the number of the editable points. The data sent using this command can be edited in local mode.

Example :SOUR1:DATA VOLATILE,-0.6,-0.4,-0.3,-0.1,0,0.1,0.2,0.3
/*Download the floating voltages -0.6, -0.4, -0.3, -0.1, 0, 0.1, 0.2, 0.3 to the volatile memory of CH1*/

[[:SOURce[<n>]][:TRACe]:DATA:DELeTe[:NAME]

Syntax [[:SOURce[<n>]][:TRACe]:DATA:DELeTe[:NAME] <trace_name>

Description Delete the specified arbitrary waveform data file stored.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<trace_name>	ASCII string	Filenames of the arbitrary waveform data files stored	None

Explanation The specified arbitrary waveform data file cannot be deleted if it is locked ([\[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOCK\[:STATe\]](#)).

Example :DATA:DEL 000.RAF /*Delete the stored arbitrary waveform data file 000.RAF*/

Related Command [\[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOCK\[:STATe\]](#)

[[:SOURce[<n>]][:TRACe]:DATA:LOAD

Syntax [[:SOURce[<n>]][:TRACe]:DATA:LOAD? VOLATILE

[[:SOURce[<n>]][:TRACe]:DATA:LOAD? <Num>

Description Query the number of the arbitrary waveform data packages in the volatile memory.

Read the specified arbitrary waveform data package in the volatile memory.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<Num>	Integer	1 to the number of data packages	1

Explanation

This command is used to load the specified arbitrary waveform in the memory to the PC software. First, send the [[:SOURce[<n>]][:TRACe]:DATA:LOAD? VOLATILE command to acquire the number of the data packages. Then, send the [[:SOURce[<n>]][:TRACe]:DATA:LOAD? <Num> command to read the Numth data package. The data read contains an 11-bit header denoting the amount of data in this transmission. For example, #9000016384 denotes that 16K data is transmitted in this operation. Before reading the data, you need to query the total number of the data packages.

Return Format

Sending the [[:SOURce[<n>]][:TRACe]:DATA:LOAD? VOLATILE command returns a decimal value. Sending the [[:SOURce[<n>]][:TRACe]:DATA:LOAD? <Num> command returns a binary data package starting with #. For example, #9000016384 binary data. Wherein, the number 9 behind # denotes that the data length information (000016384) occupies 9 characters; 000016384 denotes the number of bytes of the binary data following it.

Example

```
:DATA:LOAD? VOLATILE /*Query the number of the arbitrary waveform data
                        packages in the volatile memory and the query returns
                        5*/

:DATA:LOAD? 1 /*Read the first arbitrary waveform data package in the
               volatile memory and the query returns a string starting
               with #*/
```

[[:SOURce[<n>]][:TRACe]:DATA:LOCK[:STATe]

Syntax [:SOURce[<n>]][:TRACe]:DATA:LOCK[:STATe] <trace_name>,{ON|OFF|1|0}
 [:SOURce[<n>]][:TRACe]:DATA:LOCK[:STATe]? <trace_name>

Description Lock or unlock the arbitrary waveform data file stored.

Query whether the specified arbitrary waveform data file stored is locked.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<trace_name>	ASCII string	Filenames of the arbitrary waveform files stored	None
{ON OFF 1 0}	Bool	ON OFF 1 0	OFF

Explanation The locked arbitrary waveform data file cannot be deleted
 ([\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DELeTe\[:NAME\]](#)).

Return Format The query returns ON or OFF.

Example :DATA:LOCK 000.RAF,ON /*Lock the arbitrary waveform data file 000.RAF*/
 :DATA:LOCK? 000.RAF /*Query whether the arbitrary waveform data file
 000.RAF is locked and the query returns ON*/

Related Command [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DELeTe\[:NAME\]](#)

[[:SOURce[<n>]][:TRACe]:DATA:POINTS

Syntax [:SOURce[<n>]][:TRACe]:DATA:POINTS
 VOLATILE[,<points>|MINimum|MAXimum]
 [:SOURce[<n>]][:TRACe]:DATA:POINTS? VOLATILE[,MINimum|MAXimum]

Description Set the number of initial points of the waveform editing.

Query the number of initial points of the waveform editing.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<points>	Integer	8 to 16384	8

Explanation After this command is sent, the instrument switches the output mode to arbitrary waveform (volatile waveform) automatically and initializes the volatile waveform to waveform with the specified number of points of which the amplitudes are 0. At this point, you can send the [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:VALue](#) command to set the amplitude of the specified point.

Return Format The query returns an integer between 8 and 16384.

Example :DATA:POIN VOLATILE,9 /*Set the number of initial points of the waveform
 editing to 9*/
 :DATA:POIN? VOLATILE /*Query the number of initial points of the waveform
 editing and the query returns 9*/

Related Command [\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:VALue](#)

[[:SOURce[<n>]][:TRACe]:DATA:VALue

Syntax [[:SOURce[<n>]][:TRACe]:DATA:VALue VOLATILE,<point>,<data>

[[:SOURce[<n>]][:TRACe]:DATA:VALue? VOLATILE,<point>

Description Modify the decimal integer value of the specified point in the volatile memory.

Query the decimal integer value of the specified point in the volatile memory.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<point>	Integer	1 to the number of waveform points	None
<data>	Integer	0 to 16383	None

- Explanation**
- <point> is the point to be modified and <data> is a decimal data.
 - This command is only valid when the output waveform is arbitrary waveform and the arbitrary waveform type is volatile waveform.

Return Format The query returns an integer between 0 and 16383.

Example :DATA:VAL VOLATILE,5,8 /*Modify the decimal integer value of the fifth point to 8*/

:DATA:VAL? VOLATILE,5 /*Query the decimal integer value of the fifth point and the query returns 8*/

:SOURce:TRACK Command

[[:SOURce[<n>]]:TRACK

Syntax [:SOURce[<n>]]:TRACK {ON|OFF|INVerted}

[:SOURce[<n>]]:TRACK?

Description Set the state of the track function of the specified channel to ON, OFF or INVerted.
Query the state of the track function of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{ON OFF INVerted}	Discrete	ON OFF INVerted	OFF

- Explanation**
- On: enable the track function. The instrument copies the various parameters and states (except the channel output state) of CH1 to CH2 automatically. When the parameters or states of CH1 are changed, the corresponding parameters or states of CH2 (except the channel output state) will be adjusted to the same values or states automatically. At this point, the dual channels (if the channel outputs are currently enabled) can output the same signal.
 - Off: disable the track function.
 - Inverted: the track function is enabled. The instrument copies the various parameters and states (except the channel output state) of CH1 to CH2 automatically. When the parameters or states of CH1 are changed, the corresponding parameters or states of CH2 (except the channel output state) will be adjusted to the same value automatically. At this point, CH2 (if the channel output is currently enabled) outputs the inverted signal of the output signal of CH1.
 - When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - When the track function is enabled, the coupling function and channel copy function are disabled, the user interface is switched to single channel view mode and the current channel is CH1.

Return Format The query returns ON, OFF or INVERTED.

Example :SOUR1:TRACK ON /*Set the state of the track function of CH1 to ON */
:SOUR1:TRACK? /*Query the state of the track function of CH1 and the query returns ON*/

:SOURce:VOLTage Comamnds

[:SOURce[<n>]]:VOLTage:COUPlE[:STATe]

Syntax [:SOURce[<n>]]:VOLTage:COUPlE[:STATe] {ON|1|OFF|0}

[:SOURce[<n>]]:VOLTage:COUPlE[:STATe]?

Description Turn on or off the amplitude coupling function.

Query the on/off status of the amplitude coupling function.

Parameter

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

- Explanation**
- When the amplitude coupling is enabled, CH1 and CH2 take each other as the reference source. When the amplitude of one channel (the reference source) is changed, the amplitude of the other channel will be changed automatically and always keeps the specified amplitude deviation or ratio with that of the reference channel.
 - Please select the desired amplitude coupling mode ([:COUPling:AMPL:MODE](#)) and set the corresponding amplitude deviation ([:COUPling:AMPL:DEVIation](#)) or amplitude ratio ([:COUPling:AMPL:RATio](#)) before enabling the amplitude coupling function. You cannot set the amplitude coupling mode and the amplitude deviation/ratio after the amplitude coupling function is enabled.
 - You can also send the [:COUPling:AMPL\[:STATe\]](#) command to set and query the on/off status of the amplitude coupling function.

Return Format The query returns ON or OFF.

Example

```
:SOUR1:VOLT:COUP ON      /*Turn on the amplitude coupling function*/
:SOUR1:VOLT:COUP?        /*Query the on/off status of the amplitude coupling
                           function and the query returns ON*/
```

Related Commands

- [:COUPling:AMPL:DEVIation](#)
- [:COUPling:AMPL:MODE](#)
- [:COUPling:AMPL:RATio](#)
- [:COUPling:AMPL\[:STATe\]](#)

[[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

Syntax [:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]
{<amplitude>|MINimum|MAXimum}

[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]? [MINimum|MAXimum]

Description Set the waveform amplitude of the specified channel (basic waveforms and arbitrary waveform).

Query the waveform amplitude of the specified channel (basic waveforms and arbitrary waveform).

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<amplitude>	Real	Refer to the "Explanation"	5Vpp

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The minimum of <amplitude> is 2mVpp and the maximum is limited by the "Impedance" (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD) and "Frequency/Period" (:SOURce[<n>]:FREQuency[:FIXed] or :SOURce[<n>]:PERiod[:FIXed]) settings. If the amplitude in the command is greater than the corresponding upper limit or lower than the corresponding lower limit, the system will set the waveform amplitude of the specified channel to the amplitude upper limit or lower limit.
 - The current amplitude of the instrument is the default value or the amplitude set formerly. When the configuration (such as the frequency) of the instrument is changed, the instrument still uses the current amplitude if the amplitude is valid; the instrument displays prompt message and set the amplitude to the amplitude upper limit of the new configuration automatically if the current amplitude is invalid.
 - You can use the "High Level" or "Low Level" to set the amplitude and offset.
Amplitude = High Level - Low Level
Offset = (High Level + Low Level)/2

Return Format The query returns the waveform amplitude in scientific notation with 7 effective digits, for example, 5.000000E+00 (the waveform amplitude is 5Vpp).

Example :SOUR1:VOLT 5 /*Set the waveform amplitude of CH1 to 5Vpp*/
:SOUR1:VOLT? /*Query the waveform amplitude of CH1 and the query returns 5.000000E+00*/

Related Commands [:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)
[\[:SOURce\[<n>\]\]:FREQuency\[:FIXed\]](#)
[\[:SOURce\[<n>\]\]:PERiod\[:FIXed\]](#)

[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:HIGH

Syntax [:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:HIGH
 {<voltage>|MINimum|MAXimum}

[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:HIGH? [MINimum|MAXimum]

Description Set the high level value of the waveform (basic waveform and arbitrary waveform) of the specified channel.

Query the high level value of the waveform (basic waveform and arbitrary waveform) of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<voltage>	Real	Refer to the "Explanation"	2.5Vpp

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - You can also use the "Amplitude" ([\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:AMPLitude](#)) and "Offset" ([\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:OFFSet](#)) to set the high level and low level.
 High Level = Offset + Amplitude/2
 Low Level = Offset - Amplitude/2

Return Format The query returns the waveform high level value in scientific notation with 7 effective digits, for example, 3.500000E+00 (the waveform high level value is 3.5Vpp).

Example

```
:SOUR1:VOLT:HIGH 3.5      /*Set the high level value of the waveform of CH1 to 3.5Vpp*/
:SOUR1:VOLT:HIGH?         /*Query the high level value of the waveform of CH1 and the query returns 3.500000E+00*/
```

Related Commands [\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:AMPLitude](#)
[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:OFFSet](#)

[[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:LOW

Syntax [:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:LOW
{<voltage>|MINimum|MAXimum}

[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:LOW? [MINimum|MAXimum]

Description Set the low level value of the waveform (basic waveform and arbitrary waveform) of the specified channel.

Query the low level value of the waveform (basic waveform and arbitrary waveform) of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<voltage>	Real	Refer to the "Explanation"	-2.5Vpp

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - You can also use the "Amplitude" ([\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:AMPLitude](#)) and "Offset" ([\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:OFFSet](#)) to set the high level and low level.
High Level = Offset + Amplitude/2
Low Level = Offset - Amplitude/2

Return Format The query returns the waveform low level value in scientific notation with 7 effective digits, for example, -1.500000E+00 (the waveform low level value is -1.5Vpp).

Example

```
:SOUR1:VOLT:LOW -1.5      /*Set the low level value of the waveform of CH1 to
                           -1.5Vpp*/

:SOUR1:VOLT:LOW?          /*Query the low level value of the waveform of CH1 and
                           the query returns -1.500000E+00*/
```

Related Commands [\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:AMPLitude](#)
[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:OFFSet](#)

[[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:OFFSet

Syntax [:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:OFFSet
{<voltage>|MINimum|MAXimum}

[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate]:OFFSet? [MINimum|MAXimum]

Description Set the waveform offset voltage of the specified channel.

Query the waveform offset voltage of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
<voltage>	Real	Refer to the "Explanation"	0V _{DC}

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - The range of the DC offset voltage is limited by the "Impedance" (:OUTPut[<n>]:IMPedance or :OUTPut[<n>]:LOAD), "Frequency" (:SOURce[<n>]:FREQuency[:FIXed]) and "Amplitude" (:SOURce[<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude]) settings. If the offset in the command is greater than the corresponding offset upper limit or lower than the corresponding offset lower limit, the system will set the waveform offset of the specified channel to the offset upper limit or lower limit.
 - The current DC offset voltage of the instrument is the default value or the offset specified formerly. When the instrument configuration (such as the impedance) is changed, the instrument still uses the current offset if the offset is valid; the instrument displays prompt message and set the offset to the offset upper limit of the new configuration automatically if the current offset is invalid.

Return Format The query returns the waveform offset voltage in scientific notation with 7 effective digits, for example, 1.000000E+00 (the waveform offset voltage is 1V_{DC}).

Example :SOUR1:VOLT:OFFS 1 /*Set the offset voltage of CH1 to 1V_{DC}*/
:SOUR1:VOLT:OFFS? /*Query the offset voltage of CH1 and the query returns 1.000000E+00*/

Related Commands :OUTPut[<n>]:IMPedance
:OUTPut[<n>]:LOAD
[:SOURce[<n>]]:FREQuency[:FIXed]
[:SOURce[<n>]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

[[:SOURce[<n>]]:VOLTage:RANGe:AUTO

Syntax [:SOURce[<n>]]:VOLTage:RANGe:AUTO {OFF|ON|0|1}

[:SOURce[<n>]]:VOLTage:RANGe:AUTO?

Description Set the range of the specified channel to auto (ON or 1) or hold (OFF or 0).

Query the on/off status of the auto range of the specified channel.

Parameter

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

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - ON|1: set the channel range to auto. The instrument selects the optimum amplifier/attenuator combination automatically.
 - OFF|0: set the channel range to hold. In this mode, the possible transient amplitude variation of the output signal when the attenuator range is changed and during the switch process can be eliminated, which might affect the amplitude and offset accuracy, the resolution as well as the waveform fidelity.

Return Format The query returns ON or OFF.

Example

```
:SOUR1:VOLT:RANG:AUTO ON      /*Set the range of CH1 to auto*/
:SOUR1:VOLT:RANG:AUTO?        /*Query the on/off status of the auto range of
                                CH1 and the query returns ON*/
```

[[:SOURce[<n>]]:VOLTage:UNIT

Syntax [:SOURce[<n>]]:VOLTage:UNIT {VPP|VRMS|DBM}

[:SOURce[<n>]]:VOLTage:UNIT?

Description Set the amplitude unit of the specified channel to Vpp (VPP), Vrms (VRMS) or dBm (DBM).

Query the amplitude unit of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{VPP VRMS DBM}	Discrete	VPP VRMS DBM	VPP

- Explanation**
- When [:SOURce[<n>]] or [<n>] is omitted, the system sets the related parameters of CH1 by default.
 - Vpp is the unit of the peak-peak value of the signal; Vrms the unit of the effective value of the signal; dBm is the unit of the absolute value of the power of the signal. The relation between Vpp and Vrms differs for different waveform. Take sine as an example. The conversion relation between V_{pp} and V_{rms} fulfills the equation $V_{pp} = 2\sqrt{2}V_{rms}$.

$$dBm \text{ and } V_{rms} \text{ fulfills the equation } dBm = 10\lg\left(\frac{V_{rms}^2}{R} \times \frac{1}{0.001W}\right).$$

Wherein, R denotes the output impedance of the channel and must be a specific value; therefore, dBm cannot be used when the output impedance is HighZ.

Return Format The query returns VPP, VRMS or DBM.

Example

```
:SOUR1:VOLT:UNIT VPP      /*Set the amplitude unit of CH1 to Vpp*/
:SOUR1:VOLT:UNIT?          /*Query the amplitude unit of CH1 and the query returns
                             VPP*/
```

:SYSTem Commands

The :SYSTem commands are used to set the beeper state, query the number of channels of the instrument and the current channel, set the various interface (GPIB, LAN and USB) parameters and states, execute the channel copy operation, query the error queue, lock the front panel, set the system language and power-on status, set the clock source as well as query the system version.

Command List:

- ◆ [:SYSTem:BEEPer\[:IMMediate\]](#)
- ◆ [:SYSTem:BEEPer:STATe](#)
- ◆ [:SYSTem:CHANnel:CURrent](#)
- ◆ [:SYSTem:CHANnel:NUMber?](#)
- ◆ [:SYSTem:COMMunicate:GPIB\[:SELF\]:ADDress](#)
- ◆ [:SYSTem:COMMunicate:LAN:APPLy](#)
- ◆ [:SYSTem:COMMunicate:LAN:AUTOip\[:STATe\]](#)
- ◆ [:SYSTem:COMMunicate:LAN:CONTRol?](#)
- ◆ [:SYSTem:COMMunicate:LAN:DHCP\[:STATe\]](#)
- ◆ [:SYSTem:COMMunicate:LAN:DNS](#)
- ◆ [:SYSTem:COMMunicate:LAN:DOMain](#)
- ◆ [:SYSTem:COMMunicate:LAN:GATEway](#)
- ◆ [:SYSTem:COMMunicate:LAN:HOSTname](#)
- ◆ [:SYSTem:COMMunicate:LAN:IPADdress](#)
- ◆ [:SYSTem:COMMunicate:LAN:MAC?](#)
- ◆ [:SYSTem:COMMunicate:LAN:SMASK](#)
- ◆ [:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)
- ◆ [:SYSTem:COMMunicate:LAN:UPDate](#)
- ◆ [:SYSTem:COMMunicate:USB:INFormation?](#)
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- ◆ [:SYSTem:SECurity:IMMediate](#)
- ◆ [:SYSTem:VERSion?](#)

:SYSTem:BEEPer[:IMMediate]

Syntax :SYSTem:BEEPer[:IMMediate]

Description The beeper generates a beep immediately.

Explanation This command will not be affected by the current on/off status of the beeper. The beeper will generate a beep immediately when this command is sent even if the beeper is currently turned off.

:SYSTem:BEEPer:STATe

Syntax :SYSTem:BEEPer:STATe {ON|1|OFF|0}

:SYSTem:BEEPer:STATe?

Description Turn on or off the beeper.

Query the beeper status.

Parameter	Name	Type	Range	Default
	{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

Explanation When the beeper is turned on, the beeper beeps when error occurs during front-panel operation or remote operation.

Return Format The query returns ON or OFF.

Example :SYST:BEEP:STAT 1 /*Turn on the beeper */

:SYST:BEEP:STAT? /*Query the beeper status and the query returns ON*/

:SYSTem:CHANnel:CURrent

Syntax :SYSTem:CHANnel:CURrent {CH1|CH2}

:SYSTem:CHANnel:CURrent?

Description Select the current channel.

Query the current channel.

Parameter	Name	Type	Range	Default
	{CH1 CH2}	Discrete	CH1 CH2	CH1

Return Format The query returns CH1 or CH2.

Example :SYST:CHAN:CUR CH2 /*Select CH2 as the current channel*/

:SYST:CHAN:CUR? /*Query the current channel and the query returns CH2*/

:SYSTem:CHANnel:NUMber?

Syntax :SYSTem:CHANnel:NUMber?

Description Query the number of channels of the instrument.

Return Format The query returns an integer.

Example :SYST:CHAN:NUM? /*Query the number of channels of the instrument and the query returns 2*/

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRESS

Syntax :SYSTem:COMMunicate:GPIB[:SELF]:ADDRESS <integer>

:SYSTem:COMMunicate:GPIB[:SELF]:ADDRESS?

Description Set the GPIB address of the instrument.

Query the GPIB address of the instrument.

Parameter

Name	Type	Range	Default
<integer>	Integer	0 to 30	2

Explanation To use the GPIB interface, make sure that your PC has installed the GPIB card. Then, connect the USB terminal of the USB-GPIB interface converter to the USB Host interface at the front panel of the signal generator and connect the GPIB terminal of the USB-GPIB interface converter to the GPIB card terminal of the PC.

Return Format The query returns the GPIB address in scientific notation with 7 effective digits, for example, 7.000000E+00 (the GPIB address is 7).

Example :SYST:COMM:GPIB:ADDR 7 /*Set the GPIB address of the instrument to 7*/
 :SYST:COMM:GPIB:ADDR? /*Query the GPIB address of the instrument and the query returns 7.000000E+00*/

:SYSTem:COMMunicate:LAN:APPLY

Syntax :SYSTem:COMMunicate:LAN:APPLY

Description Apply the current network parameters.

Explanation After setting the LAN parameters, the new settings will only take effect when this command is executed.

:SYSTem:COMMunicate:LAN:AUTOip[:STATe]

Syntax :SYSTem:COMMunicate:LAN:AUTOip[:STATe] {ON|1|OFF|0}

:SYSTem:COMMunicate:LAN:AUTOip[:STATe]?

Description Turn on or off the AutoIP configuration mode.

Query the status of the AutoIP configuration mode.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

- Explanation**
- Before using the LAN interface, connect the instrument to the PC or the network of the PC using a network cable.
 - The instrument provides DHCP, AutoIP or ManualIP configuration modes.
 - In AutoIP mode, the signal generator acquires IP address within 169.254.0.1 and 169.254.255.254 and subnet mask 255.255.0.0 automatically according to the current network configuration.
 - If all the three IP configuration modes are “On”, the priority of parameters configuration from high to low is “DHCP”, “AutoIP” and “ManualIP”. Therefore, to enable the AutoIP configuration mode, “DHCP” must be set to “Off”.
 - The three IP configuration modes cannot be set to “Off” at the same time.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.

Return Format The query returns ON or OFF.

Example :SYST:COMM:LAN:AUTO OFF /*Turn off the AutoIP configuration mode*/
 :SYST:COMM:LAN:AUTO? /*Query the status of the AutoIP configuration mode and the query returns OFF*/

Related Command [:SYSTem:COMMunicate:LAN:APPLy](#)

:SYSTem:COMMunicate:LAN:CONTrol?

Syntax :SYSTem:COMMunicate:LAN:CONTrol?

Description Query the number of the initial control connecting terminal used for socket communication.

Return Format The query returns 5555; if the interface does not support socket, the query returns 0.

:SYSTem:COMMunicate:LAN:DHCP[:STATe]

Syntax :SYSTem:COMMunicate:LAN:DHCP[:STATe] {ON|1|OFF|0}
 :SYSTem:COMMunicate:LAN:DHCP[:STATe]?

Description Turn on or off the DHCP configuration mode.

Query the status of the DHCP configuration mode.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	ON

- Explanation**
- In DHCP mode, DHCP server in the current network assigns LAN parameters, e.g. IP address, for the signal generator.
 - If all the three IP configuration modes are “On”, the priority of parameters configuration from high to low is “DHCP”, “AutoIP” and “ManualIP”.
 - The three IP configuration modes cannot be set to “Off” at the same time.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.

Return Format The query returns ON or OFF.

Example :SYST:COMM:LAN:DHCP OFF /*Turn off the DHCP configuration mode*/
 :SYST:COMM:LAN:DHCP? /*Query the status of the DHCP configuration mode and the query returns OFF*/

Related Command [:SYSTem:COMMunicate:LAN:APPLy](#)

:SYSTem:COMMunicate:LAN:DNS

Syntax :SYSTem:COMMunicate:LAN:DNS <address>

:SYSTem:COMMunicate:LAN:DNS?

Description Set the DNS (Domain Name Service) address.

Query the DNS address.

Parameter

Name	Type	Range	Default
<address>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- This command is only valid when the ManualIP configuration mode is turned on ([:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)).
 - The format of <address> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (except 127) and the other three nnn range from 0 to 255. It is recommended that users acquire an available DNS address from their network administrator.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.

Return Format The query returns a string, for example, 202.106.46.151.

Example :SYST:COMM:LAN:DNS 202.106.46.151 /*Set the DNS address to
202.106.46.151*/

:SYST:COMM:LAN:DNS? /*Query the DNS address and the query
returns 202.106.46.151*/

Related Commands [:SYSTem:COMMunicate:LAN:APPLy](#)
[:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)

:SYSTem:COMMunicate:LAN:DOMain

Syntax :SYSTem:COMMunicate:LAN:DOMain <name>

:SYSTem:COMMunicate:LAN:DOMain?

Description Set the domain name.

Query the domain name.

Parameter

Name	Type	Range	Default
<name>	ASCII string	Refer to the "Explanation"	YYYRigolLan

Explanation <name> is the specified domain name and cannot exceeds 99 characters (can include English characters and numbers).

Return Format The query returns a string.

Example :SYST:COMM:LAN:DOM RIGOL /*Set the domain name to RIGOL*/

:SYST:COMM:LAN:DOM? /*Query the domain name and the query
returns RIGOL*/

:SYSTem:COMMunicate:LAN:GATEway

Syntax :SYSTem:COMMunicate:LAN:GATEway <address>

:SYSTem:COMMunicate:LAN:GATEway?

Description Set the default gateway.

Query the default gateway.

Parameter

Name	Type	Range	Default
<address>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- This command is only valid when the ManualIP configuration mode is turned on ([:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)).
 - The format of <address> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (except 127) and the other three nnn range from 0 to 255. It is recommended that users acquire an available default gateway from their network administrator.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.

Return Format The query returns a string, for example, 192.168.1.1.

Example :SYST:COMM:LAN:GATE 192.168.1.1 /*Set the default gateway to 192.168.1.1*/

:SYST:COMM:LAN:GATE? /*Query the default gateway and the query returns 192.168.1.1*/

Related Commands [:SYSTem:COMMunicate:LAN:APPLy](#)
[:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)

:SYSTem:COMMunicate:LAN:HOSTname

Syntax :SYSTem:COMMunicate:LAN:HOSTname <name>

:SYSTem:COMMunicate:LAN:HOSTname?

Description Set the host name.

Query the host name.

Parameter

Name	Type	Range	Default
<name>	ASCII string	Refer to the "Explanation"	YYYrigollan

Explanation <name> is the specified host name and cannot exceeds 99 characters (can include English characters and numbers).

Return Format The query returns a string.

Example :SYST:COMM:LAN:HOST RIGOL123 /*Set the host name to RIGOL123*/

:SYST:COMM:LAN:HOST? /*Query the host name and the query returns RIGOL123*/

:SYSTem:COMMunicate:LAN:IPADdress

Syntax :SYSTem:COMMunicate:LAN:IPADdress <ip_address>

:SYSTem:COMMunicate:LAN:IPADdress?

Description Set the IP address.

Query the IP address.

Parameter

Name	Type	Range	Default
<ip_address>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- This command is only valid when the ManualIP configuration mode is turned on ([:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)).
 - The format of <ip_address> is nnn.nnn.nnn.nnn; wherein, the first nnn ranges from 1 to 223 (except 127) and the other three nnn range from 0 to 255. It is recommended that users acquire an available address from their network administrator.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.

Return Format The query returns a string, for example, 192.168.1.88.

Example :SYST:COMM:LAN:IPAD 192.168.1.88 /*Set the IP address to 192.168.1.88*/

:SYST:COMM:LAN:IPAD? /*Query the IP address and the query returns 192.168.1.88*/

Related Commands [:SYSTem:COMMunicate:LAN:APPLy](#)
[:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)

:SYSTem:COMMunicate:LAN:MAC?

Syntax :SYSTem:COMMunicate:LAN:MAC?

Description Query the MAC address of the instrument.

Explanation MAC (Media Access Control) address, also called hardware address, is used for defining the position of the network device. For a signal generator, the MAC address is always unique. It is always used to identify the instrument while assigning IP address for instrument. MAC address (48 bits, namely 6 bytes) is usually expressed in hexadecimal format, such as 00-14-0E-42-12-CF.

Return Format The query returns a string, for example, 00-14-0E-42-12-CF.

:SYSTem:COMMunicate:LAN:SMASk

Syntax :SYSTem:COMMunicate:LAN:SMASk <mask>
:SYSTem:COMMunicate:LAN:SMASk?

Description Set the subnet mask.

Query the subnet mask.

Parameter	Name	Type	Range	Default
	<mask>	ASCII string	Refer to the "Explanation"	None

- Explanation**
- This command is only valid when the ManualIP configuration mode is turned on ([:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)).
 - The format of <mask> is nnn.nnn.nnn.nnn; wherein, nnn ranges from 0 to 255. It is recommended that users acquire an available subnet mask from their network administrator.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLy](#) command is executed to apply the current network parameters.
 - The subnet mask must be continuous, namely the 1 and 0 must be continuous.

Return Format The query returns a string, for example, 255.255.255.0.

Example :SYST:COMM:LAN:SMAS 255.255.255.0 /*Set the subnet mask to 255.255.255.0*/
:SYST:COMM:LAN:SMAS? /*Query the subnet mask and the query returns 255.255.255.0*/

Related Commands [:SYSTem:COMMunicate:LAN:APPLy](#)
[:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)

:SYSTem:COMMunicate:LAN:STATic[:STATe]

Syntax :SYSTem:COMMunicate:LAN:STATic[:STATe] {ON|1|OFF|0}
 :SYSTem:COMMunicate:LAN:STATic[:STATe]?

Description Turn on or off the ManualIP configuration mode.

Query the status of the ManualIP configuration mode.

Parameter

Name	Type	Range	Default
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

- Explanation**
- In ManualIP mode, the LAN parameters of the signal generator, e.g. IP address, are defined by users.
 - If all the three IP configuration modes are “On”, the priority of parameters configuration from high to low is “DHCP”, “AutoIP” and “ManualIP”. Therefore, to enable the AutoIP configuration mode, “DHCP” and “AutoIP” must be set to “Off”.
 - The three IP configuration modes cannot be set to “Off” at the same time.
 - After sending this command, the new settings will only take effect when the [:SYSTem:COMMunicate:LAN:APPLY](#) command is executed to apply the current network parameters.

Return Format The query returns ON or OFF.

Example :SYST:COMM:LAN:STAT ON /*Turn on the ManualIP configuration mode*/
 :SYST:COMM:LAN:STAT? /*Query the status of the ManualIP configuration mode and the query returns ON */

Related Command [:SYSTem:COMMunicate:LAN:APPLY](#)

:SYSTem:COMMunicate:LAN:UPDate

Syntax :SYSTem:COMMunicate:LAN:UPDate

Description Store all the modifications of the LAN setting to the non-volatile memory and restart the LAN drive program using the updated setting.

- Explanation**
- You must send this command after modifying the DHCP, DNS, gateway, host name, IP address and subnet mask settings.
 - Please finish all the modifications of the LAN setting before sending this command.

:SYSTem:COMMunicate:USB:INFormation?

Syntax :SYSTem:COMMunicate:USB:INFormation?

Description Query the USB information of the instrument.

Return Format The query returns a string, for example, :USB0::0x1AB1::0x0642::DG1ZA000000001::INSTR.

:SYSTem:COMMunicate:USB[:SELF]:CLASs

Syntax :SYSTem:COMMunicate:USB[:SELF]:CLASs {COMPUter|PRINter}
 :SYSTem:COMMunicate:USB[:SELF]:CLASs?

Description Set the type of the device connected to the USB Device interface at the rear panel of the instrument to computer (COMPUter) or printer (PRINter).

Query the type of the device connected to the USB Device interface at the rear panel of the instrument.

Parameter	Name	Type	Range	Default
	{COMPUter PRINter}	Discrete	COMPUter PRINter	COMPUter

Explanation Please select COMPUter or PRINter according to the device currently connected to the USB Device interface at the rear panel of the instrument.

Return Format The query returns COMP or PRIN.

Example :SYST:COMM:USB:CLAS PRIN /*Set the type of the device connected to the USB Device interface at the rear panel of the instrument to printer*/
 :SYST:COMM:USB:CLAS? /*Query the type of the device connected to the USB Device interface at the rear panel of the instrument and the query returns PRIN*/

:SYSTem:CSCopy

Syntax :SYSTem:CSCopy <name>,<name>

Description Copy all the parameters and states (except the channel output on/off state) as well as the arbitrary waveform data of a channel to the other channel.

Parameter

Name	Type	Range	Default
<name>	Discrete	CH1 CH2	None

- Explanation**
- When the channel coupling function ([:COUPling:AMPL\[:STATe\]](#), [:COUPling:FREQuency\[:STATe\]](#), [:COUPling:PHASe\[:STATe\]](#) or [:COUPling\[:STATe\]](#)) or track function ([\[:SOURce\[<n>\]\]:TRACK](#)) is turned on, the channel copy function is not available.
 - The two <name> parameters cannot be the same, namely <name>,<name> can be CH1,CH2 or CH2,CH1.
 CH1,CH2: copy all the parameters and states (except the channel output on/off state) as well as the arbitrary waveform data of CH1 to CH2.
 CH2,CH1: copy all the parameters and states (except the channel output on/off state) as well as the arbitrary waveform data of CH2 to CH1.

Example :SYST:CSC CH1,CH2 /*Copy all the parameters and states (except the channel output on/off state) as well as the arbitrary waveform data of CH1 to CH2.*/

Related Commands [:COUPling:AMPL\[:STATe\]](#)
[:COUPling:FREQuency\[:STATe\]](#)
[:COUPling:PHASe\[:STATe\]](#)
[:COUPling\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:TRACK](#)

:SYSTem:ERRor?

Syntax :SYSTem:ERRor?

Description Query and clear an error message in the error queue.

Explanation The error will be cleared when you read the error queue. You can also clear the error queue using the [*CLS](#) command (clear the status) or [*RST](#) command (restore the instrument to its factory state) or by 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, -113,"Undefined header; keyword cannot be found"; wherein, **-113** is the number of the error message and **Undefined header; keyword cannot be found** (the content enclosed in the double quotation marks) is the content of the error message.

Related Commands [*CLS](#)
[*RST](#)

:SYSTem:KLOCK

Syntax :SYSTem:KLOCK <key>,{ON|1|OFF|0}

:SYSTem:KLOCK? <key>

Description Lock or unlock the specified key or knob at the front panel.

Query whether the specified key or knob at the front panel is locked.

Parameter

Name	Type	Range	Default
<key>	Discrete	Refer to the "Explanation"	None
{ON 1 OFF 0}	Bool	ON 1 OFF 0	OFF

- Explanation**
- <key> is used to specify the key and the range is as following:
 MOD|SWEEP|BURST|STORE|UTILITY|HELP| /*Function keys*/
 SINE|SQUARE|RAMP|PULSE|NOISE|ARB| /*Waveform keys*/
 M1|M2|M3|M4|M5|PAGE| /*Menu softkeys and menu page up/down key*/
 NUM0|NUM1|NUM2|NUM3|NUM4|NUM5| /*Numeric keyboard*/
 NUM6|NUM7|NUM8|NUM9|DOT|SIGN|
 LEFT|RIGHT|KNOB| /*Direction keys and knob*/
 OUTPUT1|OUTPUT2|CH| /*Output control keys and channel switch key*/
 RETURN| /*Return the previous menu key*/
 COUNTER| /*Counter key*/
 ALL /*All the keys and knob at the front panel*/
 - {ON|OFF|0|1} is used to lock or unlock the keys. ON|1 denotes locking the specified key and OFF|0 denotes unlocking the specified key.
 - DG1000Z allows users to lock the specified key or knob at the front panel to avoid the danger caused by mis-operation. When the key is locked, it can only be unlocked by sending this command and cannot be unlock by front panel operation.

Return Format The query returns 1 or 0.

Example

```
:SYST:KLOC MOD,1 /*Lock the MOD key at the front panel*/
:SYST:KLOC? MOD /*The query returns 1*/
:SYST:KLOC MOD,OFF /*Unlock the MOD key at the front panel*/
:SYST:KLOC? MOD /*The query returns 0*/
```

:SYSTem:LANGuage

Syntax :SYSTem:LANGuage {ENGLISH|SCHinese}

:SYSTem:LANGuage?

Description Set the system language to English (ENGLISH) or simplified Chinese (SCHinese).

Query the system language.

Parameter

Name	Type	Range	Default
{ENGLISH SCHinese}	Discrete	ENGLISH SCHinese	SCHinese

Return Format The query returns ENGL or SCH.

Example :SYST:LANG SCH /*Set the system language to simplified Chinese*/

:SYST:LANG? /*Query the system language and the query returns SCH*/

:SYSTem:POWeron

Syntax :SYSTem:POWeron {DEFAULT|LAST}

:SYSTem:POWeron?

Description Set the power-on state to default (DEFAULT) or last (LAST).

Query the power-on state.

Parameter

Name	Type	Range	Default
{DEFAULT LAST}	Discrete	DEFAULT LAST	DEFAULT

- Explanation**
- DEFAULT: the factory default values, except the parameters (such as the language) that will not be affected by the reset operation. For the details, please refer to “**Appendix B: Factory Setting**”.
 - LAST: include all the system parameters and states (except the channel output on/off state and the clock source).

Return Format The query returns DEFAULT or LAST.

Example :SYST:POW LAST /*Set the power-on state to last*/

:SYST:POW? /*Query the power-on state and the query returns LAST*/

:SYSTem:PRESet

Syntax :SYSTem:PRESet
 {DEFAult|USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|
 USER9|USER10}

Description Restore the instrument to the default state (DEFAult) or recall the specified user-stored state file (USER1 to USER10) in the internal memory of the instrument.

Parameter	Name	Type	Range	Default
	{DEFAult USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10}	Discrete	DEFAult USER1 USER2 USER3 USER4 USER5 USER6 USER7 USER8 USER9 USER10	None

Explanation USER1 to USER10 denotes the files stored in the state file storage locations 1 to 10 in the internal memory of the instrument respectively. The state file can only be recalled when the specified storage location in the internal memory contains a state file.

Example Assume that the state file storage location 1 in the internal memory of the instrument contains a state file,

```
:SYSTem:PRESet USER1    /*Recall the state file stored in the state file storage
                           location 1 in the internal memory of the
                           instrument*/
```

:SYSTem:ROSCillator:SOURce

Syntax :SYSTem:ROSCillator:SOURce {INTernal|EXTernal}

:SYSTem:ROSCillator:SOURce?

Description Set the system clock source to internal source (INTernal) or external source (EXTernal).

Query the system clock source type.

Parameter

Name	Type	Range	Default
{INTernal EXTernal}	Discrete	INTernal EXTernal	INTernal

Explanation

- DG1000Z provides an internal 10MHz clock source and accepts external clock source from the **[10MHz In/Out]** connector at the rear panel. It can also output clock source from the **[10MHz In/Out]** connector for other devices.
- If external clock source is selected, the instrument will detect whether a valid external clock signal is inputted from the **[10MHz Out/In]** connector at the rear panel. If no valid clock source is detected, the corresponding prompt message would be displayed and the clock source would be switched to internal.
- You can synchronize two or more instruments by setting the clock source.
Synchronization between two instruments:
Connect the output of the **[10MHz In/Out]** connector of instrument A (set the clock source to "Internal") to the **[10MHz In/Out]** connector of instrument B (set the clock source to "External") and set the output frequencies of instruments A and B as a same value to realize synchronization between the two instruments.
Synchronization among multiple instruments:
Divide the 10MHz clock source of a instrument (set the clock source to "Internal") into multiple instruments, and then connect them to the **[10MHz In/Out]** connectors of other generators (set the clock source to "External") respectively, and finally set the output frequencies of all the instruments as a same value to realize synchronization among the multiple instruments.

Return Format The query returns INT or EXT.

Example :SYST:ROSC:SOUR INT /*Set the system clock source to internal*/
:SYST:ROSC:SOUR? /*Query the system clock source and the query returns INT*/

:SYSTem:SECurity:IMMediate

Syntax :SYSTem:SECurity:IMMediate

Description Sanitizes all the user-accessible instrument memory information.

Explanation This command sanitizes all the user-defined state information, arbitrary waveforms and I/O settings (such as the IP address) as well as restores the instrument settings to the factory values.

:SYSTem:VERSion?

Syntax :SYSTem:VERSion?

Description Query the system SCPI version information.

Return Format The query returns a string in YYYY.V form; wherein, YYYY denotes the year of the version and V denotes the edition in that year. For example, 1999.0.

:TRIGger Commands

The :TRIGger commands are used to set the trigger source type, trigger input edge type and trigger delay as well as generate a trigger event.

Command List:

- ◆ [:TRIGger\[<n>\]:DELay](#)
- ◆ [:TRIGger\[<n>\]\[:IMMediate\]](#)
- ◆ [:TRIGger\[<n>\]:SLOPe](#)
- ◆ [:TRIGger\[<n>\]:SOURce](#)

:TRIGger[<n>]:DELay

Syntax :TRIGger[<n>]:DELay {<seconds>|MINimum|MAXimum}
:TRIGger[<n>]:DELay? [MINimum|MAXimum]

Description Set the burst delay of the specified channel.

Query the burst delay of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Integer	1 2	1
<seconds>	Real	Refer to the "Explanation"	0s

Explanation

- The burst delay refers to the time from when the signal generator receives the trigger signal to when it starts to output the N cycle or infinite burst. It is only applicable to the N cycle and infinite burst modes.
- For the N cycle or infinite burst mode in external trigger or manual trigger ([\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)), the range of <delay> is from 0s to 100s.
- For the N cycle burst mode in internal trigger, the range of <delay> is from 0s to $(P_{burst} - P_{waveform} \times N_{cycle} - 2\mu s)$ and the burst delay must be lower than or equal to 100s.
Wherein,
 P_{burst} —burst period;
 $P_{waveform}$ —waveform period (period of the burst function (such as sine and square) ;
 N_{cycle} —number of cycles.
- When [<n>] is omitted, the system sets the burst delay of CH1 by default.

Return Format The query returns the burst delay in scientific notation with 7 effective digits, for example, 1.000000E+00 (the burst delay is 1s).

Example :TRIG:DEL 1 /*Set the burst delay of CH1 to 1s*/
:TRIG:DEL? /*Query the burst delay of CH1 and the query returns 1.000000E+00*/

Related Command [\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)

:TRIGger[<n>][:IMMediate]**Syntax** :TRIGger[<n>] [:IMMediate]**Description** Generate a trigger in the specified channel.**Parameter**

Name	Type	Range	Default
[<n>]	Discrete	1 2	1

- Explanation**
- This command is only applicable to the burst output ([\[:SOURce\[<n>\]:BURSt\[:STATe\]](#)) or sweep output ([\[:SOURce\[<n>\]:SWEep:STATe\]](#)) in manual trigger ([:TRIGger\[<n>\]:SOURce](#)).
 - When [<n>] is omitted, the system generates a trigger in CH1 by default.
 - The trigger will be ignored if the output of the corresponding channel is not turned on.

Example :TRIG1 /*Generate a trigger in CH1*/

Related Commands

[\[:SOURce\[<n>\]:BURSt\[:STATe\]](#)

[\[:SOURce\[<n>\]:SWEep:STATe\]](#)

[:TRIGger\[<n>\]:SOURce](#)

:TRIGger[<n>]:SLOPe

Syntax :TRIGger[<n>]:SLOPe {POSitive|NEGative}

:TRIGger[<n>]:SLOPe?

Description Set the edge type of the trigger input signal of the specified channel to rising edge (POSitive) or falling edge (NEGative).

Query the edge type of the trigger input signal of the specified channel.

Parameter

Name	Type	Range	Default
[<n>]	Discrete	1 2	1
{POSitive NEGative}	Discrete	POSitive NEGative	POSitive

- Explanation**
- This command is only applicable to the burst (N cycle, infinite or gated) output ([\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)) or sweep output ([\[:SOURce\[<n>\]\]:SWEep:STATe](#)) in external trigger ([:TRIGger\[<n>\]:SOURce](#)). When external trigger is selected, the signal generator receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel and initiates a burst output (N cycle, infinite or gated) or sweep output each time a TTL pulse with the specified polarity is received.
 - When [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns POS or NEG.

Example :TRIG1:SLOP NEG /*Set the edge type of the trigger input signal of CH1 to falling edge*/

:TRIG1:SLOP? /*Query the edge type of the trigger input signal of CH1 and the query returns NEG*/

Related Commands [\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)
[\[:SOURce\[<n>\]\]:SWEep:STATe](#)
[:TRIGger\[<n>\]:SOURce](#)

:TRIGger[<n>]:SOURce

Syntax :TRIGger[<n>]:SOURce {INTernal|EXTernal|BUS}
:TRIGger[<n>]:SOURce?

Description Set the trigger source of the specified channel to internal (INTernal), external (EXTernal) or manual (MANual).

Query the trigger source of the specified channel.

Parameter	Name	Type	Range	Default
	[<n>]	Discrete	1 2	1
	{INTernal EXTernal BUS}	Discrete	INTernal EXTernal BUS	INTernal

- Explanation**
- This command is only applicable to the burst (N cycle, infinite or gated) output or sweep output.
 - The N cycle burst and sweep mode support internal trigger. When internal trigger is selected, the frequency of the N cycle burst is determined by the “Burst Period” and the trigger period of the sweep waveform is determined by the specified sweep time, return time, start hold and stop hold. You can also set the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to output trigger signal with the specified edge type (rising edge or falling edge) or turn off the trigger signal output.
 - The N cycle, infinite and gated bursts as well as the sweep mode all supports external trigger. When external trigger is selected, the signal generator receives the trigger signal inputted from the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel and initiates a burst (N cycle, infinite or gated) output or sweep output each time a TTL pulse with the specified polarity is received. You can specify the edge type of the trigger input signal ([:TRIGger\[<n>\]:SLOPe](#)).
 - The N cycle and infinite bursts as well as the sweep mode support manual trigger. When manual trigger is selected and the output of the corresponding channel is turned on, the instrument outputs N cycle burst or infinite burst when the [*TRG, :TRIGger\[<n>\]:IMMediate](#) or [\[:SOURce\[<n>\]:BURSt:TRIGger\[:IMMediate\]](#) command is sent; the instrument initiates a sweep in the corresponding channel immediately each time the [*TRG, :TRIGger\[<n>\]:IMMediate](#) or [\[:SOURce\[<n>\]:SWEep:TRIGger\[:IMMediate\]](#) command is send. If the output of the corresponding channel is not turned on, the trigger will be ignored. You can also set the **[Mod/Trig/FSK/Sync]** connector of the corresponding channel at the rear panel to output trigger signal with the specified edge type (rising edge or falling edge) or turn off the trigger signal output.
 - When [<n>] is omitted, the system sets the related parameters of CH1 by default.

Return Format The query returns INT, EXT or MAN.

Example :TRIG1:SOUR INT /*Set the trigger source of CH1 to internal*/
:TRIG1:SOUR? /*Query the trigger source p of CH1 and the query returns INT*/

Related Commands [\[:SOURce\[<n>\]:BURSt:TRIGger\[:IMMediate\]](#)
[\[:SOURce\[<n>\]:SWEep:TRIGger\[:IMMediate\]](#)
[*TRG](#)
[:TRIGger\[<n>\]:IMMediate](#)
[:TRIGger\[<n>\]:SLOPe](#)

Chapter 3 Application Examples

This chapter provides some application examples of the SCPI commands. A series of SCPI commands are combined to realize the main functions of the signal generator.

Note:

1. The examples in this chapter are based on DG1062Z. For other models, the ranges of some parameters might be different. When using the commands, please make proper adjustment according to the model of your instrument.
2. Before using the examples in this chapter, please select the desired communication interface (USB, LAN or GPIB) and make correct connections (refer to the introductions in “**To Build Remote Communication**”). Besides, you have to install Ultra Sigma or other PC software for sending commands on your PC.
3. The content enclosed in “/*” and “*/” after each command in the examples of this chapter is annotation for easier understanding and is not a part of the command.

Main topics of this chapter:

- ◆ [To Output Basic Waveform](#)
- ◆ [To Output Arbitrary Waveform](#)
- ◆ [To Output Harmonic Waveform](#)
- ◆ [To Output AM Modulated Waveform](#)
- ◆ [To Output FSK Modulated Waveform](#)
- ◆ [To Output Sweep Waveform](#)
- ◆ [To Output Burst Waveform](#)
- ◆ [To Use the Frequency Counter Function](#)

To Output Basic Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output a sine from the output connector of CH1 at the front panel: 500Hz frequency, 2.5Vpp amplitude, 1V_{DC} offset and 90° start phase.

Method 1

- | | |
|------------------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:APPL:SIN 500,2.5,1,90 | /*Set the waveform of CH1 to sine, the frequency to 500Hz, the amplitude to 2.5Vpp, the offset to 1V _{DC} and the start phase to 90°*/ |
| 3. :OUTP1 ON | /*Turn on the output of CH1*/ |

Method 2

- | | |
|--------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:FUNC SIN | /*Set the waveform of CH1 to sine*/ |
| 3. :SOUR1:FREQ 500 | /*Set the waveform frequency of CH1 to 500Hz*/ |
| 4. :SOUR1:VOLT 2.5 | /*Set the waveform amplitude of CH1 to 2.5Vpp*/ |
| 5. :SOUR1:VOLT:OFFS 1 | /*Set the waveform offset voltage of CH1 to 1V _{DC} */ |
| 6. :SOUR1:PHAS 90 | /*Set the waveform start phase of CH1 to 90°*/ |
| 7. :OUTP1 ON | /*Turn on the output of CH1*/ |

To Output Arbitrary Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output arbitrary waveform (volatile memory waveform) from the output connector of CH1 at the front panel; select the sample rate output mode; set the frequency to 500Hz, the number of waveform points to 10 and the floating voltages to -0.6, -0.4, -0.3, -0.1, 0, 0.1, 0.2, 0.3, 0.5 and 0.7.

Method

- | | |
|--|--|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:APPL:ARB 500 | /*Set CH1 to output arbitrary waveform (sample rate output mode) and the waveform frequency to 500Hz*/ |
| 3. :SOUR1:DATA VOLATILE,-0.6,-0.4,-0.3,-0.1,0,0.1,0.2,0.3,0.5,0.7 | /*Download the floating voltages -0.6,-0.4,-0.3,-0.1,0,0.1,0.2,0.3,0.5,0.7 to the volatile memory of CH1*/ |
| 4. :OUTP1 ON | /*Turn on the output of CH1*/ |

To Output Harmonic Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output harmonic waveform from the output connector of CH1 at the front panel; the fundamental waveform (sine) parameters are 1kHz frequency, 5Vpp amplitude, 0V_{DC} offset voltage and 0° start phase; set the highest order of harmonic to 4, the harmonic type to even, the amplitude and phase of the second order of harmonic to 2Vpp and 30°, the amplitude and phase of the forth order of harmonic to 1Vpp and 50°.

Method

- | | |
|----------------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:APPL:SIN 1000,5,0,0 | /*Set the waveform of CH1 to sine, the frequency to 1kHz, the amplitude to 5Vpp, the offset to 0V _{DC} and the start phase to 0°*/ |
| 3. :SOUR1:HARM ON | /*Turn on the harmonic function of CH1*/ |
| 4. :SOUR1:HARM:ORDE 4 | /*Set the highest order of harmonic of CH1 to 4*/ |
| 5. :SOUR1:HARM:TYP EVEN | /*Set the harmonic type of harmonic of CH1 to even*/ |
| 6. :SOUR1:HARM:AMPL 2,2 | /*Set the amplitude of the second order of harmonic of CH1 to 2Vpp*/ |
| 7. :SOUR1:HARM:PHAS 2,30 | /*Set the phase of the second order of harmonic of CH1 to 30°*/ |
| 8. :SOUR1:HARM:AMPL 4,1 | /*Set the amplitude of the forth order of harmonic of CH1 to 1Vpp*/ |
| 9. :SOUR1:HARM:PHAS 4,50 | /*Set the phase of the forth order of harmonic of CH1 to 50°*/ |
| 10. :OUTP1 ON | /*Turn on the output of CH1*/ |

To Output AM Modulated Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output AM modulated waveform from the output connector of CH1 at the front panel; set the carrier waveform to sine (1kHz frequency, 5Vpp amplitude, 0V_{DC} 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 200Hz; turn on the carrier waveform suppression function.

Method

- | | |
|----------------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:APPL:SIN 1000,5,0,0 | /*Set the waveform of CH1 to sine, the frequency to 1kHz, the amplitude to 5Vpp, the offset to 0V _{DC} and the start phase to 0°*/ |
| 3. :SOUR1:AM:STAT ON | /*Turn on the AM modulation function of CH1*/ |
| 4. :SOUR1:AM:SOUR INT | /*Set the AM modulation source of CH1 to internal*/ |
| 5. :SOUR1:AM:INT:FUNC SIN | /*Set the AM modulating waveform of CH1 to sine*/ |
| 6. :SOUR1:AM 80 | /*Set the AM modulation depth of CH1 to 80%*/ |
| 7. :SOUR1:AM:INT:FREQ 200 | /*Set the AM modulation frequency of CH1 to 200Hz*/ |
| 8. :SOUR1:AM:DSSC ON | /*Turn on the AM carrier waveform suppression function of CH1*/ |
| 9. :OUTP1 ON | /*Turn on the output of CH1*/ |

To Output FSK Modulated Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output FSK modulated waveform from the output connector of CH1 at the front panel; set the carrier waveform to sine (1kHz frequency, 5Vpp amplitude, 0V_{DC} offset voltage and 0° start phase); select external modulation source; set the hop frequency to 2kHz and the modulation polarity to positive.

Method

- | | |
|----------------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:APPL:SIN 1000,5,0,0 | /*Set the waveform of CH1 to sine, the frequency to 1kHz, the amplitude to 5Vpp, the offset to 0V _{DC} and the start phase to 0°*/ |
| 3. :SOUR1:FSK:STAT ON | /*Turn on the FSK modulation function of CH1*/ |
| 4. :SOUR1:FSK:SOUR EXT | /*Set the FSK modulation source of CH1 to external */ |
| 5. :SOUR1:FSK 2000 | /*Set the FSK hop frequency of CH1 to 2kHz */ |
| 6. :SOUR1:FSK:POL POS | /*Set the FSK modulation polarity of CH1 to positive */ |
| 7. :OUTP1 ON | /*Turn on the output of CH1*/ |

To Output Sweep Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output sweep waveform from the output connector of CH1 at the front panel; set the sweep waveform to sine (5Vpp amplitude and 0V_{DC} offset voltage), the sweep type to linear, the sweep time to 3s, the return time to 0.1s, the start frequency to 100Hz and the stop frequency to 1kHz; turn on the frequency mark function and set the mark frequency to 500Hz, the start hold to 0.1s, the stop hold to 0.1s, the trigger source to manual and the edge type of the trigger output signal to rising edge.

Method

- | | |
|---------------------------------|---|
| 1. *IDN? | /*Query the ID string of the signal generator to check whether the remote communication is normal*/ |
| 2. :SOUR1:FUNC SIN | /*Set the waveform of CH1 to sine*/ |
| 3. :SOUR1:VOLT 5 | /*Set the waveform amplitude of CH1 to 5Vpp*/ |
| 4. :SOUR1:VOLT:OFFS 0 | /*Set the waveform offset voltage of CH1 to 0V _{DC} */ |
| 5. :SOUR1:SWE:STAT ON | /*Turn on the sweep function of CH1*/ |
| 6. :SOUR1:SWE:SPAC LIN | /*Set the sweep type of CH1 to linear*/ |
| 7. :SOUR1:SWE:TIME 3 | /*Set the sweep time of CH1 to 3s*/ |
| 8. :SOUR1:SWE:RTIM 0.1 | /*Set the return time of the sweep function of CH1 to 0.1s*/ |
| 9. :SOUR1:FREQ:STAR 100 | /*Set the start frequency of the sweep function of CH1 to 100Hz*/ |
| 10. :SOUR1:FREQ:STOP 1000 | /*Set the stop frequency of the sweep function of CH1 to 1kHz*/ |
| 11. :SOUR1:MARK ON | /*Enable the frequency mark function of the sweep function of CH1*/ |
| 12. :SOUR1:MARK:FREQ 500 | /*Set the mark frequency of the sweep function of CH1 to 500Hz*/ |
| 13. :SOUR1:SWE:HTIM:STAR 0.1 | /*Set the start hold of the sweep function of CH1 to 0.1s*/ |
| 14. :SOUR1:SWE:HTIM 0.1 | /*Set the stop hold of the sweep function of CH1 to 0.1s*/ |
| 15. :SOUR1:SWE:TRIG:SOUR MAN | /*Set the sweep trigger source of CH1 to manual*/ |
| 16. :SOUR1:SWE:TRIG:TRIGO POS | /*Set the edge type of the trigger output signal of CH1 to rising edge*/ |
| 17. :OUTP1 ON | /*Turn on the output of CH1*/ |
| 18. :SOUR1:SWE:TRIG | /*Trigger a sweep in CH1 immediately*/ |

To Output Burst Waveform

Requirement

Use the SCPI commands to realize the following functions:

Output burst waveform from the output connector of CH1 at the front panel; set the burst waveform to sine (1kHz frequency, 5Vpp amplitude, 0V_{DC} offset voltage and 0° start phase), the burst type to N cycle, the number of cycles to 10, the burst time to 0.1s, the trigger source to internal, the trigger output signal to falling edge and the trigger delay to 0.01s.

Method

1.	*IDN?	/*Query the ID string of the signal generator to check whether the remote communication is normal*/
2.	:SOUR1:APPL:SIN 1000,5,0,0	/*Set the waveform of CH1 to sine, the frequency to 1kHz, the amplitude to 5Vpp, the offset to 0V _{DC} and the start phase to 0°*/
3.	:SOUR1:BURS ON	/*Turn on the burst function of CH1*/
4.	:SOUR1:BURS:MODE TRIG	/*Set the burst type of CH1 to N cycle*/
5.	:SOUR1:BURS:NCYC 10	/*Set the number of cycles of the N cycle burst of CH1 to 10*/
6.	:SOUR1:BURS:INT:PER 0.1	/*Set the internal burst period of the N cycle burst of CH1 to 0.1s*/
7.	:SOUR1:BURS:TRIG:SOUR INT	/*Set the trigger source of the burst mode of CH1 to internal*/
8.	:SOUR1:BURS:TRIG:TRIGO NEG	/*Set the edge type of the trigger output signal of the burst mode of CH1 to falling edge*/
9.	:SOUR1:BURS:TDEL 0.01	/*Set the trigger delay of the N cycle burst of CH1 to 0.01s*/
10.	:OUTP1 ON	/*Turn on the output of CH1*/
11.	:SOUR1:BURS:TRIG	/*Trigger a burst output in CH1 immediately*/

To Use the Frequency Counter Function

Requirement

Use the SCPI commands to realize the following functions:

Enable the frequency counter function; set the instrument to select the proper gate time automatically according to the characteristic of the signal to be measured; turn on the statistic function; set the display mode of the statistic results to number, the sensitivity to 30%, the trigger level to 0.1V and the coupling mode to AC coupling; turn on the high-frequency rejection function; set the running state to run.

Method

1.	*IDN?	/*Query the ID string of the signal generator to check whether the remote communication is normal*/
2.	:COUN ON	/*Turn on the frequency counter function*/
3.	:COUN:AUTO	/*Set the instrument to select the proper gate time according to the characteristic of the signal to be measured*/
4.	:COUN:STATI ON	/*Turn on the statistic function of the measurement results of the frequency counter*/
5.	:COUN:STATI:DISP DIGITAL	/*Set the display mode of the statistic results of the measurement results of the frequency counter to number*/
6.	:COUN:SENS 30	/*Set the trigger sensitivity of the frequency counter to 30%*/
7.	:COUN:LEVE 0.1	/*Set the trigger level of the frequency counter to 0.1V*/
8.	:COUN:COUP AC	/*Set the coupling mode of the input signal to AC coupling*/
9.	:COUN:HF ON	/*Turn on the high-frequency rejection function of the frequency counter*/
10.	:COUN RUN	/*Set the running state of the frequency counter to run*/

Chapter 4 Programming Demos

This chapter provides the demos for programming and controlling the signal generator using SCPI commands under Excel, Matlab, LabVIEW, Visual Basic and Visual C++ environments on the basis of NI-VISA.

NI-VISA (National Instrument-Virtual Instrument Software Architecture) is an advanced application programming interface developed by NI (National Instrument) for communicating with various instrument buses. It can communicate with instrument in the same method regardless of the type of the instrument interface (GPIB, USB, LAN/Ethernet or RS232).

The instruments which communicate with NI-VISA via various interfaces are called “resources”. The VISA descriptor (namely the resource name) is used to describe the accurate name and location of the VISA resource. If LAN interface is currently used for communicating with the instrument, the VISA descriptor is :TCPIP0::172.16.2.13::INSTR. Before programming, please acquire the correct VISA descriptor.

Main topics of this chapter:

- ◆ [Programming Preparations](#)
- ◆ [Excel Programming Demo](#)
- ◆ [Matlab Programming Demo](#)
- ◆ [LabVIEW Programming Demo](#)
- ◆ [Visual Basic Programming Demo](#)
- ◆ [Visual C++ Programming Demo](#)

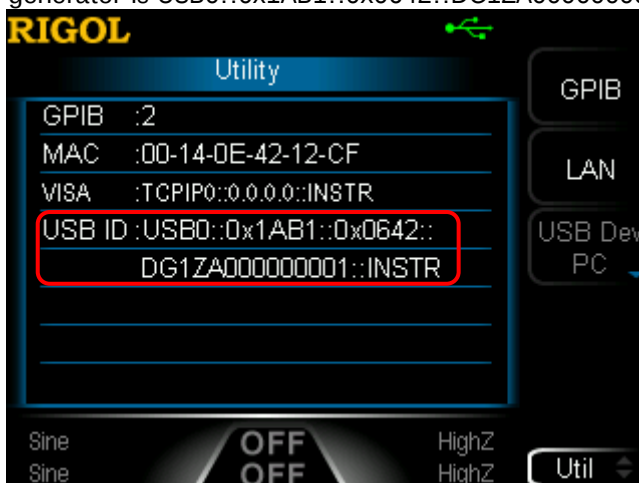
Programming Preparations

Before programming, you need to make the following preparations:

- 1 Install the Ultra Sigma common PC software. Please download the software from www.rigol.com and install it according to the instructions. After installing Ultra Sigma, the NI-VISA library is installed automatically. Here, the default installation path is C:\Program Files\IVI Foundation\VISA.
- 2 Here, the USB DEVICCE interface of the signal generator is used to communicate with the PC. Please use USB cable to connect the USB DEVICE interface at the rear panel of the signal generator to the PC. You can also use LAN or GPIB interface to communicate with the PC.
- 3 Power on the instrument after connecting the signal generator and PC correctly.
- 4 At this point, the "Found New Hardware Wizard" dialog box appears on the PC. Please follow the instructions to install the "USB Test and Measurement Device (IVI)" (refer to "To Control via USB" in Chapter 3 "Remote Control" in the *DG1000Z User's Guide*).



- 5 Acquire the USB VISA descriptor of the signal generator: press **Utility** → **I/O Config** and the USB ID is displayed at the center of the interface, as shown in the figure below. Here, the USB ID of the signal generator is USB0::0x1AB1::0x0642::DG1ZA000000001::INSTR.



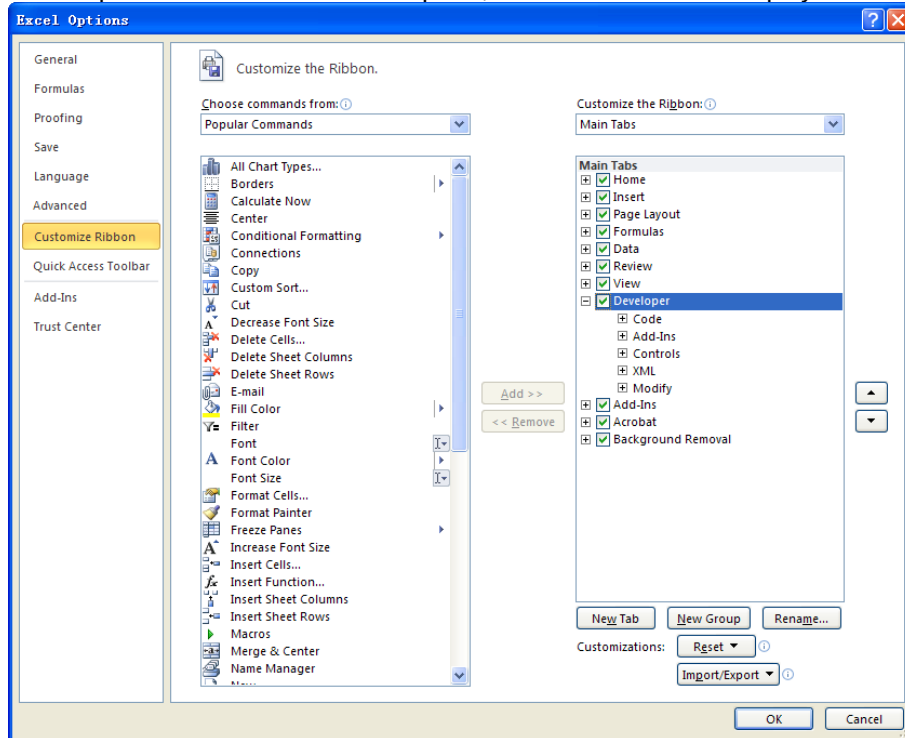
By now, the programming preparations are finished.

Excel Programming Demo

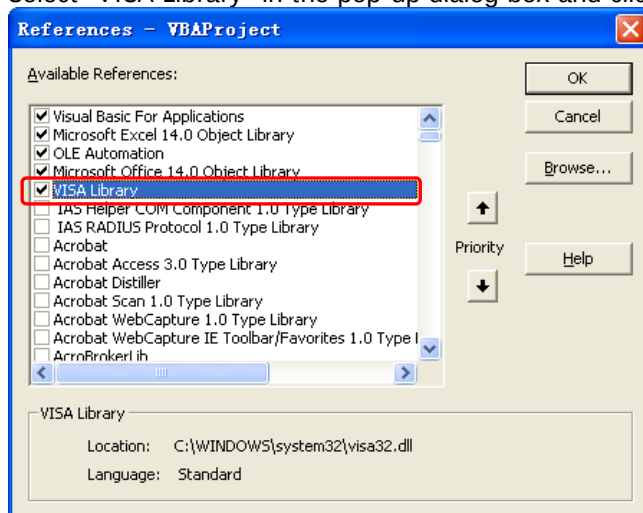
The program used in this demo: Microsoft Excel 2010

The function realized in this demo: send the *IDN? Command to read the device information.

- 1 Create a new Excel file that enables the Macros. In this demo, the file is named as DG1000Z_Demo_Excel.xlsm.
- 2 Run the DG1000Z_Demo_Excel.xlsm file. Click “File → Options” at the upper-left corner of the Excel file to open the interface as shown in the figure below. Click “Customize Ribbon” at the left, check “Developer” and click “OK”. At this point, the Excel menu bar displays the “Developer” menu.



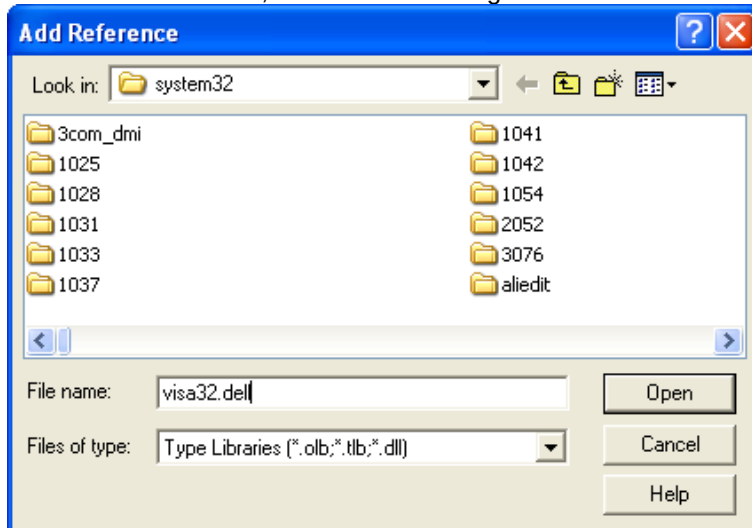
- 3 Enter the USB ID into a cell of the file as shown in the figure below. Click the “Developer” menu and select the “Visual Basic” option to open the Microsoft Visual Basic.
- 4 Select “Tools(T)” in the Microsoft Visual Basic menu bar and click “References”. Select “VISA Library” in the pop-up dialog box and click “OK” to refer to the VISA Library.



Explanation:

If you cannot find VISA Library in the list at the left of the figure above, please follow the method below to find it.

- (1) Make sure that your PC has installed the NI-VISA library.
- (2) Click “Browse...” at the right to search. The search range is C:\WINDOWS\system32 and the filename to visa32.dll, as shown in the figure below.



- 5 Click “View Code” in the “Developer” menu to enter the Microsoft Visual Basic interface. Add the following codes (the parts in green are the explanations) to the DG1000Z_Demo_Excel.xlsm – Sheet1 (code) window and save the file.

Sub QueryIdn()

```
Dim viDefRm As Long
Dim viDevice As Long
Dim viErr As Long
Dim cmdStr As String
Dim idnStr As String * 128
Dim ret As Long
```

'Turn on the device, the device resource descriptor is in CELLS(1,2) of SHEET1'

```
viErr = visa.viOpenDefaultRM(viDefRm)
viErr = visa.viOpen(viDefRm, Sheet1.Cells(1, 2), 0, 5000, viDevice)
```

'Send request, read the data, the return value is in CELLS(2,2) of SHEET1'

```
cmdStr = "*IDN?"
viErr = visa.viWrite(viDevice, cmdStr, Len(cmdStr), ret)
viErr = visa.viRead(viDevice, idnStr, 128, ret)
Sheet1.Cells(2, 2) = idnStr
```

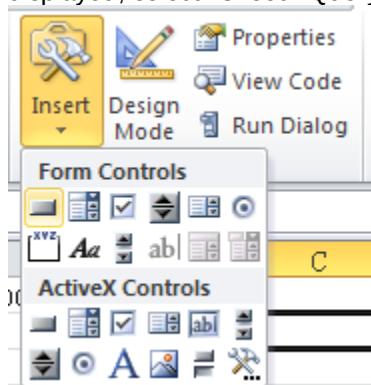
'Turn off the device'

```
visa.viClose (viDevice)
visa.viClose (viDefRm)
```

End Sub

Note: If the Excel file created at step 2 does not enable the Macros, at this point, the prompt message “The following features cannot be saved in macro-free workbooks” will be displayed. In this situation, please save the Excel file as a file using the Macros.

- 6 Add button control: click “Insert” in the “Developer menu”, select the desired button in “Form Controls” and click a cell of the Excel to put the button into the cell. At this point, the “Assign Macro” interface is displayed, select “Sheet1.QueryIdn” and click “OK”.



By default, the button name is “Button 1”. Right-click the button and select “Edit Text” in the pop-up menu to change the button name to “*IDN?”.

- 7 Click “*IDN?” button inserted into the Excel file in the last step to run the program and the device information is returned.

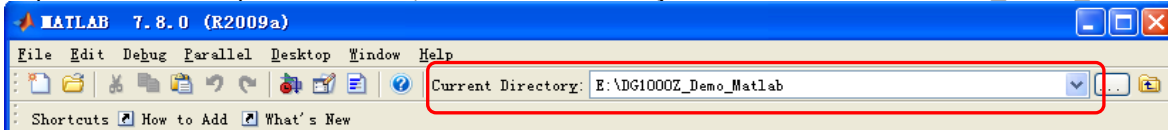
	A	B	C	D	E
1	Device:	USB0::0x1AB1::0x0642::DG1ZA000000001::INSTR	*IDN?		
2		Rigol			
3		Technologies, DG1062Z, DG1ZA000000001, 00.01.03			

Matlab Programming Demo

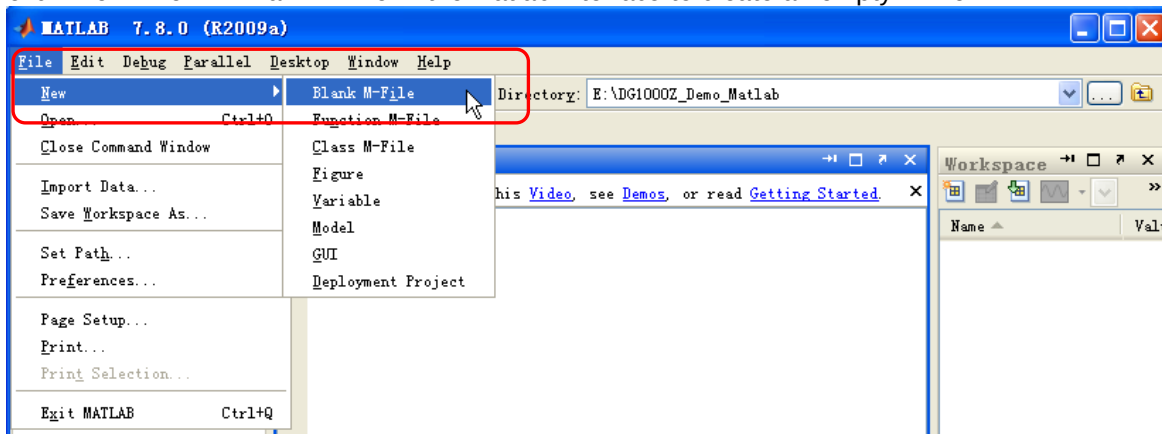
The program used in this demo: MATLAB R2009a

The function realized in this demo: query the current waveform type as well as the waveform frequency, amplitude, offset and phase of CH1.

1. Run the Matlab software and modify the current directory (namely modify the Current Directory at the top of the software). In this demo, the current directory is modified to E:\DG1000Z_Demo_Matlab.



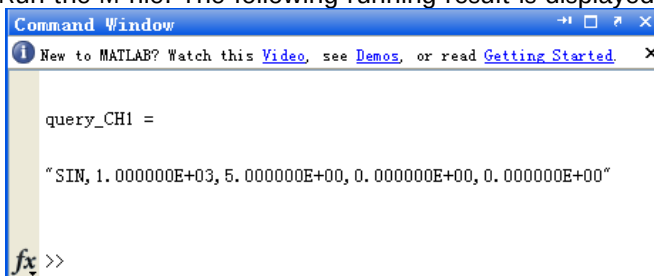
2. Click File → New → Blank M-File in the Matlab interface to create an empty M file.



3. Add the following codes in the M file:

```
dg1000z = visa('ni','USB0::0x1AB1::0x0642::DG1ZA000000001::INSTR'); %Create VISA object
fopen(dg1000z); %Open the VISA object created
fprintf(dg1000z, ':SOURce1:APPLY?'); %Send request
query_CH1 = fscanf(dg1000z); %Query data
fclose(dg1000z); %Close the VISA object
display(query_CH1) %Display the device information read
```

4. Save the M file under the current directory. In this demo, the M file is named as DG1000Z_Demo_MATLAB.m.
5. Run the M file. The following running result is displayed in the command window.

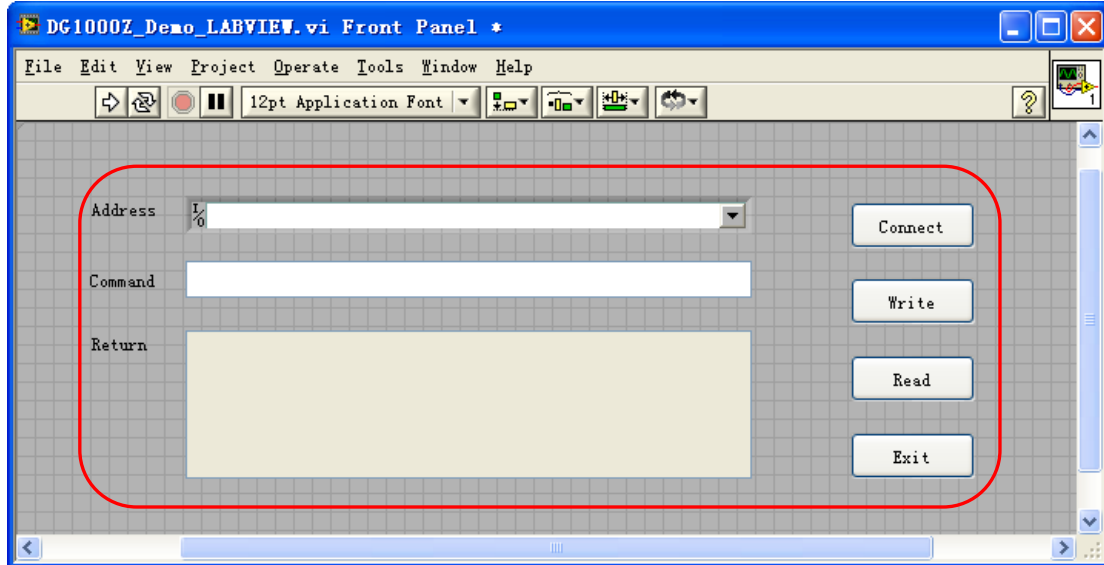


LabVIEW Programming Demo

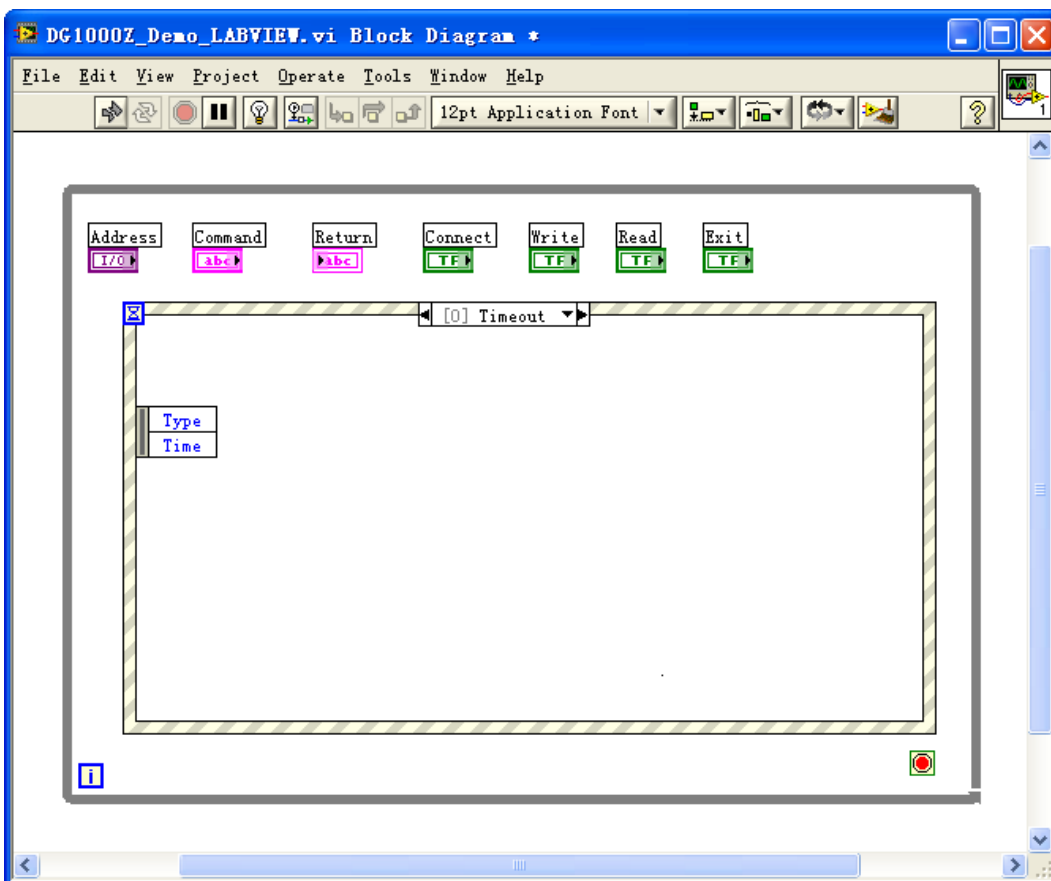
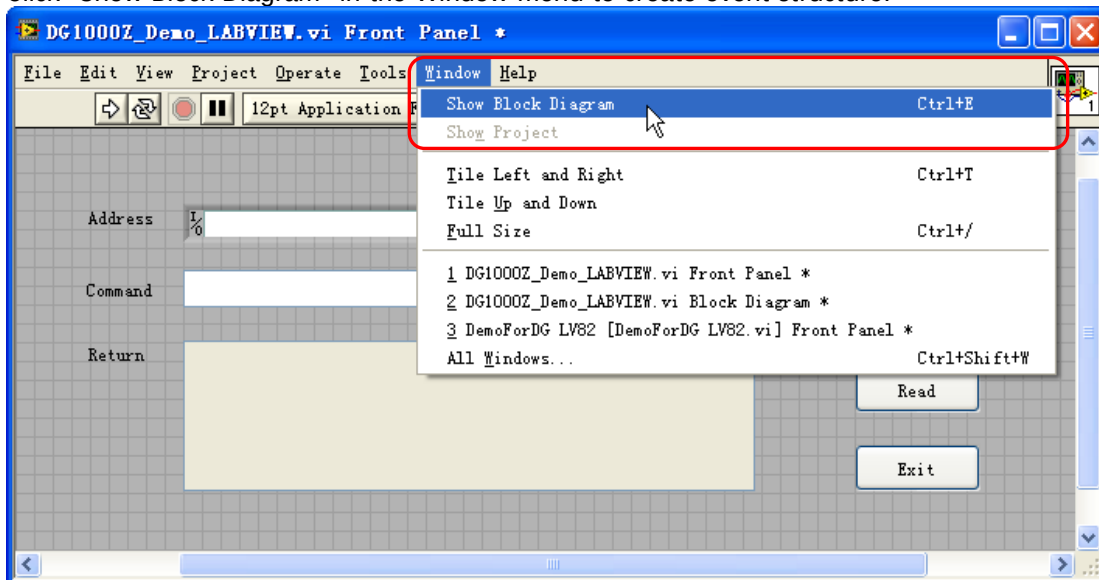
The program used in this demo: LabVIEW 2009

The functions realized in this demo: search for the instrument address, connect the instrument, send command and read the return value.

- 1 Run LabVIEW 2009, create a VI file and name it as DG1000Z_Demo_LABVIEW.
- 2 Add controls in the front panel interface, including the Address bar, Command bar and Return bar as well as the Connect, Write, Read and Exit buttons.

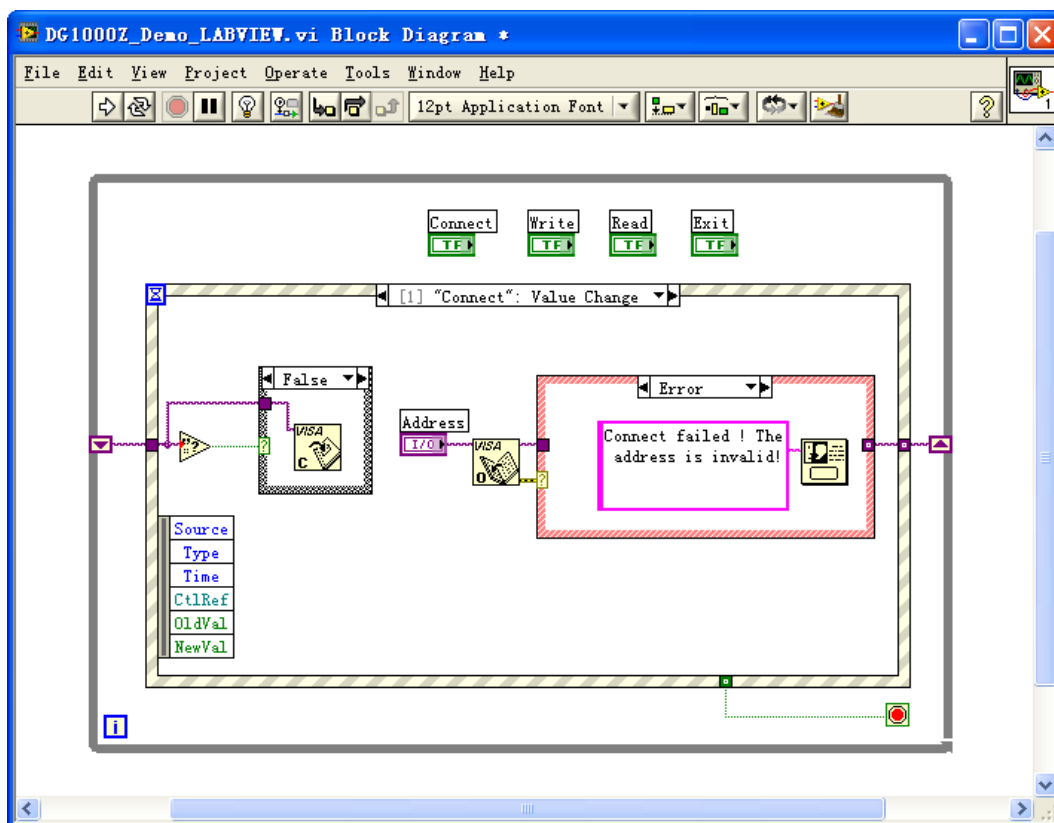
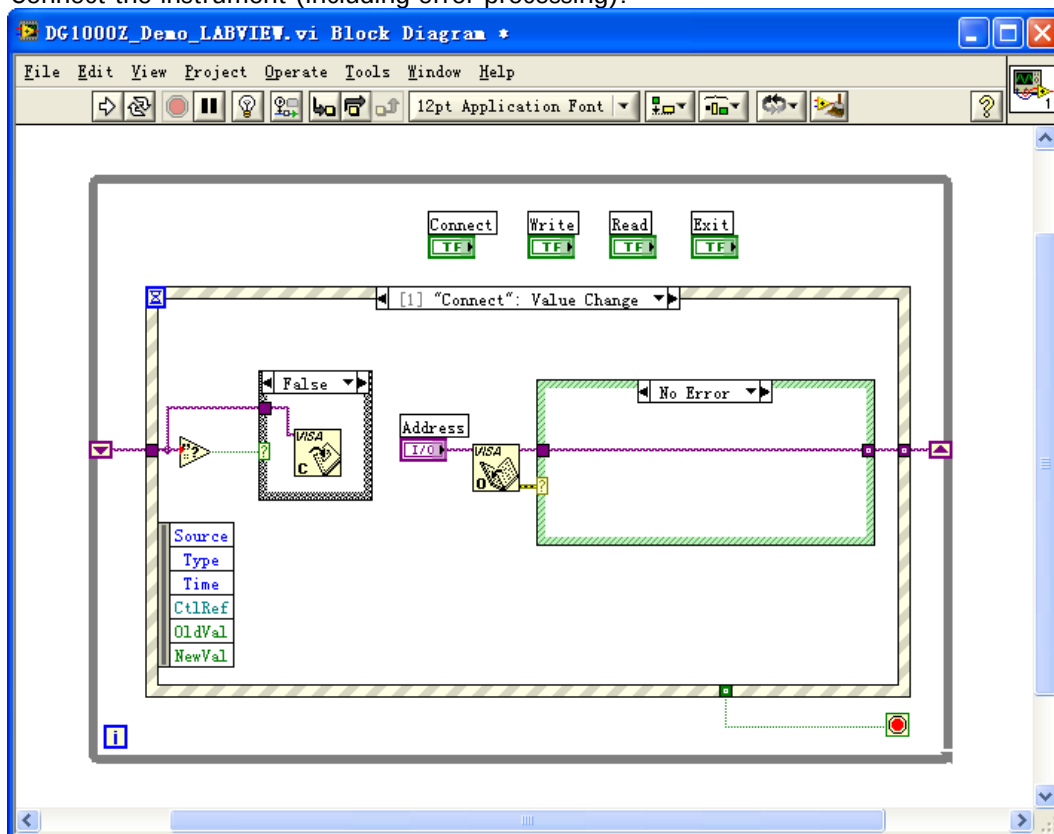


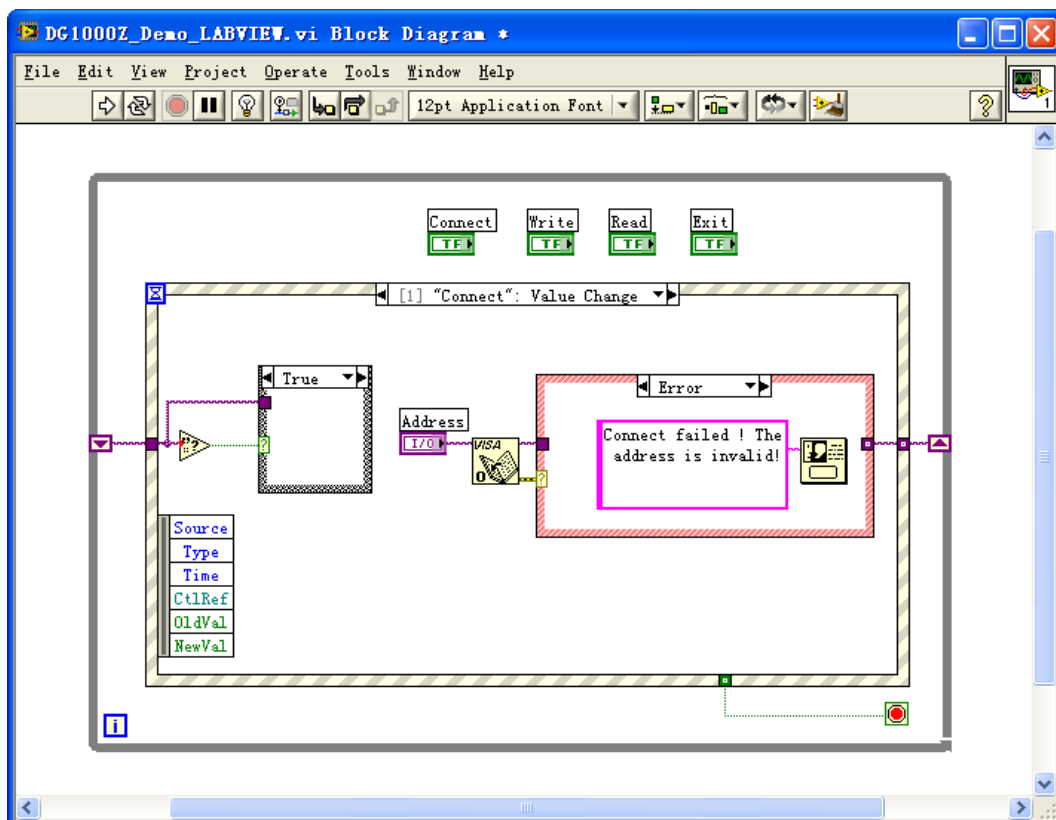
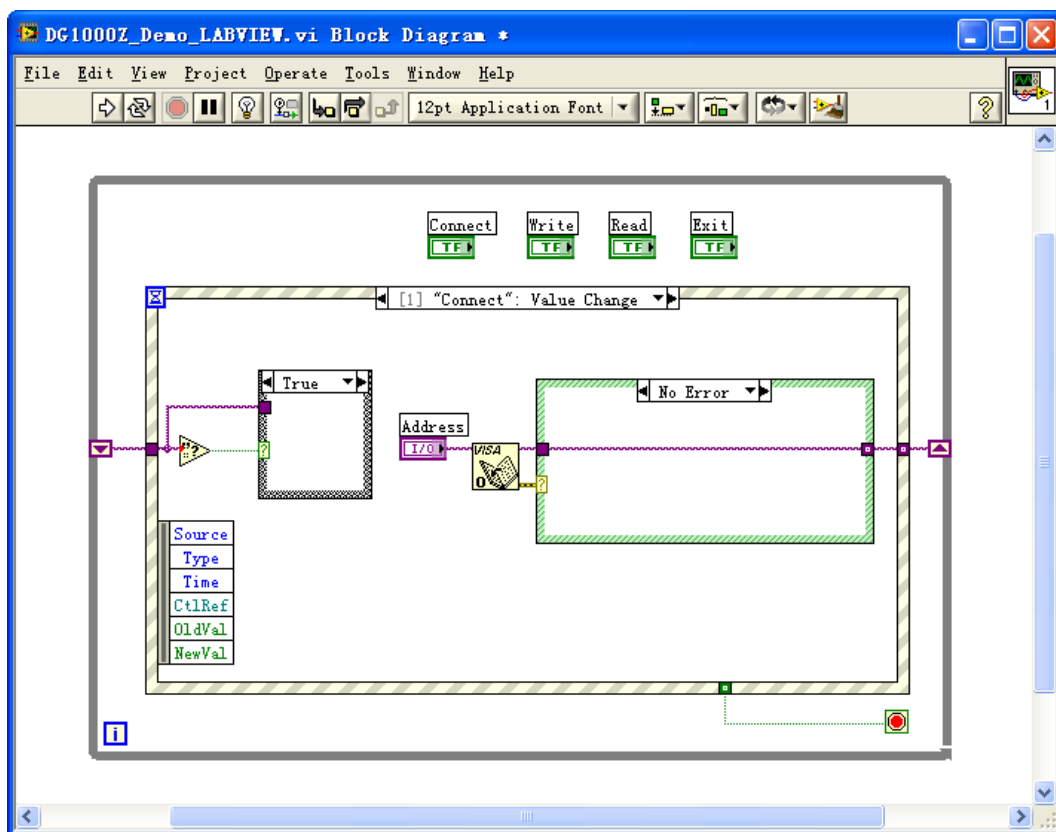
- 3 Click “Show Block Diagram” in the Window menu to create event structure.



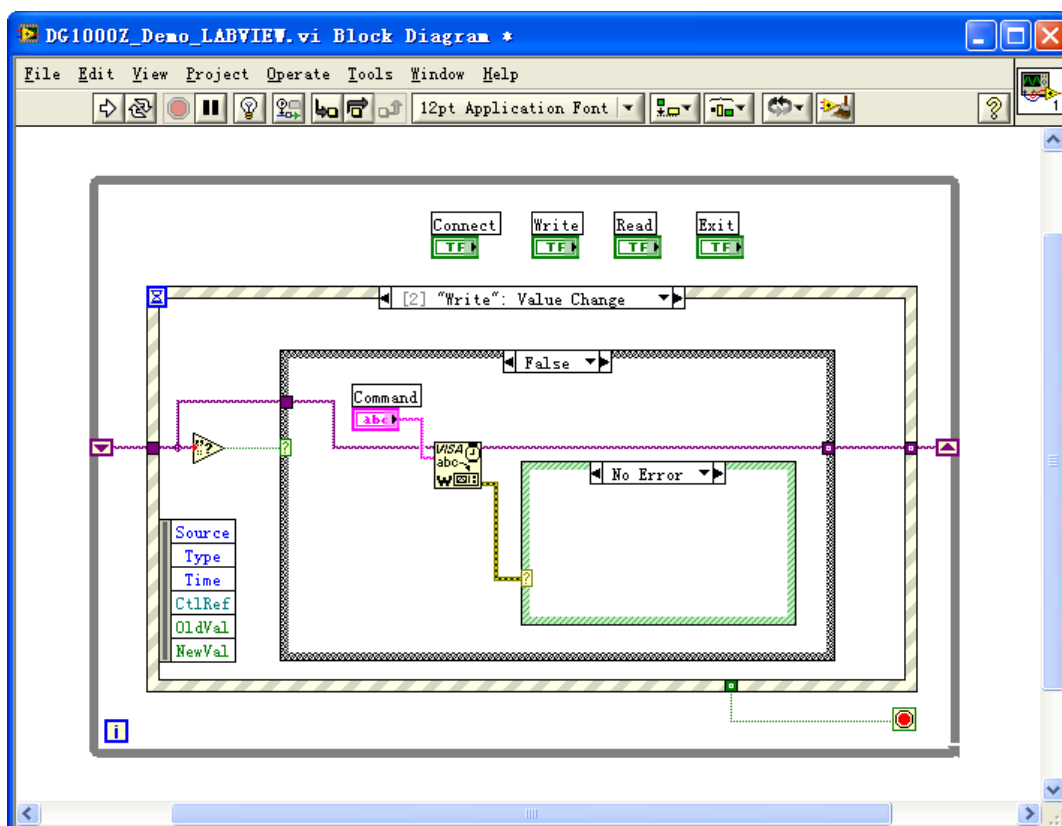
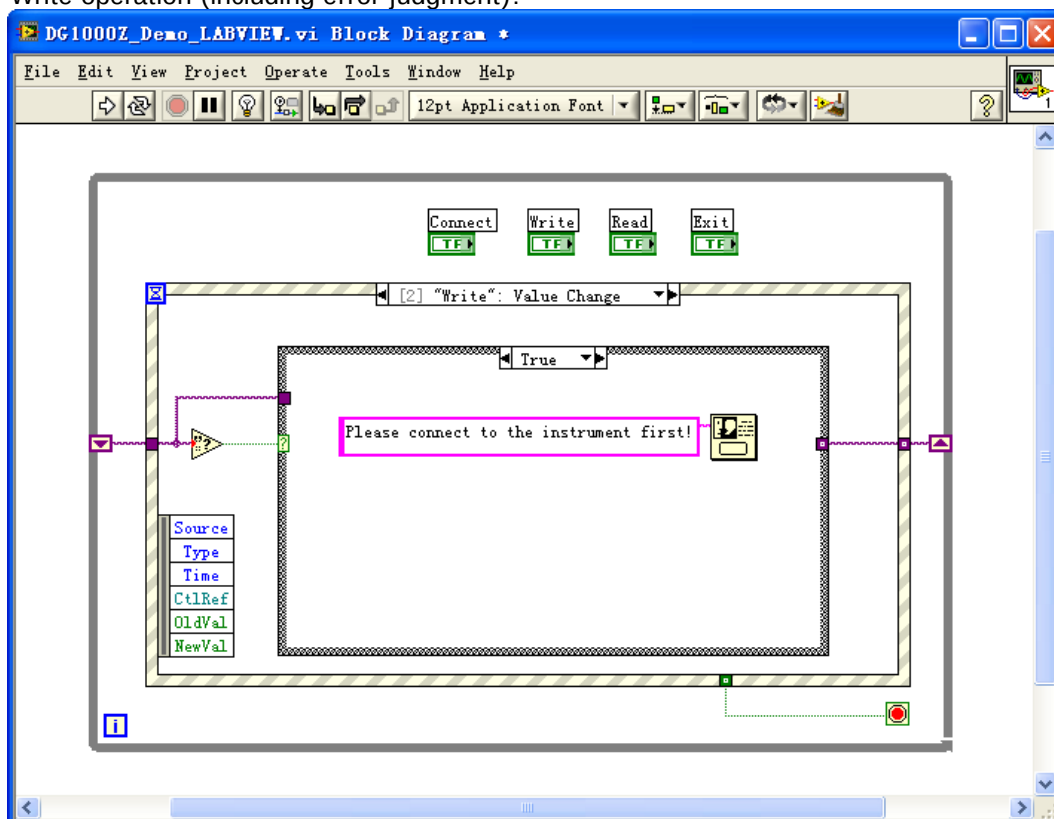
- 4 Add events, including connecting instrument, write operation, read operation and exit.

- (1) Connect the instrument (including error processing):

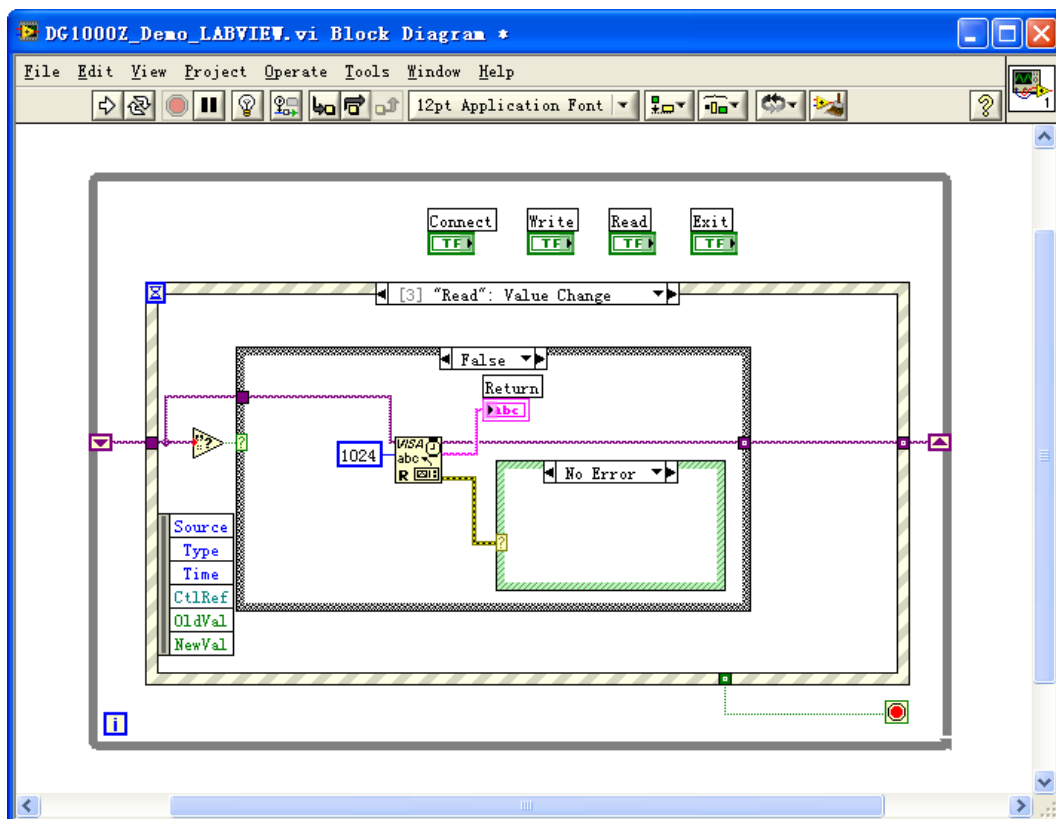
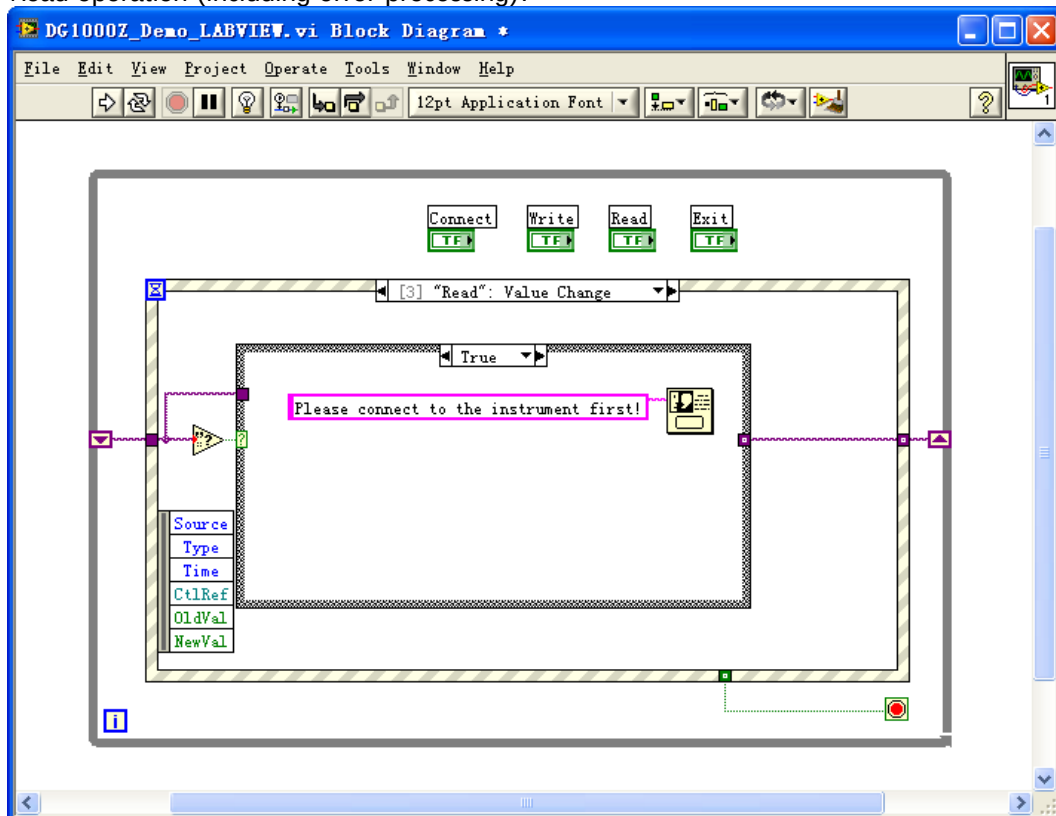




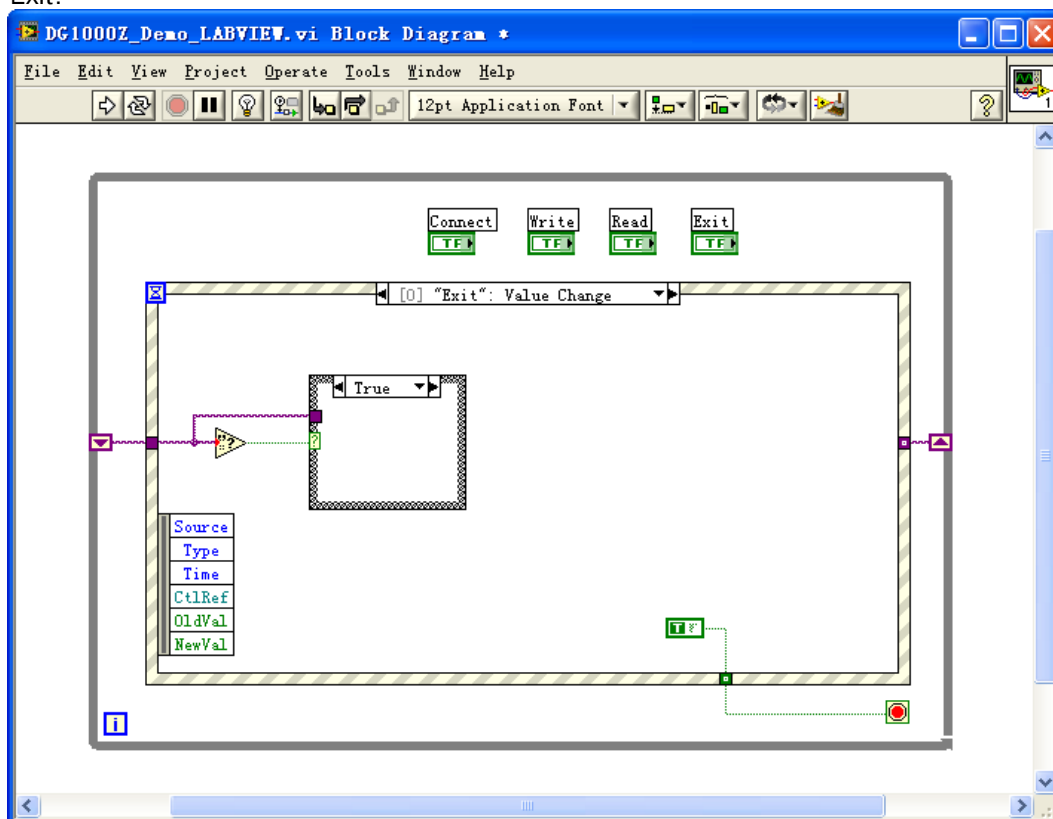
(2) Write operation (including error judgment):



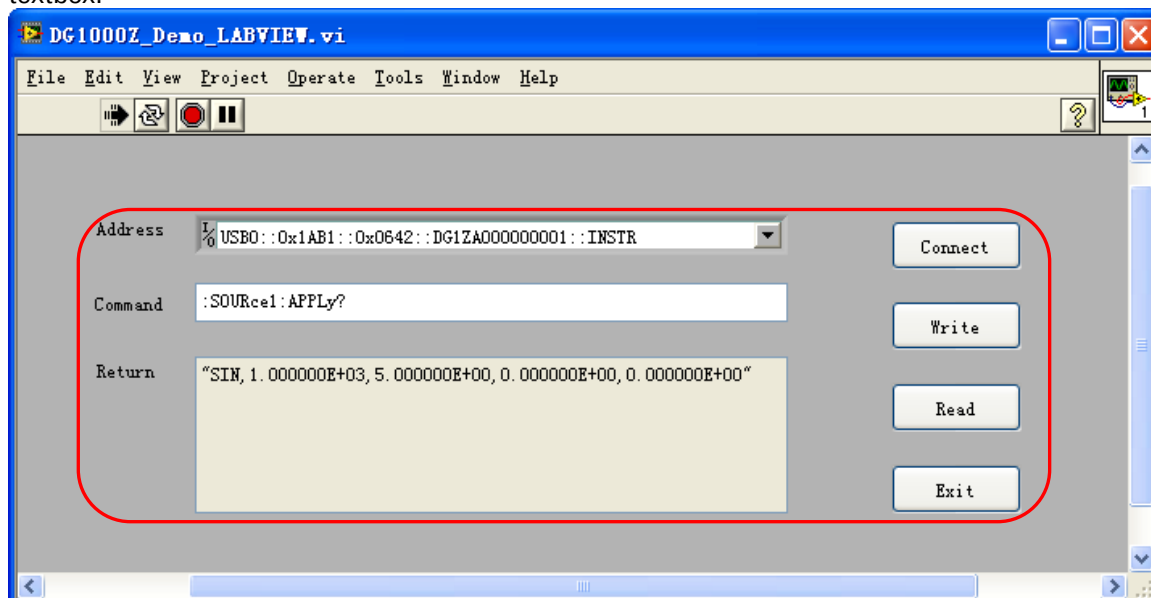
(3) Read operation (including error processing):



(4) Exit:



- Run the program and the interface as shown in the figure below is displayed. Click the “Address” dropdown box and select the VISA resource name; click “Connect” to connect the instrument; enter the command into the “Command” textbox and click “Write” to write the command into the instrument. If the command is a query command, click “Read” and the return value is displayed in the “Return” textbox.

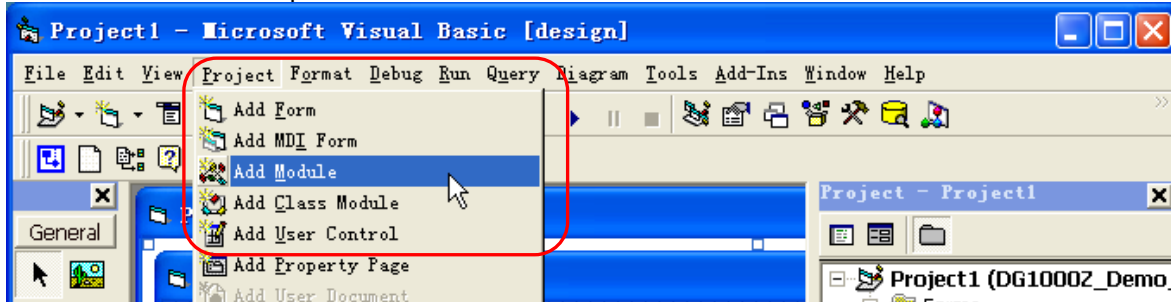


Visual Basic Programming Demo

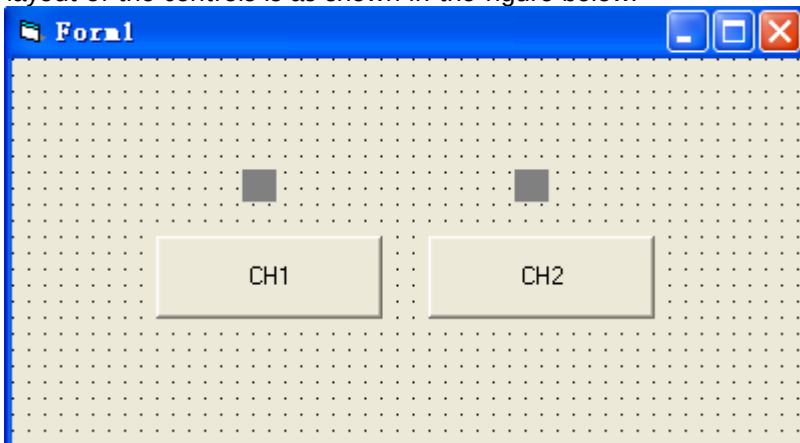
The program used in this demo: Visual Basic 6.0

The function realized in this demo: enable the two channels of the signal generator and show the corresponding colors of the channels.

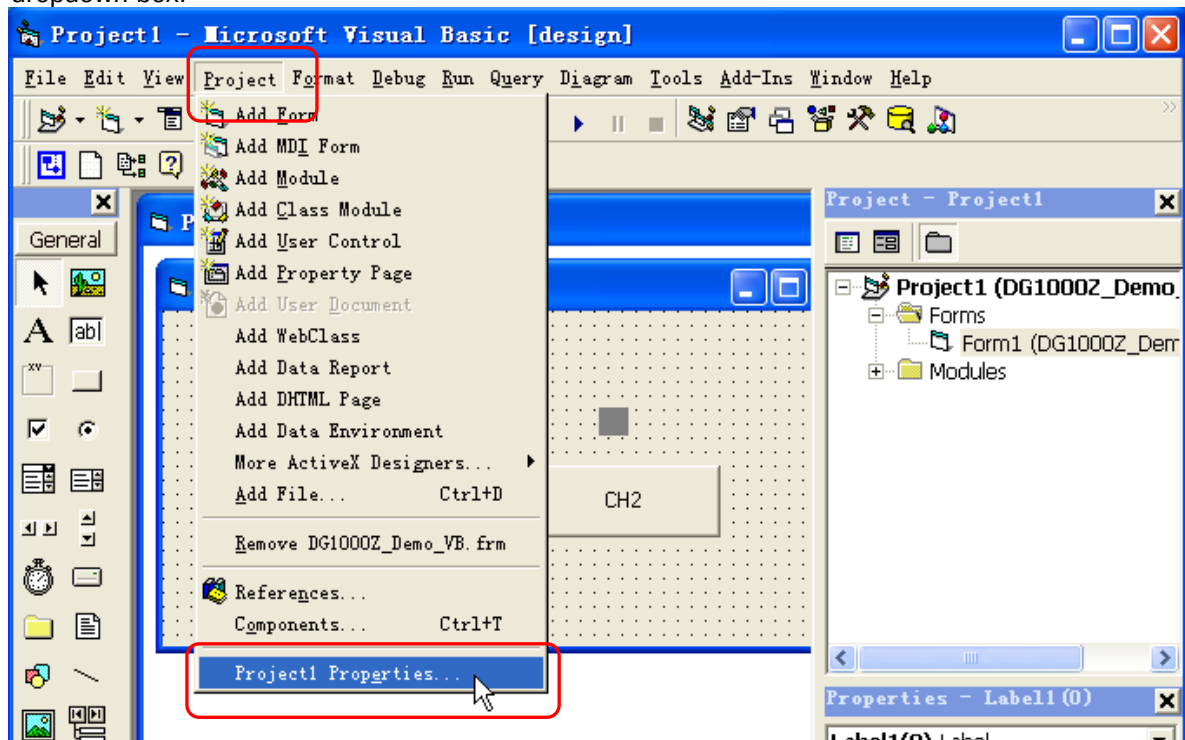
- 1 Run Visual Basic 6.0, build a standard application program project (Standard EXE) and name it as DG1000Z_Demo_VB.
- 2 Click the Existing tab of Project→Add Module. Search for the visa32.bas file in the include folder under the NI-VISA installation path and add the file.



- 3 Add two Command Button controls to represent CH1 and CH2 respectively. Add two Label controls (Label1(0) and Label1(1)) to represent the status of the two channels respectively (by default, the Text control is gray; when the channel is enabled, it displays the corresponding color of the channel). The layout of the controls is as shown in the figure below.



- 4 Open the “General” tab in Project → Project1 Properties and select “Form1” in the “Startup Object” dropdown box.



- 5 Double-click the CH1 button to enter the programming environment. Add the following codes to control CH1 and CH2. The codes of CH1 are as shown below; the codes of CH2 are similar.

```
Dim defrm As Long
Dim vi As Long
Dim strRes As String * 200
Dim list As Long
Dim nmatches As Long
Dim matches As String * 200
```

' Acquire the usb resource of visa

```
Call viOpenDefaultRM(defrm)
Call viFindRsrc(defrm, "USB?*", list, nmatches, matches)
```

' Turn on the device

```
Call viOpen(defrm, matches, 0, 0, vi)
```

' Send command to query the CH1 status

```
Call viVPrintf(vi, ":OUTP1?" + Chr$(10), 0)
```

' Acquire the status of CH1

```
Call viVScanf(vi, "%t", strRes)
```

If strRes = "ON" Then

' Send the setting command

```
Call viVPrintf(vi, ":OUTP1 OFF" + Chr$(10), 0)
Label1(0).ForeColor = &H808080 'Gray
```

Else

```
Call viVPrintf(vi, ":OUTP1 ON" + Chr$(10), 0)
```

```
Label1(0).ForeColor = &HFFFF& 'Yellow
```

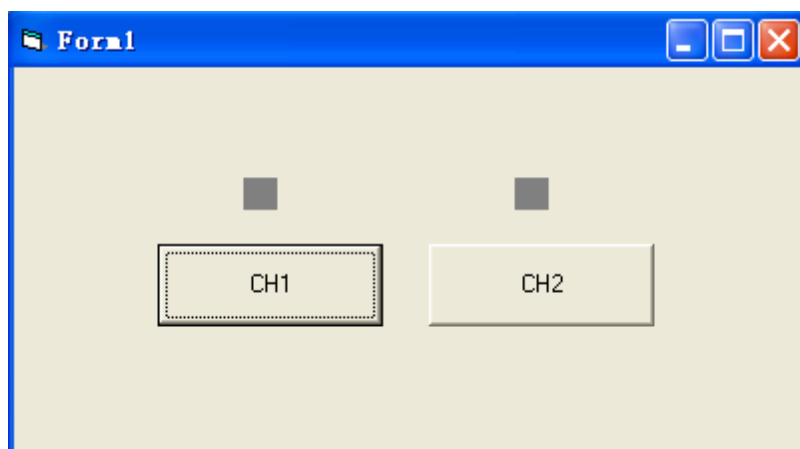
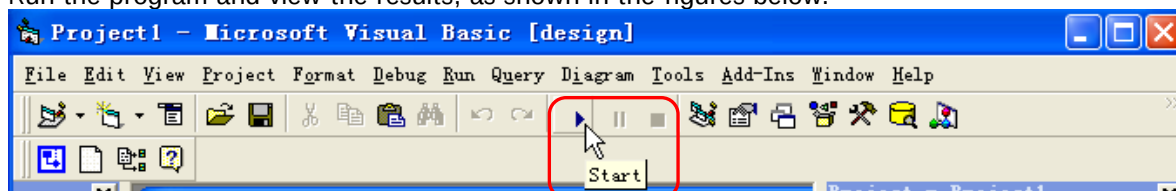
```
End If
```

```
' Turn off the resource
```

```
Call viClose(vi)
```

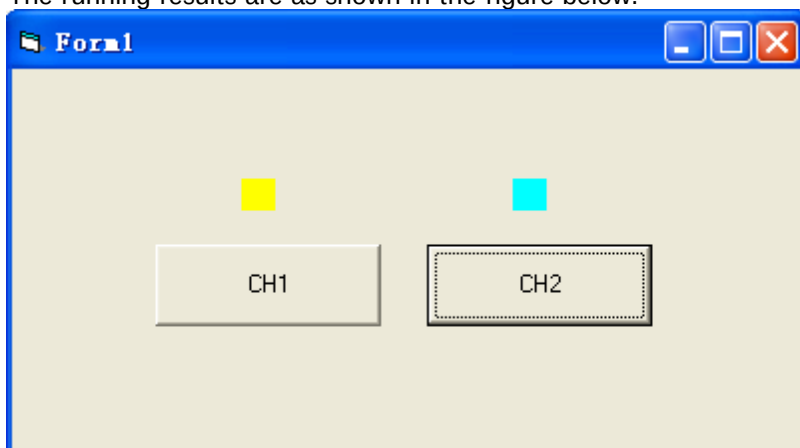
```
Call viClose(defrm)
```

- 6 Run the program and view the results, as shown in the figures below.



- 1) Click the CH1 button to enable CH1 and the control above CH1 turns yellow;
- 2) Click the CH2 button to enable CH2 and the control above CH2 turns blue.

The running results are as shown in the figure below.

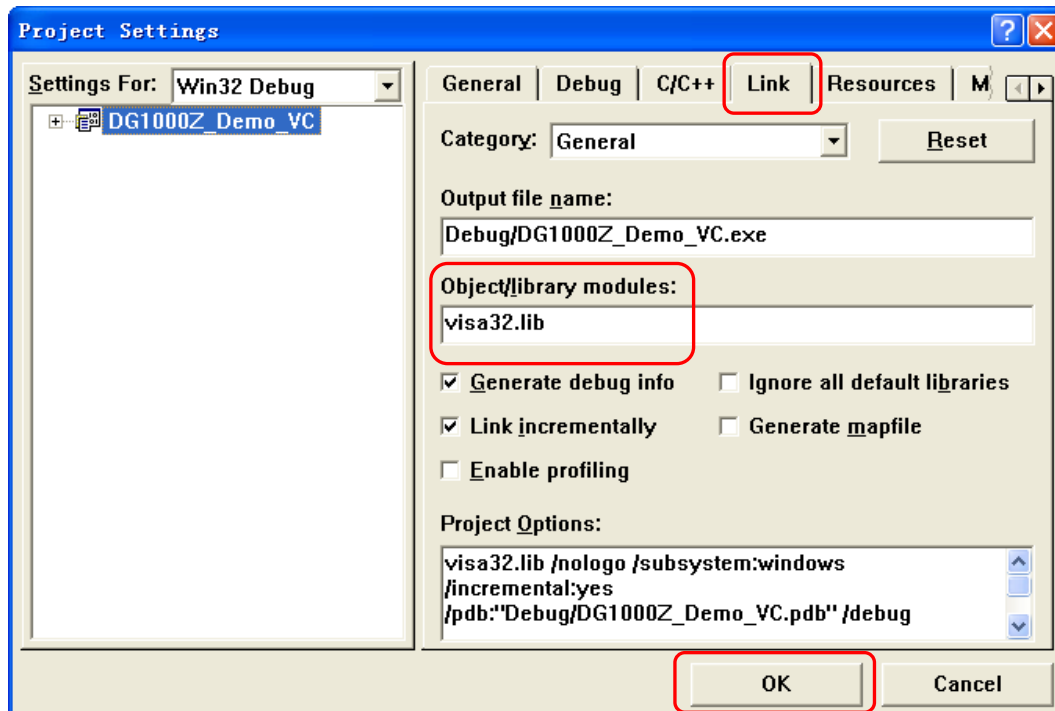
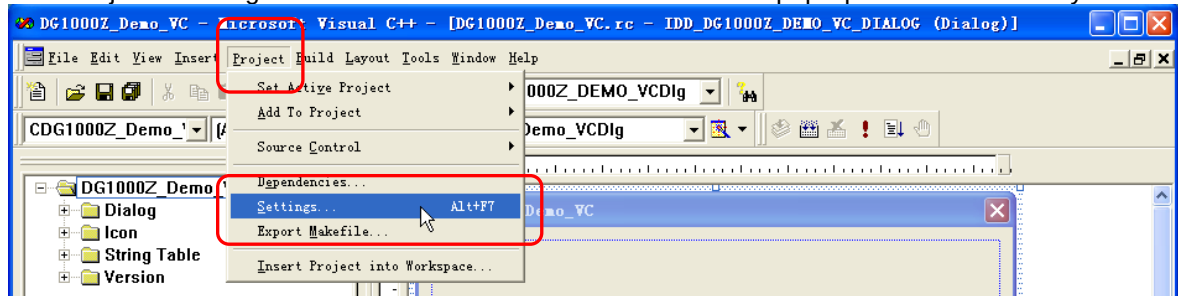


Visual C++ Programming Demo

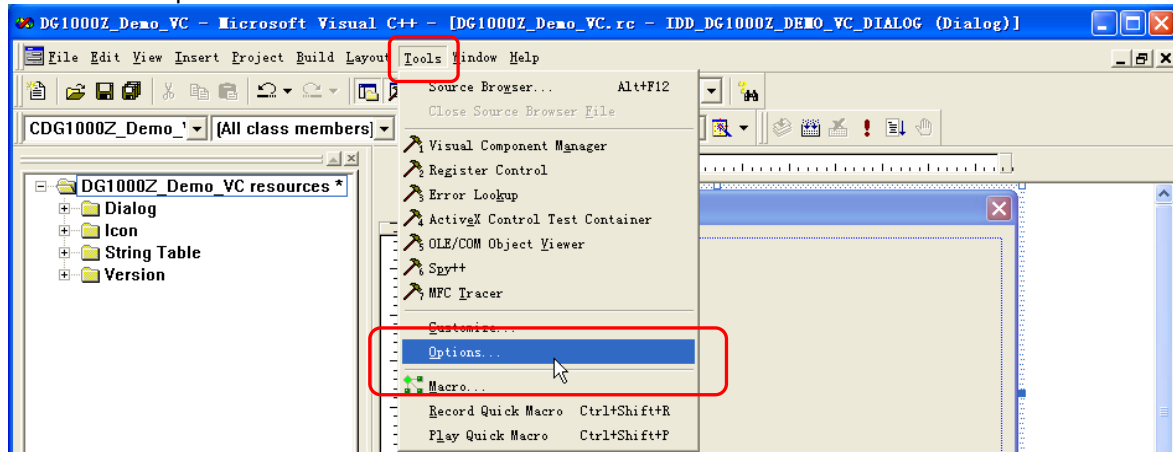
The program used in this demo: Microsoft Visual C++ 6.0

The functions realized in this demo: search for the instrument address, connect the instrument, send command and read the return value.

- 1 Run Microsoft Visual C++ 6.0, create a MFC project based on dialog box and name it as DG1000Z_Demo_VC.
- 2 Click Project→Settings and add visa32.lib in the “Link” tab in the pop-up interface manually.



3 Click Tools→Options.

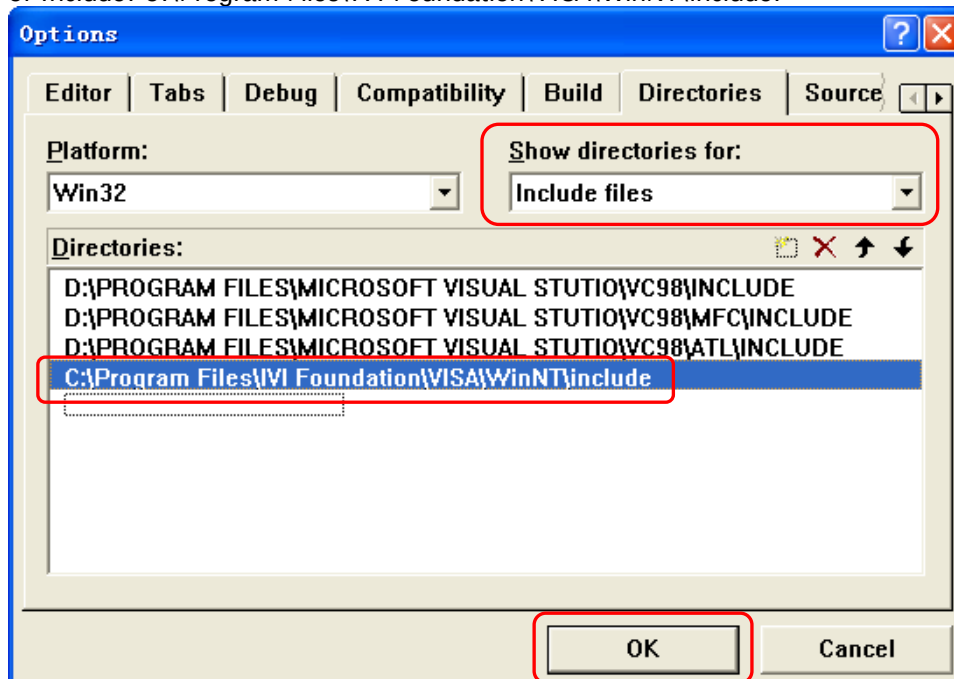


Add the Include and Lib paths in the “Directories” tab in the pop-up interface.

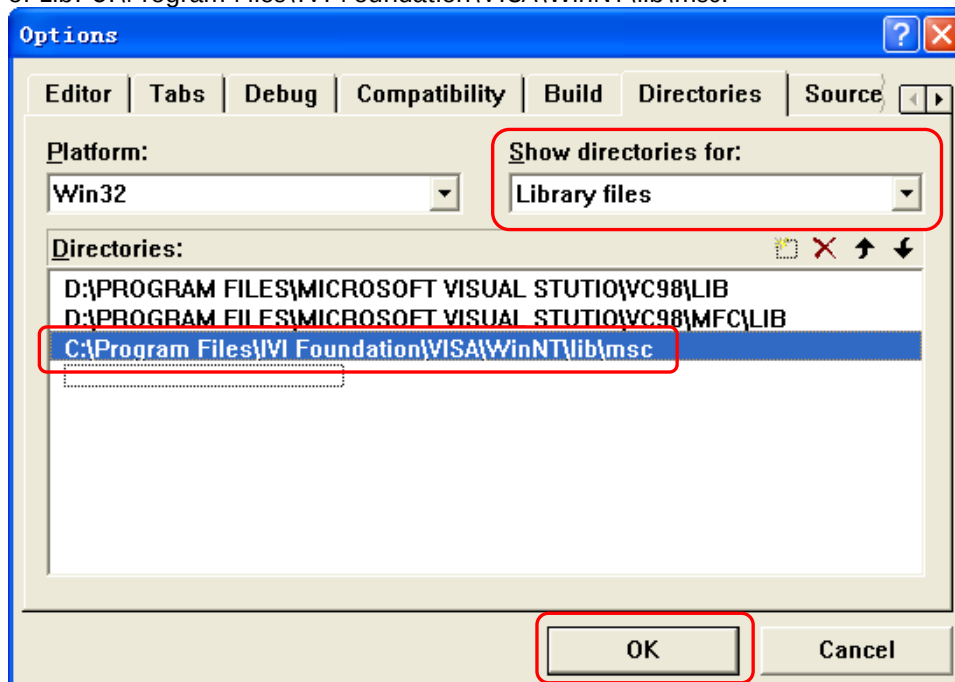
Note:

The two paths added here are related to the NI-VISA installation path on your PC. Here, the NI-VISA is installed under C:\Program Files\IVI Foundation\VISA.

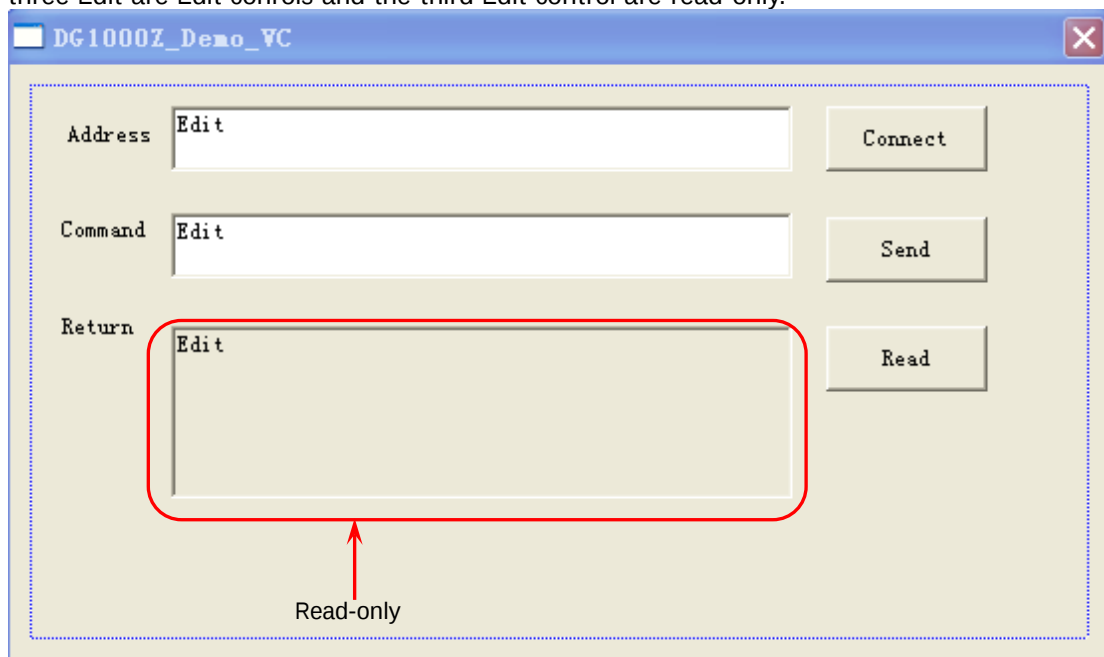
Select Include files in “Show directories for” and double-click the blank in “Directories” to add the path of Include: C:\Program Files\IVI Foundation\VISA\WinNT\include.



Select Library files in “Show directories for” and double-click the blank in “Directories” to add the path of Lib: C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc.



- 4 Add the Text, Edit and Button controls and the layout is as shown in the figure below. Wherein, Address, Command and Return are Text controls; Connect, Send and Read are Button controls; the three Edit are Edit controls and the third Edit control is read-only.

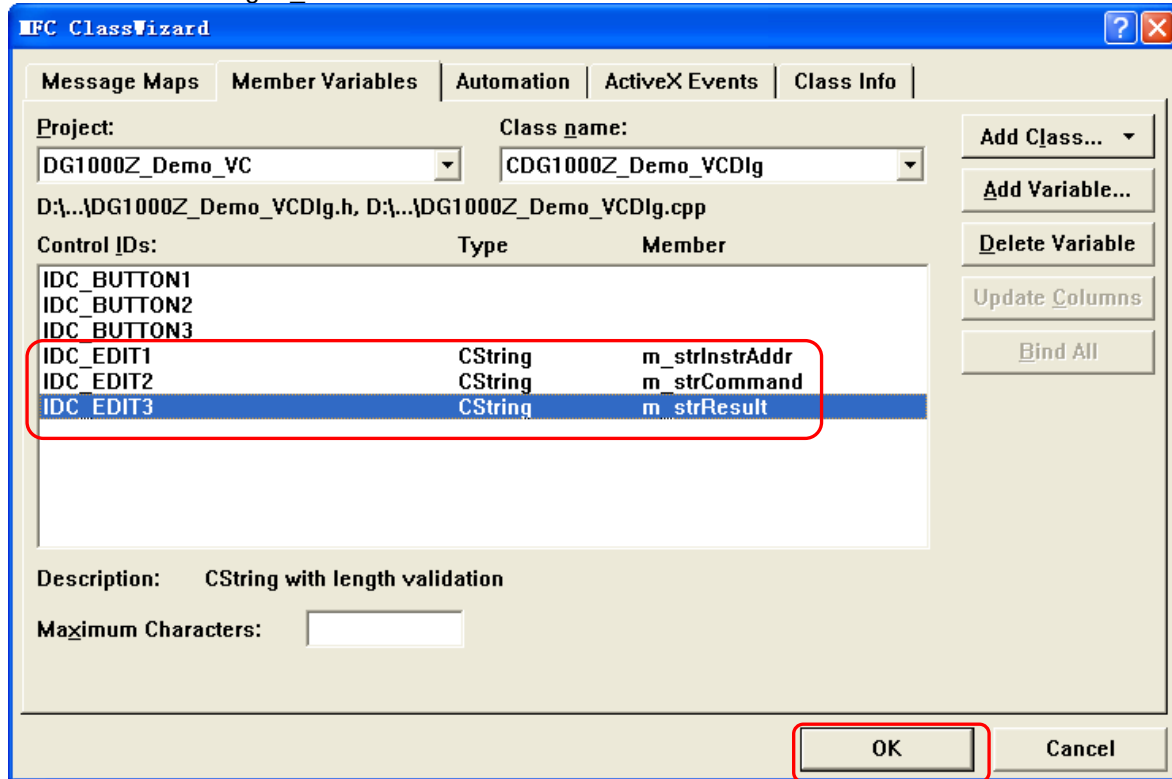


- 5 Click View→ClassWizard and add the control variables in the “Member Variables” tab in the pop-up interface.

Instrument address: CString m_strInstrAddr

Command: CString m_strCommand

Return value: CString m_strResult



- 6 Encapsulate the write and read operations of VISA.

1) Encapsulate the write operation of VISA for easier operation.

bool CDG1000Z_Demo_VCDlg::InstrWrite(CString strAddr, CString strContent) //write function

```
{
    ViSession defaultRM,instr;
    ViStatus status;
    ViUInt32 retCount;
    char * SendBuf = NULL;
    char * SendAddr = NULL;
    bool bWriteOK = false;
    CString str;

    //Change the address's data style from CString to char*
    SendAddr = strAddr.GetBuffer(strAddr.GetLength());
    strcpy(SendAddr,strAddr);
    strAddr.ReleaseBuffer();

    //Change the command's data style from CString to char*
    SendBuf = strContent.GetBuffer(strContent.GetLength());
    strcpy(SendBuf,strContent);
    strContent.ReleaseBuffer();

    //open the VISA instrument
    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
        AfxMessageBox("No VISA instrument was opened !");
    }
}
```

```

        return false;
    }

    status = viOpen(defaultRM, SendAddr, VI_NULL, VI_NULL, &instr);
    //write command to the instrument
    status = viWrite(instr, (unsigned char *)SendBuf, strlen(SendBuf), &retCount);

    //close the instrument
    status = viClose(instr);
    status = viClose(defaultRM);

    return bWriteOK;
}

```

2) Encapsulate the read operation of VISA for easier operation.

```
bool CDG1000Z_Demo_VCDlg::InstrRead(CString strAddr, CString *pstrResult)
```

```

//Read from the instrument
{
    ViSession defaultRM,instr;
    ViStatus status;
    ViUInt32 retCount;
    char * SendAddr = NULL;
    unsigned char RecBuf[MAX_REC_SIZE];
    bool bReadOK = false;
    CString str;

    //Change the address's data style from CString to char*
    SendAddr = strAddr.GetBuffer(strAddr.GetLength());
    strcpy(SendAddr,strAddr);
    strAddr.ReleaseBuffer();

    memset(RecBuf,0,MAX_REC_SIZE);

    //open the VISA instrument
    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
        // Error Initializing VISA...exiting
        AfxMessageBox("No VISA instrument was opened !");
        return false;
    }

    //open the instrument
    status = viOpen(defaultRM, SendAddr, VI_NULL, VI_NULL, &instr);

    //read from the instrument
    status = viRead(instr, RecBuf, MAX_REC_SIZE, &retCount);

    //close the instrument
    status = viClose(instr);
    status = viClose(defaultRM);

    (*pstrResult).Format("%s",RecBuf);

    return bReadOK;
}

```

- 7 Add the control message response code.

1) Connect the instrument

```
void CDG1000Z_Demo_VCDlg::OnConnect()
```

```
{
    // TODO: Add your control notification handler code here
    ViStatus status;
    ViSession defaultRM;
    ViString expr = "?*";
    ViPFindList findList = new unsigned long;
    ViPUInt32 retcnt = new unsigned long;
    ViChar instrDesc[1000];
    CString strSrc = "";
    CString strInstr = "";
    unsigned long i = 0;
    bool bFindDP = false;

    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
        // Error Initializing VISA...exiting
        MessageBox("No VISA instrument was opened ! ");
        return ;
    }

    memset(instrDesc,0,1000);

    // Find resource
    status = viFindRsrc(defaultRM,expr,findList, retcnt, instrDesc);

    for (i = 0;i < (*retcnt);i++)
    {
        // Get instrument name
        strSrc.Format("%s",instrDesc);
        InstrWrite(strSrc,"*IDN?");
        ::Sleep(200);
        InstrRead(strSrc,&strInstr);

        // If the instrument(resource) belongs to the DP series then jump out from the loop
        strInstr.MakeUpper();
        if (strInstr.Find("DG") >= 0)
        {
            bFindDP = true;
            m_strInstrAddr = strSrc;
            break;
        }

        //Find next instrument
        status = viFindNext(*findList,instrDesc);
    }

    if (bFindDP == false)
    {
        MessageBox("Didn't find any DG!");
    }
    UpdateData(false);
}
```

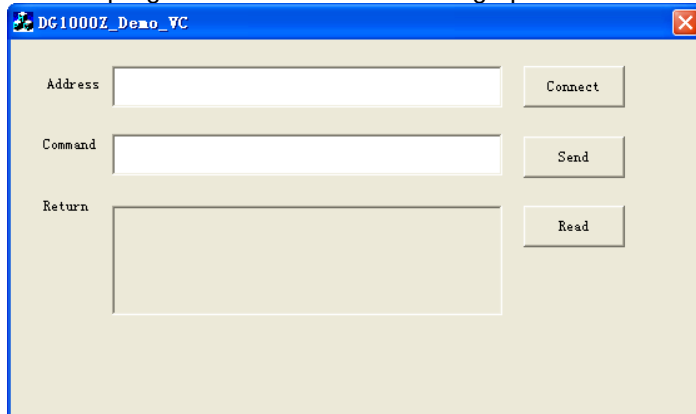
2) Write operation

```
void CDG1000Z_Demo_VCDlg::OnSend()
{
    // TODO: Add your control notification handler code here
    UpdateData(true);
    if (m_strInstrAddr.IsEmpty())
    {
        MessageBox("Please connect to the instrument first!");
    }
    InstrWrite(m_strInstrAddr,m_strCommand);
    m_strResult.Empty();
    UpdateData(false);
}
```

3) Read operation

```
void CDG1000Z_Demo_VCDlg::OnRead()
{
    // TODO: Add your control notification handler code here
    UpdateData(true);
    InstrRead(m_strInstrAddr,&m_strResult);
    UpdateData(false);
}
```

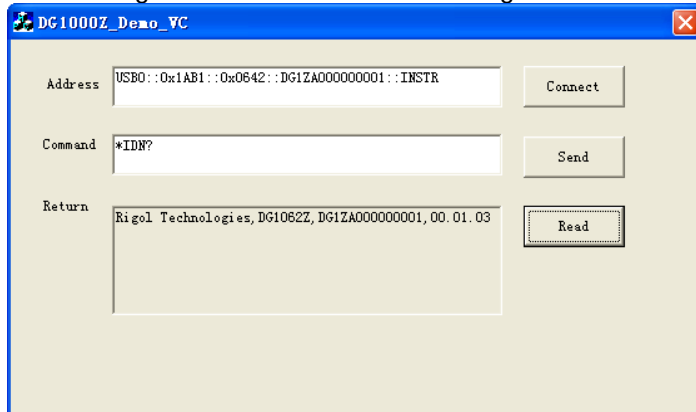
8 Run the program and enter the following operation interface.



Execute the following steps:

- 1) Click the Connect button to search for the signal generator and connect it;
- 2) Enter the command in to the Command textbox, for example, *IDN?;
- 3) Click the Send button to send the command;
- 4) Click the Read button to read the return value.

The running results are as shown in the figure below.



Chapter 5 Appendix

Appendix A: Command List

◆ [:COUNter Commands](#)

[:COUNter:AUTO](#)
[:COUNter:COUPLing](#)
[:COUNter:GATEtime](#)
[:COUNter:HF](#)
[:COUNter:LEVEL](#)
[:COUNter:MEASure?](#)
[:COUNter:SENSitive](#)
[:COUNter\[:STATe\]](#)
[:COUNter:STATIstics:CLEAr](#)
[:COUNter:STATIstics:DISPlay](#)
[:COUNter:STATIstics\[:STATe\]](#)

◆ [:COUPLing Commands](#)

[:COUPLing:AMPL:DEViation](#)
[:COUPLing:AMPL:MODE](#)
[:COUPLing:AMPL:RATio](#)
[:COUPLing:AMPL\[:STATe\]](#)
[:COUPLing:FREQuency:DEViation](#)
[:COUPLing:FREQuency:MODE](#)
[:COUPLing:FREQuency:RATio](#)
[:COUPLing:FREQuency\[:STATe\]](#)
[:COUPLing:PHASe:DEViation](#)
[:COUPLing:PHASe:MODE](#)
[:COUPLing:PHASe:RATio](#)
[:COUPLing:PHASe\[:STATe\]](#)
[:COUPLing\[:STATe\]](#)

◆ [:DISPlay Commands](#)

[:DISPlay:BRIGhtness](#)
[:DISPlay:CONTrast](#)
[:DISPlay:DATA?](#)
[:DISPlay:MODE](#)
[:DISPlay:SAVer:IMMediate](#)
[:DISPlay:SAVer\[:STATe\]](#)

[:DISPlay\[:STATe\]](#)

[:DISPlay:TEXT?](#)

[:DISPlay:TEXT:CLEAr](#)

[:DISPlay:TEXT\[:SET\]](#)

◆ [:HCOPy Commands](#)

[:HCOPy:SDUMp:DATA?](#)

[:HCOPy:SDUMp:DATA:FORMat](#)

◆ [IEEE488.2 Common Commands](#)

[*CLS](#)

[*ESE](#)

[*ESR?](#)

[*IDN?](#)

[*OPC](#)

[*OPT?](#)

[*PSC](#)

[*RCL](#)

[*RST](#)

[*SAV](#)

[*SRE](#)

[*STB?](#)

[*TRG](#)

[*WAI](#)

◆ [:LICense Command](#)

[:LICense:INSTall](#)

[:LICense:SET](#)

◆ [:LXI Commands](#)

[:LXI:IDENtify\[:STATE\]](#)

[:LXI:MDNS:ENABle](#)

[:LXI:MDNS:HNAME](#)

[:LXI:MDNS:SNAME:DESired](#)

[:LXI:MDNS:SNAME\[:RESolved\]?](#)

[:LXI:RESet](#)

[:LXI:REStart](#)

◆ [:MEMory Commands](#)

[:MEMory:NSTates?](#)

[:MEMory:STATe:CATalog?](#)
[:MEMory:STATe:DELeTe](#)
[:MEMory:STATe:LOCK](#)
[:MEMory:STATe:NAME](#)
[:MEMory:STATe:RECall:AUTO](#)
[:MEMory:STATe:VALid?](#)

◆ [:MMEMory Commands](#)

[:MMEMory:CATalog\[:ALL\]?](#)
[:MMEMory:CATalog:DATA:ARBitrary?](#)
[:MMEMory:CATalog:STATe?](#)
[:MMEMory:CDIRectory](#)
[:MMEMory:COPI](#)
[:MMEMory:DELeTe](#)
[:MMEMory:LOAD\[:ALL\]](#)
[:MMEMory:LOAD:DATA](#)
[:MMEMory:LOAD:STATe](#)
[:MMEMory:MDIRectory](#)
[:MMEMory:RDIRectory?](#)
[:MMEMory:RDIRectory](#)
[:MMEMory:STORe\[:ALL\]](#)
[:MMEMory:STORe:DATA](#)
[:MMEMory:STORe:STATe](#)

◆ [:OUTPut Commands](#)

[:OUTPut\[<n>\]:GATe:POLarity](#)
[:OUTPut\[<n>\]:IMPedance](#)
[:OUTPut\[<n>\]:LOAD](#)
[:OUTPut\[<n>\]:MODE](#)
[:OUTPut\[<n>\]:POLarity](#)
[:OUTPut\[<n>\]\[:STATe\]](#)
[:OUTPut\[<n>\]:SYNC:DELay](#)
[:OUTPut\[<n>\]:SYNC:POLarity](#)
[:OUTPut\[<n>\]:SYNC\[:STATe\]](#)

◆ [:PA Commands](#)

[:PA:GAIN](#)
[:PA:OFFSet\[:STATe\]](#)
[:PA:OFFSet:VALUe](#)
[:PA:OUTPut:POLarity](#)

[:PA:SAVE](#)

[:PA\[:STATe\]](#)

◆ [:ROSCillator Commands](#)

[:ROSCillator:SOURce](#)

[:ROSCillator:SOURce:CURRent?](#)

◆ [:SOURce Commands](#)

[:SOURce:APPLy Commands](#)

[\[:SOURce\[<n>\]\]:APPLy?](#)

[\[:SOURce\[<n>\]\]:APPLy:ARBitrary](#)

[\[:SOURce\[<n>\]\]:APPLy:DC](#)

[\[:SOURce\[<n>\]\]:APPLy:HARMonic](#)

[\[:SOURce\[<n>\]\]:APPLy:NOISe](#)

[\[:SOURce\[<n>\]\]:APPLy:PULSe](#)

[\[:SOURce\[<n>\]\]:APPLy:RAMP](#)

[\[:SOURce\[<n>\]\]:APPLy:SINusoid](#)

[\[:SOURce\[<n>\]\]:APPLy:SQUare](#)

[\[:SOURce\[<n>\]\]:APPLy:TRIangle](#)

[\[:SOURce\[<n>\]\]:APPLy:USER](#)

[:SOURce:BURSt Commands](#)

[\[:SOURce\[<n>\]\]:BURSt:GATE:POLarity](#)

[\[:SOURce\[<n>\]\]:BURSt:INTernal:PERiod](#)

[\[:SOURce\[<n>\]\]:BURSt:MODE](#)

[\[:SOURce\[<n>\]\]:BURSt:NCYCles](#)

[\[:SOURce\[<n>\]\]:BURSt:PHASe](#)

[\[:SOURce\[<n>\]\]:BURSt\[:STATe\]](#)

[\[:SOURce\[<n>\]\]:BURSt:TDELay](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger\[:IMMediate\]](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger:SLOPe](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger:SOURce](#)

[\[:SOURce\[<n>\]\]:BURSt:TRIGger:TRIGOut](#)

[:SOURce:FREQuency Commands](#)

[\[:SOURce\[<n>\]\]:FREQuency:CENTer](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle:MODE](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle:OFFSet](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle:RATio](#)

[\[:SOURce\[<n>\]\]:FREQuency:COUPle\[:STATe\]](#)

[\[:SOURce\[<n>\]\]:FREQuency\[:FIXed\]](#)

[\[\[:SOURce\[<n>\]\]:FREQuency:SPAN](#)

[\[\[:SOURce\[<n>\]\]:FREQuency:STARt](#)

[\[\[:SOURce\[<n>\]\]:FREQuency:STOP](#)

[:SOURce:FUNcTION Commands](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:ARBitrary:MODE](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:ARBitrary:SRATe](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:DCYCLe](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:HOLD](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:PERiod](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:TRANSition\[:BOTH\]](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:TRANSition:LEADIng](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:TRANSition:TRAILing](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:PULSe:WIDTh](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:RAMP:SYMMetry](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION\[:SHAPE\]](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:SQUare:DCYCLe](#)

[\[\[:SOURce\[<n>\]\]:FUNcTION:SQUare:PERiod](#)

[:SOURce:HARMonic Commands](#)

[\[\[:SOURce\[<n>\]\]:HARMonic:AMPL](#)

[\[\[:SOURce\[<n>\]\]:HARMonic:ORDER](#)

[\[\[:SOURce\[<n>\]\]:HARMonic:PHASe](#)

[\[\[:SOURce\[<n>\]\]:HARMonic\[:STATe\]](#)

[\[\[:SOURce\[<n>\]\]:HARMonic:TYPe](#)

[\[\[:SOURce\[<n>\]\]:HARMonic:USER](#)

[:SOURce:MARKer Commands](#)

[\[\[:SOURce\[<n>\]\]:MARKer:FREQuency](#)

[\[\[:SOURce\[<n>\]\]:MARKer\[:STATe\]](#)

[:SOURce\[:MOD\]:AM Commands](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM\[:DEPTH\]](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:DSSC](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:INTernal:FREQuency](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:INTernal:FUNcTION](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:SOURce](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:AM:STATe](#)

[:SOURce\[:MOD\]:ASKey Commands](#)

[\[\[:SOURce\[<n>\]\]\[:MOD\]:ASKey:AMPLitude](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:ASKey:INTernal\[:RATE\]](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:ASKey:POLarity](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:ASKey:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:ASKey:STATe](#)

[:SOURce\[:MOD\]:FM Commands](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:FM\[:DEViation\]](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FM:INTernal:FREQuency](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FM:INTernal:FUNCTion](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FM:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FM:STATe](#)

[:SOURce\[:MOD\]:FSKey Commands](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:FSKey\[:FREQuency\]](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FSKey:INTernal:RATE](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FSKey:POLarity](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FSKey:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:FSKey:STATe](#)

[:SOURce\[:MOD\]:PM Commands](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:PM\[:DEViation\]](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PM:INTernal:FREQuency](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PM:INTernal:FUNCTion](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PM:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PM:STATe](#)

[:SOURce\[:MOD\]:PSKey Commands](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:PSKey:INTernal:RATE](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PSKey:PHASe](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PSKey:POLarity](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PSKey:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PSKey:STATe](#)

[:SOURce\[:MOD\]:PWM Commands](#)

[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM\[:DEViation\]:DCYClе](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM\[:DEViation\]\[:WIDTh\]](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM:INTernal:FREQuency](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM:INTernal:FUNCTion](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM:SOURce](#)
[\[:SOURce\[<n>\]\]\[\[:MOD\]:PWM:STATe](#)

[:SOURce:MOD Commands](#)

[\[:SOURce\[<n>\]\]:MOD\[:STATe\]](#)

[\[:SOURce\[<n>\]\]:MOD:TYPe](#)

[:SOURce:PERiod Command](#)

[\[:SOURce\[<n>\]\]:PERiod\[:FIXed\]](#)

[:SOURce:PHASe Commands](#)

[\[:SOURce\[<n>\]\]:PHASe\[:ADJust\]](#)

[\[:SOURce\[<n>\]\]:PHASe:INITiate](#)

[\[:SOURce\[<n>\]\]:PHASe:SYNChronize](#)

[:SOURce:PULSe Commands](#)

[\[:SOURce\[<n>\]\]:PULSe:DCYCLe](#)

[\[:SOURce\[<n>\]\]:PULSe:HOLD](#)

[\[:SOURce\[<n>\]\]:PULSe:TRANSition\[:LEADing\]](#)

[\[:SOURce\[<n>\]\]:PULSe:TRANSition:TRAILing](#)

[\[:SOURce\[<n>\]\]:PULSe:WIDTh](#)

[:SOURce:SUM Commands](#)

[\[:SOURce\[<n>\]\]:SUM:AMPLitude](#)

[\[:SOURce\[<n>\]\]:SUM:INTernal:FREQuency](#)

[\[:SOURce\[<n>\]\]:SUM:INTernal:FUNCTion](#)

[\[:SOURce\[<n>\]\]:SUM\[:STATe\]](#)

[:SOURce:SWEEp Commands](#)

[\[:SOURce\[<n>\]\]:SWEEp:HTIME:STARt](#)

[\[:SOURce\[<n>\]\]:SWEEp:HTIME\[:STOP\]](#)

[\[:SOURce\[<n>\]\]:SWEEp:RTIME](#)

[\[:SOURce\[<n>\]\]:SWEEp:SPACing](#)

[\[:SOURce\[<n>\]\]:SWEEp:STATe](#)

[\[:SOURce\[<n>\]\]:SWEEp:STEP](#)

[\[:SOURce\[<n>\]\]:SWEEp:TIME](#)

[\[:SOURce\[<n>\]\]:SWEEp:TRIGger\[:IMMediate\]](#)

[\[:SOURce\[<n>\]\]:SWEEp:TRIGger:SLOPe](#)

[\[:SOURce\[<n>\]\]:SWEEp:TRIGger:SOURce](#)

[\[:SOURce\[<n>\]\]:SWEEp:TRIGger:TRIGOut](#)

[:SOURce:TRACe Commands](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:CATalog?](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:COpy](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DAC16](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DAC](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA\[:DATA\]](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:DELeTe\[:NAME\]](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOAD](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:LOCK\[:STATe\]](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:POINts](#)

[\[:SOURce\[<n>\]\]\[:TRACe\]:DATA:VALue](#)

[:SOURce:TRACK Command](#)

[\[:SOURce\[<n>\]\]:TRACK](#)

[:SOURce:VOLTage Comamnds](#)

[\[:SOURce\[<n>\]\]:VOLTage:COUPle\[:STATe\]](#)

[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]\[:AMPLitude\]](#)

[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:HIGH](#)

[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:LOW](#)

[\[:SOURce\[<n>\]\]:VOLTage\[:LEVel\]\[:IMMediate\]:OFFSet](#)

[\[:SOURce\[<n>\]\]:VOLTage:RANGe:AUTO](#)

[\[:SOURce\[<n>\]\]:VOLTage:UNIT](#)

◆ [:SYSTem Commands](#)

[:SYSTem:BEEPer\[:IMMediate\]](#)

[:SYSTem:BEEPer:STATe](#)

[:SYSTem:CHANnel:CURrent](#)

[:SYSTem:CHANnel:NUMber?](#)

[:SYSTem:COMMunicate:GPIB\[:SELF\]:ADDReSS](#)

[:SYSTem:COMMunicate:LAN:APPLY](#)

[:SYSTem:COMMunicate:LAN:AUTOip\[:STATe\]](#)

[:SYSTem:COMMunicate:LAN:CONTRol?](#)

[:SYSTem:COMMunicate:LAN:DHCP\[:STATe\]](#)

[:SYSTem:COMMunicate:LAN:DNS](#)

[:SYSTem:COMMunicate:LAN:DOMain](#)

[:SYSTem:COMMunicate:LAN:GATEway](#)

[:SYSTem:COMMunicate:LAN:HOSTname](#)

[:SYSTem:COMMunicate:LAN:IPADdress](#)

[:SYSTem:COMMunicate:LAN:MAC?](#)

[:SYSTem:COMMunicate:LAN:SMASK](#)

[:SYSTem:COMMunicate:LAN:STATic\[:STATe\]](#)

[:SYSTem:COMMunicate:LAN:UPDate](#)

[:SYSTem:COMMunicate:USB:INFormation?](#)

[:SYSTem:COMMunicate:USB\[:SELF\]:CLASs](#)

[:SYSTem:CSCopy](#)

[:SYSTem:ERRor?](#)

[:SYSTem:KLOCK\[:STATe\]](#)

[:SYSTem:LANGuage](#)

[:SYSTem:POWeron](#)

[:SYSTem:PRESet](#)

[:SYSTem:ROSCillator:SOURce](#)

[:SYSTem:SECurity:IMMediate](#)

[:SYSTem:VERSion?](#)

◆ [:TRIGger Commands](#)

[:TRIGger\[<n>\]:DELay](#)

[:TRIGger\[<n>\]\[:IMMediate\]](#)

[:TRIGger\[<n>\]:SLOPe](#)

[:TRIGger\[<n>\]:SOURce](#)

Appendix B: Factory Setting

The factory settings are as shown in the table below. Note that the items marked with “*” are set at the factory and are related to the set of the users and will not be affected by the reset operation.

Parameters	Defaults
Channel Parameters	
Current Carrier Waveform	Sine
Output Impedance	HighZ
Output Load	50Ω
Sync Output	On
Sync Polarity	Pos
Sync Delay	0s
Channel Output	Normal
Output Mode	Normal
Gated Polarity	Pos
Range	Auto
Waveform Sum Switch	Off
Sum Source	Sine
Sum Frequency	1kHz
Sum Ratio	100%
Basic Waveform	
Frequency	1kHz
Amplitude	5Vpp
Amplitude Unit	Vpp
Offset	0V _{DC}
Start Phase	0°
Square Duty Cycle	50%
Ramp Waveform Symmetry	50%
Pulse Duty Cycle	50%
Pulse Width	500μs
Pulse Leading Edge	20ns
Pulse Trailing Edge	20ns
Harmonic Type	Even
Harmonic Order	2
Harmonic Phase (7)	0°
Harmonic Serial Number	2
Harmonic Amplitude (7)	1.2647Vpp
Harmonic State	Off
User-defined	X0000000
Arb Waveform	
Sample Rate	20MSa/s
DC Offset	0V _{DC}
Arb Waveform Mode	Frequency
Built-in Arbitrary Waveform	Sinc
Insret Waveform	
Insert position	1
Insert Way	Insert
Cycles	1
Points	8
High Level	2.5V
Low Level	-2.5V

Edit Points	
Points	1
Voltage	-2.5V
Edit Block	
X1	1
Y1	-2.5V
X2	8
Y2	-2.5V
Modulation	
Modulation Type	AM
AM Modulation	
Modulation Source	Int
Modulating Waveform Shape	Sine
Modulation Frequency	100Hz
Modulation Depth	100%
Carrier Waveform Suppression	Off
FM Modulation	
Modulation Source	Int
Modulating Waveform Shape	Sine
Modulation Frequency	100Hz
Frequency Deviation	1kHz
PM Modulation	
Modulation Source	Int
Modulating Waveform Shape	Sine
Modulation Frequency	100Hz
Phase Deviation	90°
ASK Modulation	
Modulation Source	Int
ASK Rate	100Hz
Modulation Amplitude	2Vpp
ASK Polarity	Pos
FSK Modulation	
Modulation Source	Int
FSK Rate	100Hz
Hop Frequency	10kHz
FSK Polarity	Pos
PSK Modulation	
Modulation Source	Int
PSK Rate	100Hz
PSK Phase	180°
PSK Polarity	Pos
PWM Modulation	
Modulation Source	Int
Modulating Waveform Shape	Sine
Modulation Frequency	100Hz
Width Deviation	200μs
Duty Cycle Deviation	20%
Sweep	
Sweep Type	Linear
Sweep Time	1s
Return Time	0s
Start Frequency	100Hz
Stop Frequency	1kHz

Center Frequency	550Hz
Frequency Span	900Hz
Start Hold	0s
Stop Hold	0s
Mark Frequency State	Off
Mark Frequency	550Hz
Trigger Source	Int
Trigger Output	Off
SlopeIn	Leading
Step Number	2

Burst

Burst Mode	N Cycle
Cycle Number	1
Burst Period	10ms
Gated Polarity	Pos
Trigger Source	Int
Trigger Output	Off
Trigger Input	Leading
Delay	0ns

Interface Focus Items

Frequency/Period	Freq
Amplitude/High Level	Ampl
Offset/Low Level	Offset
Pulse Width/Duty Cycle	Duty
Start/Center	Start
Stop/Span	Stop
Frequency Coupling Deviation/Ratio	Ratio
Amplitude Coupling Deviation/Ratio	Ratio
Phase Coupling Deviation/Ratio	Ratio
Default Channel	CH1

Counter

Measurement Parameter	Frequency
Gate Time	1ms
Statistic Function	Off
Display Mode	Digital
Trigger Sensitivity	25%
Trigger Level	0V
Coupling Mode	AC
High-frequency Suppression	Off

System Parameter**Coupling Set**

Frequency Coupling	Off
Frequency Deviation	0uHz
Frequency Ratio	1
Amplitude Coupling	Off
Amplitude Deviation	0Vpp
Amplitude Ratio	1
Phase Coupling	Off
Phase Deviation	0°
Phase Ratio	1
Track	Off

Print Set	
Print Switch	Off
Print Destination	Usb Disk
Print Format	Bmp
Print Copies	0
Print Palette	Gray
Invert	On
UI Customization	
Set Coordinate*	(0,0)
System Set	
Power On Setting	Default
Clock Source	Int
Decimal Point	Dot
Thousand Separator	Comma
Beeper	On
Screen Saver	On
Brightness*	50%
Contrast*	25%
Display Mode*	Dual Channels Parameters
Language*	Factory Delivery Setting
I/O Configuration	
USB Device Type	Computer
GPIB*	2
DHCP*	On (default setting in LAN)
Auto IP*	On (default setting in LAN)
Manual IP*	Off (default setting in LAN)

Appendix C: Warranty

RIGOL warrants that its products mainframe and accessories will be free from defects in materials and workmanship within the warranty period.

If a product is proven to be defective within the respective period, **RIGOL** guarantees the free replacement or repair of products which are approved defective. To get repair service, please contact with your nearest **RIGOL** sales and service office.

RIGOL does not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.