RIGOL

Programming Guide

DG4000 Series Function/Arbitrary Waveform Generator

This manual introduces how to program and control **RIGOL** DG4000 series function/arbitrary waveform generator using SCPI commands through remote interfaces (USB or LAN).

Main topics in this manual:

Software Version:

00.01.12

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SCPI Overview

SCPI (Standard Commands for Programmable Instrument) is a standard command set for programmable instrument based on IEEE 488.2.

Topics of this chapter:

Syntax
Symbol Description
Parameter Type
Command Abbreviation

Syntax

SCPI commands present a hierarchical tree structure and contain multiple subsystems, each of which is made up of a root keyword and one or more subkeywords. 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 and the command and parameter are separated by "space".

For example,

:COUPling:AMPL:DEViation <deviation>

:COUPling:AMPL:DEViation?

COUPling is the root keyword of the command. **AMPL** and **DEViation** are the second-level and third-level keywords respectively. The command string starts with ":" which separates the multiple-level keywords. **<deviation>** represents the parameter available for setting, "?" represents query and the command **:COUPling:AMPL:DEViation** and parameter **<deviation>** are separated by "space".

"," is generally used for separating different parameters contained in the same command, for example,
:MMEMory:COPY <directory_name>,<file_name>

Symbol Description

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

Braces { }
The parameters enclosed in braces are optional and can be ignored or set for one or more times. For example,
In the [:TRACe]:DATA[:DATA] VOLATILE,<value>{,<value>} command, the floating point voltage in **{,<value>}** can be omitted or be set to one or more values.

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,
In the :DISPlay:SAVer[:STATe] ON|OFF command, the command parameters available are "ON" and "OFF".

Triangle Brackets < >
The parameter enclosed in the triangle brackets must be replaced by an effective value. For example,
Send the :DISPlay:BRIGhtness <brightness>|MINimum|MAXimum command in **:DISPlay:BRIGhtness 10** format.

Square Brackets [ ]
The content (parameter or keyword) enclosed in the square brackets can be omitted. When the parameter is omitted, the instrument will set the parameter to its default. For example,
for the [:SOURce<n>]:MOD[:STATe]? command,
sending any of the four commands below can generate the same effect:

```
:MOD?
:MOD:STATe?
:SOURce1:MOD?
:SOURce1:MOD:STATe?
```

Parameter Type

The command parameters introduced in this manual include 6 types: Bool, Keyword, Integer, Consecutive Real Number, Discrete and ASCII Character String.

Bool
The parameter could be "ON" or "OFF". For example,
:DISPlay:SAVer[:STATe] ON|OFF

Keyword
The parameter could be any of the values listed. For example,
[:SOURce<n>]:BURSt:GATE:POLarity NORMal|INVerted
The parameter could be "NORMal" or "INVerted".

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,
:OUTPut[<n>]:LOAD <ohms>|INFinity|MINimum|MAXimum
<ohms> can be set to any integer between 1 and 10000.

Consecutive Real Number
The parameter could be any value within the effective value range according to the accuracy requirement (the default accuracy contains up to 6 digits after the decimal points). For example,
[:SOURce<n>]:MOD:AM[:DEPTh] <depth>|MINimum|MAXimum
<depth> can be set to any real number between 0 and 120.

Discrete
The parameter could only be one of the specified values and these values are discontinuous. For example,
[:SOURce<n>]:MOD[:STATe] ON|OFF
<n> could only be set to 1 or 2.

ASCII Character String
The parameter should be the combinations of ASCII characters. For example,
:MMEMory:MDIRectory <dir_name>
<dir_name> is a character string.

Explanation: in DG4000 command system, some commands contain the **MAXimum** and **MINimum** parameters. For example,
[:SOURce<n>]:MOD:ASKey:AMPLitude <amplitude>|MINimum|MAXimum
[:SOURce<n>]:MOD:ASKey:AMPLitude? [MINimum|MAXimum]

1. If **MAXimum** is used as the parameter for a setup command, the specified generator parameter will be set to the maximum.
2. If **MINimum** is used as the parameter for a setup command, the specified generator parameter will be set to the minimum.
3. If **MAXimum** is used as the parameter for a query command, the command will query the maximum of the specified generator parameter.
4. If **MINimum** is used as the parameter for a query command, the command will query the minimum of the specified generator parameter.

Command Abbreviation

Since all commands are case-insensitive, you can use any of them. But if abbreviation is used, all the capital letters in the command must be written completely. For example,

:SYSTem:COMMunicate:USB:INFormation?

can be abbreviated to

:SYST:COMM:USB:INF?

Command System

In this chapter, the DG4000 series command subsystems are introduced in alphabetical order (from A to Z).

Explanation: in this command set, commands relating to some parameter (such as frequency and amplitude) settings can be sent with units. The units supported by these parameters and the default units are as listed in the table below.

Parameter	**Units Supported**	**Default Unit**
Frequency	MHZ/KHZ/HZ/UHZ	HZ
Amplitude	VPP/MVPP/VRMS /MVRMS/DBM	VPP/VRMS/DBM (depend on the parameter currently to be set)
Offset/High Level/Low Level	V/MV	V
Time	MS/KS/S/US/NS	S
Phase	°	°
Duty Cycle/Modulation Depth etc.	%	%

- MHZ is equivalent to mHz.
- MVPP is equivalent to mVpp, MVRMS is equivalent to mVrms, MV is equivalent to mV.
- MS is equivalent to ms.

Note: this manual takes DG4162 as an example to illustrate the ranges of parameters in the commands.

COUNter Command Subsystem

:COUNter:ATTenuation 1X|10X

:COUNter:ATTenuation?

:COUNter:AUTO

:COUNter:COUPing AC|DC

:COUNter:COUPing?

:COUNter:GATEtime AUTO|USER1|USER2|USER3|USER4|USER5|USER6

:COUNter:GATEtime?

:COUNter:HF ON|OFF

:COUNter:HF?

:COUNter:IMPedance 50|1M

:COUNter:IMPedance?

:COUNter:LEVE <value>|MINimum|MAXimum

:COUNter:LEVE? [MINimum|MAXimum]

:COUNter:MEASure?

:COUNter:SENSitive <value>|MINimum|MAXimum

:COUNter:SENSitive? [MINimum|MAXimum]

:COUNter[:STATe] ON|OFF

:COUNter[:STATe]?

:COUNter:STATIstics:CLEAr

:COUNter:STATIstics:DISPlay DIGITAL|CURVE

:COUNter:STATIstics:DISPlay?

:COUNter:STATIstics[:STATe] ON|OFF

:COUNter:STATIstics[:STATe]?

:COUNter:ATTenuation

Syntax

```
:COUNter:ATTenuation 1X|10X
:COUNter:ATTenuation?
```

Description

Set the attenuation coefficient of the counter to X1 or X10.
Query the attenuation coefficient of the counter.

Parameter

Name	Type	Range	Default
--	Keyword	1X| 10X	1X

Return Format

The query returns 1X or 10X.

Example

The command below sets the attenuation coefficient to X10.

```
:COUNter:ATTenuation 10X
```

The query below returns 10X.

```
:COUNter:ATTenuation?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:AUTO

Syntax

```
:COUNter:AUTO
```

Description

Send this command and the instrument will set the gate time of the counter automatically.

Explanation

This command is only available when the counter function is enabled.
The function of this command is the same with that of the :COUNter:GATEtime AUTO command.

Example

The command below sets the gate time of the counter automatically.

```
:COUNter:AUTO
```

Related Commands

:COUNter:GATEtime AUTO|USER1|USER2|USER3|USER4|USER5|USER6
:COUNter:GATEtime?
:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:COUPing

Syntax

```
:COUNter:COUPing AC|DC
:COUNter:COUPing?
```

Description

Set the coupling mode of the counter to AC or DC.
Query the coupling mode of the counter.

Parameter

Name	Type	Range	Default
--	Keyword	AC|DC	AC

Return Format

The query returns AC or DC.

Example

The command below sets the coupling mode to DC.

```
:COUNter:COUPing DC
```

The query below returns DC.

```
:COUNter:COUPing?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:GATEtime

Syntax

```
:COUNter:GATEtime AUTO|USER1|USER2|USER3|USER4|USER5|USER6
:COUNter:GATEtime?
```

Description

Set the gate time of the counter.
Query the gate time of the counter.

Parameter

Name	Type	Range	Default
--	Keyword	AUTO|USER1|USER2|USER3|USER4|USER5|USER6	USER1

Explanation

The gate time corresponding to each parameter is as shown in the table below.

AUTO	AUTO
USER1	1ms
USER2	10ms
USER3	100ms
USER4	1s
USER5	10s
USER6	>10s

Return Format

The query returns AUTO, USER1, USER2, USER3, USER4, USER5 or USER6.

Example

The command below sets the gate time of the counter to 10ms.

```
:COUNter:GATEtime USER2
```

The query below returns USER2.

```
:COUNter:GATEtime?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?
:COUNter:AUTO

:COUNter:HF

Syntax

```
:COUNter:HF ON|OFF
:COUNter:HF?
```

Description

Enable or disable the high-frequency reject of the counter.
Query whether the high-frequency reject of the counter is enabled.

Parameter

Name	Type	Range	Default
--	Bool	ON| OFF	OFF

Return Format

The query returns ON or OFF.

Example

The command below enables the high-frequency reject of the counter.

```
:COUNter:HF ON
```

The query below returns ON.

```
:COUNter:HF?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:IMPedance

Syntax

```
:COUNter:IMPedance 50|1M
:COUNter:IMPedance?
```

Description

Set the input impedance of the counter to 50 Ω or 1 MΩ.
Query the input impedance of the counter.

Parameter

Name	Type	Range	Default
--	Discrete	50 Ω|1 MΩ	1 MΩ

Return Format

The query returns 50 or 1M.

Example

The command below sets the input impedance to 50 Ω.

```
:COUNter:IMPedance 50
```

The query below returns 50.

```
:COUNter:IMPedance?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:LEVE

Syntax

```
:COUNter:LEVE <value>|MINimum|MAXimum
:COUNter:LEVE? [MINimum|MAXimum]
```

Description

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

Parameter

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

Return Format

The query returns the trigger level in scientific notation.

Example

The command below sets the trigger level to 2 V.

```
:COUNter:LEVE 2
```

The query below returns 2.000000E+00.

```
:COUNter:LEVE?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:MEASure

Syntax

```
:COUNter:MEASure?
```

Description

Query the current measurement results of the counter.

Return Format

The query returns the measurement result of each parameter in "Frequency, Period, Duty Cycle, Positive Pulse Width, Negative Pulse Width" format and each parameter is expressed in scientific notation.

Example

The query below returns 1.000099993E+03,9.999000134E-04,1.422600068E+01,1.422537019E-04,8.576463115E-04.

```
:COUNter:MEASure?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter:SENSitive

Syntax

```
:COUNter:SENSitive <value>|MINimum|MAXimum
:COUNter:SENSitive? [MINimum|MAXimum]
```

Description

Set the trigger sensitivity of the counter.
Query the trigger sensitivity of the counter.

Parameter

Name	Type	Range	Default
<value>	Consecutive Real Number	0% to 100%	50%

Return Format

The query returns the trigger sensitivity in scientific notation.

Example

The command below sets the trigger sensitivity to 60%.

```
:COUNter:SENSitive 60
```

The query below returns 6.000000E+01.

```
:COUNter:SENSitive?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?

:COUNter[:STATe]

Syntax

```
:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?
```

Description

Enable or disable the counter function.
Query the state of the counter function.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Return Format

The query returns ON (when the counter is enabled) or OFF (when the counter is disabled).

Example

The command below enables the counter.

```
:COUNter:STATe ON
```

The query below returns ON.

```
:COUNter:STATe?
```

:COUNter:STATIstics:CLEAr

Syntax

```
:COUNter:STATIstics:CLEAr
```

Description

Clear the current statistic results.

Explanation

This command is only available when the statistic function is enabled (use the :COUNter:STATIstics[:STATe] ON|OFF command to enable the statistic function).

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?
:COUNter:STATIstics[:STATe] ON|OFF
:COUNter:STATIstics[:STATe]?

:COUNter:STATIstics:DISPlay

Syntax

```
:COUNter:STATIstics:DISPlay DIGITAL| CURVE
:COUNter:STATIstics:DISPlay?
```

Description

Set the display mode of the statistic results of the counter to DIGITAL or CURVE.
Query the display mode of the statistic results of the counter.

Parameter

Name	Type	Range	Default
--	Keyword	DIGITAL| CURVE	DIGITAL

Return Format

The query returns DIGITAL or CURVE.

Example

The command below sets the display mode of the statistic results to CURVE.

```
:COUNter:STATIstics:DISPlay CURVE
```

The query below returns CURVE.

```
:COUNter:STATIstics:DISPlay?
```

Related Commands

:COUNter[:STATe] ON|OFF
:COUNter[:STATe]?
:COUNter:STATIstics[:STATe] ON|OFF
:COUNter:STATIstics[:STATe]?

:COUNter:STATIstics[:STATe]

Syntax

```
:COUNter:STATIstics[:STATe]

ON|OFF
:COUNter:STATIstics[:STATe]?
```

Description

Enable

or disable the measurement result statistic function of the counter.

Query the status of the measurement result

statistic function of the counter.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Return

Format

The query

returns ON or OFF.

Example

The command below enables the measurement result statistic function of the counter.

```
:COUNter:STATIstics:STATe
ON
```

The query below returns ON.

```
:COUNter:STATIstics:STATe?
```

Related

Commands

:COUNter[:STATe]

ON|OFF
:COUNter[:STATe]?

COUPling Command Subsystem

:COUPling:AMPL:DEViation

Syntax

```
:COUPling:AMPL:DEViation <deviation>
:COUPling:AMPL:DEViation?
```

Description

Set the amplitude deviation of amplitude coupling.
Query the amplitude deviation.

Parameter

Name	Type	Range	Default
<deviation>	Consecutive Real Number	0 Vpp to 20 Vpp	0 Vpp

Return Format

The query returns the current amplitude deviation in scientific notation.

Example

The command below sets the amplitude deviation to 500 mVpp.

```
:COUPling:AMPL:DEViation 0.5
```

The query below returns 5.000000E-01.

```
:COUPling:AMPL:DEViation?
```

Related Commands

:COUPling[:STATe] ON|OFF
:COUPling[:STATe]?
:COUPling:AMPL[:STATe] ON|OFF
:COUPling:AMPL[:STATe]?

:COUPling:AMPL[:STATe]

Syntax

```
:COUPling:AMPL[:STATe] ON|OFF
:COUPling:AMPL[:STATe]?
```

Description

Enable or disable amplitude coupling.
Query the status of amplitude coupling.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

You can also use the :COUPling[:STATe] ON|OFF command to enable or disable frequency coupling, phase coupling and amplitude coupling at the same time.

Return Format

The query returns ON or OFF.

Example

The command below enables amplitude coupling.

```
:COUPling:AMPL:STATe ON
```

The query below returns ON.

```
:COUPling:AMPL:STATe?
```

Related Commands

:COUPling[:STATe] ON|OFF
:COUPling[:STATe]?
:COUPling:AMPL:DEViation <deviation>
:COUPling:AMPL:DEViation?

:COUPling:CHannel:BASE

Syntax

```
:COUPling:CHannel:BASE CH1|CH2
:COUPling:CHannel:BASE?
```

Description

Set the base channel of coupling to CH1 or CH2.
Query the current base channel of coupling.

Parameter

Name	Type	Range	Default
--	Keyword	CH1|CH2	CH1

Explanation
1. This command is only available when the coupling function is disabled (use the :COUPling[:STATe] ON|OFF command to disable the coupling function).
2. When frequency, phase or amplitude coupling is enabled, a green "*" is displayed at the left of the frequency, phase or amplitude of the base channel of coupling.

Return Format

The query returns CH1 or CH2.

Example

The command below sets the base channel of coupling to CH2.

```
:COUPling:CHannel:BASE CH2
```

The query below returns CH2.

```
:COUPling:CHannel:BASE?
```

Related Commands

:COUPling[:STATe] ON|OFF

:COUPling[:STATe]?

:COUPling:FREQuency:DEViation

Syntax

```
:COUPling:FREQuency:DEViation <deviation>
:COUPling:FREQuency:DEViation?
```

Description

Set the frequency deviation of frequency coupling.
Query the frequency deviation.

Parameter

Name	Type	Range	Default
<deviation>	Consecutive Real Number	0 µHz to 160 MHz	0 µHz

Return Format

The query returns the current frequency deviation in scientific notation.

Example

The command below sets the frequency deviation to 100 Hz.

```
:COUPling:FREQuency:DEViation 100
```

The query below returns 1.000000E+02.

```
:COUPling:FREQuency:DEViation?
```

Related Commands

:COUPling[:STATe] ON|OFF

:COUPling[:STATe]?

:COUPling:FREQuency[:STATe] ON|OFF

:COUPling:FREQuency[:STATe]?

:COUPling:FREQuency[:STATe]

Syntax

```
:COUPling:FREQuency[:STATe] ON|OFF
:COUPling:FREQuency[:STATe]?
```

Description

Enable or disable frequency coupling.
Query the status of frequency coupling.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

You can also use the :COUPling[:STATe] ON|OFF command to enable or disable frequency, phase and amplitude couplings at the same time.

Return Format

The query returns ON or OFF.

Example

The command below enables frequency coupling.

```
:COUPling:FREQuency:STATe ON
```

The query below returns ON.

```
:COUPling:FREQuency:STATe?
```

Related Commands

:COUPling[:STATe] ON|OFF

:COUPling[:STATe]?

:COUPling:FREQuency:DEViation <deviation>

:COUPling:FREQuency:DEViation?

:COUPling:PHASe:DEViation

Syntax

```
:COUPling:PHASe:DEViation <deviation>
:COUPling:PHASe:DEViation?
```

Description

Set the phase deviation of phase coupling.
Query the phase deviation.

Parameter

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

Return Format

The query returns the current phase deviation in scientific notation.

Example

The command below sets the phase deviation to 10°.

```
:COUPling:PHASe:DEViation 10
```

The query below returns 1.000000E+01.

```
:COUPling:PHASe:DEViation?
```

Related Commands

:COUPling[:STATe] ON|OFF
:COUPling[:STATe]?
:COUPling:PHASe[:STATe] ON|OFF
:COUPling:PHASe[:STATe]?

:COUPling:PHASe[:STATe]

Syntax

```
:COUPling:PHASe[:STATe] ON|OFF
:COUPling:PHASe[:STATe]?
```

Description

Enable or disable phase coupling.
Query the status of phase coupling.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

You can use the :COUPling[:STATe] ON|OFF command to enable or disable frequency, phase and amplitude couplings at the same time.

Return Format

The query returns ON or OFF.

Example

The command below enables phase coupling.

```
:COUPling:PHASe:STATe ON
```

The query below returns ON.

```
:COUPling:PHASe:STATe?
```

Related Commands

:COUPling[:STATe] ON|OFF

:COUPling[:STATe]?

:COUPling:PHASe:DEViation <deviation>

:COUPling:PHASe:DEViation?

:COUPling[:STATe]

Syntax

```
:COUPling[:STATe] ON|OFF
:COUPling[:STATe]?
```

Description

Enable or disable the frequency, phase and amplitude couplings of the channel.
Query the status of the three couplings.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

You can also use the corresponding command to enable or disable frequency, phase or amplitude coupling respectively (refer to the **Related Commands** below).

Return Format

The query returns the status of the three couplings in "FREQ:OFF,PHASE:OFF,AMPL:OFF" format.

Example

The command below enables the three couplings.

```
:COUPling:STATe ON
```

The query below returns FREQ:ON,PHASE:ON,AMPL:ON.

```
:COUPling:STATe?
```

Related Commands

:COUPling:AMPL[:STATe] ON|OFF

:COUPling:AMPL[:STATe]?

:COUPling:FREQuency[:STATe] ON|OFF

:COUPling:FREQuency[:STATe]?

:COUPling:PHASe[:STATe] ON|OFF

:COUPling:PHASe[:STATe]?

DISPlay Command Subsystem

:DISPlay:BRIGhtness <brightness>|MINimum|MAXimum

:DISPlay:BRIGhtness? [MINimum|MAXimum]

:DISPlay:SAVer:IMMediate

:DISPlay:SAVer[:STATe] ON|OFF

:DISPlay:SAVer[:STATe]?

:DISPlay:BRIGhtness

Syntax

```
:DISPlay:BRIGhtness <brightness>|MINimum|MAXimum
:DISPlay:BRIGhtness? [MINimum|MAXimum]
```

Description

Set the brightness of the screen.
Query the brightness setting.

Parameter

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

Explanation

This setting is stored in non-volatile memory and will not be affected by "Preset" (*RST).

Return Format

The query returns the current brightness setting in percentage.

Example

The command below sets the brightness to 80%.

```
:DISPlay:BRIGhtness 80
```

The query below returns 80%.

```
:DISPlay:BRIGhtness?
```

:DISPlay:SAVer:IMMediate

Syntax

:DISPlay:SAVer:IMMediate

Description

Enter the screen saver mode immediately.

Example

Send the command below and the instrument enters the screen saver mode immediately.

```
:DISPlay:SAVer:IMMediate
```

Related Commands

:DISPlay:SAVer[:STATe] ON|OFF
:DISPlay:SAVer[:STATe]?

:DISPlay:SAVer[:STATe]

Syntax

:DISPlay:SAVer[:STATe] ON|OFF
:DISPlay:SAVer[:STATe]?

Description

Enable or disable the screen saver mode.
Query the screen saver status.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	ON

Explanation

When the screen saver function is enabled, if you stop operating the instrument for up to 15 minutes, the instrument will enter the screen saver mode automatically.

Return Format

The query returns ON or OFF.

Example

The command below enables the screen saver function.

```
:DISPlay:SAVer:STATe ON
```

The query below returns ON.

```
:DISPlay:SAVer:STATe?
```

Related Command

:DISPlay:SAVer:IMMediate

:HCOPy:SDUMp:DATA?

Syntax

```
:HCOPy:SDUMp:DATA?
```

Description

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

Return Format

The query returns a definite-length binary

data block containing the image. The block starts with #. For example, #9001152054BM6......;

wherein, “9” following “#” denotes that the 9 characters following (001152054) are used to denote the data length.

IEEE 488.2 Common Commands

*IDN?
*RCL USER1| USER2| USER3| USER4| USER5| USER| 6USER7| USER8| USER9| USER10
*RST
*SAV USER1| USER2| USER3| USER4| USER5| USER6| USER7| USER8| USER9| USER10
*TRG

*IDN?

Syntax

*IDN?

Description

Query the ID character string of the instrument.

Return Format

The query returns the manufacturer, model, serial number and version number in character string and all the items are separated by commas.

Example

The command below queries the ID of the instrument and returns Rigol Technologies,DG4162,DG41620000,00.01.02.

```
*IDN?
```

*RCL

Syntax

```
*RCL USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10
```

Description

Recall the state file stored in the specified storage location in the non-volatile memory.

Parameter

Name	Type	Range	Default
--	Keyword	USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10	USER1

Explanation

This command is only available when the specified storage location contains data currently.
This command only loads the file stored in the specified storage location to the instrument.

Example

The command below loads the state file stored in USER2.

```
*RCL USER2
```

Related Command

*SAV USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10

*RST

Syntax

```
*RST
```

Description

Restore the instrument to its default states.

*SAV

Syntax

```
*SAV USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10
```

Description

Store the current instrument state to the specified storage location of the non-volatile memory.

Parameter

Name	Type	Range	Default
--	Keyword	USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10	USER1

Explanation

If data currently exists in the specified storage location, the current instrument state will overwrite the previous data directly and no prompt message will be displayed.

Example

The command below stores the current instrument state to USER2.

```
*SAV USER2
```

Related Command

*RCL USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

***TRG**

Syntax

```
*TRG
```

Description

Trigger the instrument to generate an output.

Explanation

This command is only available when Sweep or Burst is enabled (refer to the [:SOURce<n>]:SWEep:STATe OFF|ON or [:SOURce<n>]:BURSt[:STATe] ON|OFF command) and the trigger source is set to manual (refer to the [:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual or [:SOURce<n>]:BURSt:TRIGger:SOURce INTernal|EXTernal|MANual command).

Related Commands

[:SOURce<n>]:SWEep:STATe OFF|ON
[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual
[:SOURce<n>]:BURSt[:STATe] ON|OFF
[:SOURce<n>]:BURSt:TRIGger:SOURce INTernal|EXTernal|MANual

MEMory Command Subsystem

:MEMory:STATe:DELete

USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

:MEMory:STATe:LOCK

USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10,ON|OFF

:MEMory:STATe:LOCK?

USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

:MEMory:STATe:VALid?

USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

:MEMory:STATe:DELete

Syntax

:MEMory:STATe:DELete
USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

Description

Delete the state file stored in the specified storage location.

Parameter

Name	Type	Range	Default
--	Keyword	USER1|USER2|USER3|USER4|USER5| USER6|USER7|USER8|USER9|USER10	USER1

Explanation

This command is only available when valid state file is currently stored in the specified storage location.

Related Command

:MEMory:STATe:VALid?
USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

:MEMory:STATe:LOCK

Syntax

```
:MEMory:STATe:LOCK
USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10,ON|OF
F
:MEMory:STATe:LOCK?
USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10
```

Description

Lock or unlock the file stored in the specified storage location.
Query whether the file stored in the specified storage location is locked.

Parameter

Name	Type	Range	Default
--	Keyword	USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10	USER1
--	Bool	ON|OFF	OFF

Explanation

If the file stored in the specified storage location is locked, it can only be read and users can not modify or rename the file or store other file in that storage location.

Return Format

The query returns ON or OFF.

Example

The command below locks the file stored in USER2.

```
:MEMory:STATe:LOCK USER2,ON
```

The query below returns ON.

```
:MEMory:STATe:LOCK? USER2
```

:MEMory:STATe:VALid?

Syntax

:MEMory:STATe:VALid?
USER1|USER2|USER3|USER4|USER5|USER|6USER7|USER8|USER9|USER10

Description

Query whether the specified storage location currently contains a valid state file.

Parameter

Name	Type	Range	Default
--	Keyword	USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10	USER1

Return Format

The query returns 1 (valid) or 0 (invalid).

Example

The query below returns 1.
:MEMory:STATe:VALid? USER1

MMEMory

Command Subsystem

:MMEMory:CATalog? :MMEMory:CDIRectory <directory_name>

:MMEMory:CDIRectory?

:MMEMory:COPY <directory_name>,<file_name>

:MMEMory:DELete <file_name>

:MMEMory:LOAD <file_name>
:MMEMory:MDIRectory <dir_name>

:MMEMory:RDIRectory?

:MMEMory:STORe <file_name>

Note: the

MMEMory command subsystem is only applicable to external memory. If no USB

storage device is currently connected to DG4000, "Error generated by remote

interface command!" will be displayed when any of the commands in the MMEMory command

subsystem is sent.

:MMEMory:CATalog?

Syntax

:MMEMory:CATalog?

Description

Query all the files and folders under the current directory.

Explanation

This command is only applicable to external memory.

Return Format

Format: {space used, space left, "size, nature, name"...}. Wherein, the unit for the used space and space left is "Byte", the file nature is blank and the folder nature is DIR. For example,

```
196608,1073004544,"4000,,000.RAF","1364,,3333.RSF","1364,,2222.RSF","136
5,DIR,ABCD"
```

:MMEMory:CDIRectory

Syntax

```
:MMEMory:CDIRectory <directory_name>
:MMEMory:CDIRectory?
```

Description

Modify the current directory to the directory specified in **<directory_name>**.
The query returns the current directory in character string.

Parameter

Name	Type	Range	Default
<directory_name>	ASCII Character	Character string enclosed in double quotation marks, the length is limited to 300 characters	--

Explanation

This command is only available for external memory. If the directory set does not exist, "Error generated by remote interface command!" is displayed.

Return Format

The query returns the current directory in character string enclosed in double quotation marks.

Example

The command below sets the current directory to D:\rigol.

```
:MMEMory:CDIRectory "D:\rigol"
```

The query below returns "D:\rigol".

```
:MMEMory:CDIRectory?
```

:MMEMory:COPY

Syntax

:MMEMory:COPY <directory_name>,<file_name>

Description

Copy the file specified in <file_name> under the current directory to the directory (not the current directory) specified in <directory_name>.

Parameter

Name	Type	Range	Default
<directory_name>	ASCII Character	Character string enclosed in double quotation marks, the length is limited to 300 characters	--
<file_name>	ASCII Character	Character string enclosed in double quotation marks (include suffix), the length is limited to 40 characters	--

Explanation

This command is only applicable to external memory.

The file specified in <file_name> must be file under the current directory (you can use the :MMEMory:CDIRectory <directory_name> command to change the current directory).

If the file specified in <file_name> or the directory specified in <directory_name> does not exist, "Error generated by remote interface command!" is displayed.

Example

The command below copies the rigol1.RAF file under the current directory to D:\rigol.

```
:MMEMory:COPY "D:\rigol","rigol1.RAF"
```

:MMEMory:DELete

Syntax
:MMEMory:DELete <file_name>

Description
Delete the file or folder specified in <file_name> under the current directory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII Character	Character string enclosed in double quotation marks (include suffix), the length is limited to 40 characters	--

Explanation
This command is only applicable to external memory. If the file specified in <file_name> does not exist, "Error generated by remote interface command!" is displayed.

Example
The command below deletes the rigol1.RAF file under the current directory.

```
:MMEMory:DELete "rigol1.RAF"
```

:MMEMory:LOAD

Syntax

:MMEMory:LOAD <file_name>

Description

Load the file specified in <file_name> under the current directory.

Parameter

Name	Type	Range	Default
<file_name>	ASCII Character	Character string enclosed in double quotation marks (include suffix), the length is limited to 40 characters	--

Explanation

This command is only applicable to external memory.

If the file specified in <file_name> does not exist, "Error generated by remote interface command!" is displayed.

The types of files available are state file (.RSF) and arbitrary waveform file (.RAF).

The arbitrary waveform file is loaded to the current channel.

Example

The command below loads the the rigol1.RAF file under the current directory.

```
:MMEMory:LOAD "rigol1.RAF"
```

:MMEMory:MDIRectory

Syntax
:MMEMory:MDIRectory <dir_name>

Description
Create a folder using the filename specified in <dir_name> under the current directory.

Parameter

Name	Type	Range	Default
<dir_name>	ASCII Character	Character string enclosed in double quotation marks, the length is limited to 40 characters	--

Explanation
This command is only applicable to external memory. If the filename specified already exists, "Error generated by remote interface command!" is displayed.

Example

The command below creates a folder under the current directory using the name rigol1.

```
:MMEMory:MDIRectory "rigol1"
```

:MMEMory:RDIRectory?

Syntax

:MMEMory:RDIRectory?

Description

Query the disk (except C disk) currently available.

Explanation

This command is only applicable to external memory.

Return Format

Format: "1,"D:"" (USB storage device is currently connected).

:MMEMory:STORe

Syntax

:MMEMory:STORe <file_name>

Description

Store the file under the current directory using the filename specified in <file_name>.

Parameter

Name	Type	Range	Default
<file_name>	ASCII Character	Character string enclosed in double quotation marks (include suffix), the length is limited to 40 characters	--

Explanation

This command is only applicable to external memory. If the file specified in <file_name> does not exist, "Error generated by remote interface command!" is displayed.

The types of files available are state file (.RSF) and arbitrary waveform file (.RAF).

Only the data of the current channel is stored when storing the arbitrary waveform file.

Example

The command below stores the counter.RSF file under the current directory.

```
:MMEMory:STORe "counter.RSF"
```

OUTPut Command Subsystem

The :OUTPut[<n>] commands are used to set and control the output parameters and state of the channel. **<n>** is the number of the channel (1 or 2) and if it is not set, the operation will be executed on CH1 by default.

:OUTPut[<n>]:IMPedance <ohms>|INFinity|MINimum|MAXimum

:OUTPut[<n>]:IMPedance? [MINimum|MAXimum]

:OUTPut[<n>]:LOAD

<ohms>|INFinity|MINimum|MAXimum

:OUTPut[<n>]:LOAD? [MINimum|MAXimum]

:OUTPut[<n>]:NOISe:SCALe <percent>|MINimum|MAXimum

:OUTPut[<n>]:NOISe:SCALe? [MINimum|MAXimum]

:OUTPut[<n>]:NOISe[:STATe] ON|OFF

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

:OUTPut[<n>]:POLarity NORMal|INVerted

:OUTPut[<n>]:POLarity?

:OUTPut[<n>][:STATe] ON|OFF

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

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

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

:OUTPut[<n>]:SYNC[:STATe] ON|OFF

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

:OUTPut[<n>]:IMPedance

Syntax

:OUTPut[<n>]:IMPedance <ohms>|INFinity|MINimum|MAXimum

:OUTPut[<n>]:IMPedance? [MINimum|MAXimum]

Description

Set the output impedance of the [Output1] or [Output2] connector at the front panel and the default unit is Ω.

Query the output impedance of the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
<ohms>	Integer	1 Ω to 10000 Ω	50 Ω

Explanation
Default setting: INFinity (HighZ)
This command is completely compatible with the following commands.
:OUTPut[<n>]:LOAD <ohms>| INFinity| MINimum| MAXimum
:OUTPut[<n>]:LOAD? [MINimum| MAXimum]

Return Format
The query returns the specific impedance value or INFINITY (HighZ).

Example
The command below sets the output impedance of the [Output2] connector to 100 Ω.

```
:OUTPut2:IMPedance 100
```

The query below returns 100.

```
:OUTPut2:IMPedance?
```

Related Commands
:OUTPut[<n>]:LOAD <ohms>| INFinity| MINimum| MAXimum
:OUTPut[<n>]:LOAD? [MINimum| MAXimum]

:OUTPut[<n>]:LOAD

Syntax

```
:OUTPut[<n>]:LOAD <ohms>|INFinity|MINimum|MAXimum
:OUTPut[<n>]:LOAD? [MINimum|MAXimum]
```

Description

Set the output impedance of the [Output1] or [Output2] connector at the front panel and the default unit is Ω.

Query the output impedance of the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
<ohms>	Integer	1 Ω to 10000 Ω	50 Ω

Explanation

Default setting: INFinity (HighZ)

This command is completely compatible with the following commands.

:OUTPut[<n>]:IMPedance <ohms>|INFinity|MINimum|MAXimum

:OUTPut[<n>]:IMPedance? [MINimum|MAXimum]

Return Format

The query returns the specific impedance value or INFINITY (HighZ).

Example

The command below sets the output impedance of the [Output2] connector to 100 Ω.

```
:OUTPut2:LOAD 100
```

The query below returns 100.

```
:OUTPut2:LOAD?
```

Related Commands

:OUTPut[<n>]:IMPedance <ohms>|INFinity|MINimum|MAXimum

:OUTPut[<n>]:IMPedance? [MINimum|MAXimum]

:OUTPut[<n>]:NOISe:SCALe

Syntax

```
:OUTPut[<n>]:NOISe:SCALe <percent>|MINimum|MAXimum
:OUTPut[<n>]:NOISe:SCALe? [MINimum|MAXimum]
```

Description

Set the scale of the noise superposed on the [Output1] or [Output2] connector.
Query the scale of the noise superposed on the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
<percent>	Consecutive Real Number	0% to 50%	10%

Return Format
The query returns the current noise scale in scientific notation.

Example
The command below sets the noise scale of the [Output2] connector to 15%.

```
:OUTPut2:NOISe:SCALe 15
```

The query below returns 1.500000E+01.

```
:OUTPut2:NOISe:SCALe?
```

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

Syntax

:OUTPut[<n>]:NOISe[:STATe] ON|OFF
:OUTPut[<n>]:NOISe[:STATe]?

Description

Enable or disable the noise superposition function of the [Output1] or [Output2] connector.
Query the status of the noise superposition function of the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
--	Bool	ON| OFF	ON

Return Format

The query returns ON or OFF.

Example

The command below enables the noise superposition function of the [Output1] connector.

```
:OUTPut:NOISe ON
```

The query below returns ON.

```
:OUTPut:NOISe?
```

:OUTPut[<n>]:POLarity

Syntax

:OUTPut[<n>]:POLarity NORMal|INVerted
:OUTPut[<n>]:POLarity?

Description

Set the output polarity of the [Output1] or [Output2] connector.
Query the output polarity of the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
--	Keyword	NORMal|INVerted	NORMal

Explanation

When the output polarity is set to INVerted, the waveform inverts relatively to the offset voltage.

After the waveform is inverted, none of the offset voltages would change, the waveform displayed in the user interface is not inverted and the related sync signal is not inverted.

Return Format

The query returns NORMAL or INVERTED.

Example

The command below sets the output polarity of the [Output1] connector to INVerted.

```
:OUTPut1:POLarity INVerted
```

The query returns INVERTED.

```
:OUTPut1:POLarity?
```

:OUTPut[<n>][:STATe]

Syntax

```
:OUTPut[<n>][:STATe] ON|OFF
:OUTPut[<n>][:STATe]?
```

Description

Enable or disable the output of the [Output1] or [Output2] connector at the front panel.
Query the status of the [Output1] or [Output2] connector.

Parameter

Name	Type	Range	Default
--	Bool	ON| OFF	OFF

Return Format

The query returns ON or OFF.

Example

The command below enables the [Output1] connector.

```
:OUTPut ON
```

The query below returns ON.

```
:OUTPut?
```

:OUTPut[<n>]:SYNC:POLarity

Syntax

:OUTPut[<n>]:SYNC:POLarity POSitive|NEGative
:OUTPut[<n>]:SYNC:POLarity?

Description

Set the output polarity of the [Sync1] or [Sync2] connector.
Query the output polarity of the [Sync1] or [Sync2] connector.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive| NEGative	POSitive

Return Format

The query returns POS or NEG.

Example

The command below sets the output polarity of the [Sync2] connector to NEGative.

```
:OUTPut2:SYNC:POLarity NEGative
```

The query below returns NEG.

```
:OUTPut2:SYNC:POLarity?
```

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

Syntax

:OUTPut[<n>]:SYNC[:STATe] ON|OFF
:OUTPut[<n>]:SYNC[:STATe]?

Description

Enable or disable the sync signal on the [Sync1] or [Sync2] connector.
The query returns ON or OFF.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	ON

Explanation

When the sync signal is disabled, the output level of the [Sync1] or [Sync2] connector is logic low level.

Return Format

The query returns ON or OFF.

Example

The command below disables the sync signal on the [Sync1] connector.

```
:OUTPut:SYNC OFF
```

The query below returns OFF.

```
:OUTPut:SYNC?
```

PA Command Subsystem

The :PA commands are used to set and query the related information of the external power amplifier (PA), 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.

:PA:GAIN 1X|10X

:PA:GAIN?

:PA:OFFSet[:STATe] ON|OFF

:PA:OFFSet[:STATe]?

:PA:OFFSet:VALUe <value>|MINimum|MAXimum

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

:PA:OUTPut:POLarity NORMal|INVerted

:PA:OUTPut:POLarity?

:PA:SAVE

:PA[:STATe] ON|OFF

:PA[:STATe]?

:PA:GAIN

Syntax

```
:PA:GAIN 1X|10X

:PA:GAIN?
```

Description

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

Query the gain of 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 amplification. 10X denotes amplifying the signal 10 times and then outputting the amplified signal.

Return Format

The query returns 1X or 10X.

Example

The command below sets the gain of signal amplification at the output terminal of the PA to 10X.

```
:PA:GAIN 10X
```

The query below returns 10X.

```
:PA:GAIN?
```

:PA:OFFSet[:STATe]

Syntax

:PA:OFFSet[:STATe]

ON|OFF

: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

<table>
<tr><th>Name</th><th>Type</th><th>Range</th><th>Default</th></tr>
<tr><td>ON| OFF</td><td>Bool</td><td>ON| OFF</td><td>OFF</td></tr>
</table>

Explanation

You can send the :PA:OFFSet:VALUe command to set the value of the output offset at the output terminal of the PA.

Return Format

The query returns ON or OFF.

Example

The command below turns on the output offset at the output terminal of the PA.

```
:PA:OFFSet:STATe ON
```

The query below returns ON.

```
:PA:OFFSet:STATe?
```

:PA:OFFSet:VALUe

Syntax

```
:PA:OFFSet:VALUe <value>|MINimum|MAXimum

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

Description

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

Query the value of 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 value of the output offset in scientific notation with 7 significant bits. For example, 1.234500E+00 which denotes the value of the output offset is 1.2345V.

Example

The command below sets the value of the output offset at the output terminal of the PA to 1.2345V.

```
:PA:OFFSet:VALUe 1.2345
```

The query below returns 1.234500E+00.

```
:PA:OFFSet:VALUe?
```

: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 or 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 in NORMal output mode or INVerted output mode. In normal mode, the instrument outputs the signal normally; in inverted mode, the instrument inverts the signal and then outputs the inverted signal.

Return Format

The query returns NORMAL or INVERTED.

Example

The command below sets the output polarity of the signal at the output terminal of the PA to NORMAL.

```
:PA:OUTPut:POLarity NORMal
```

The query below returns NORMAL.

```
:PA:OUTPut:POLarity?
```

:PA:SAVE

Syntax

:PA:SAVE

Description

Save the current working status of the PA to the internal memory of the instrument.

Explanation

When the PA is turned on the next time, it will automatically recall the working status saved previously.

:PA[:STATe]

Syntax

```
:PA[:STATe] ON|OFF

: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|OFF	Bool	ON|OFF	OFF

Explanation

When the external power amplifier is turned on, the PA performs power amplification on the input signal (namely the output signal of the signal generator) and then outputs the signal. When the external power amplifier is turned off, the PA has no output.

Return Format

The query returns ON or OFF.

Example

The command below turns on the external power amplifier.

```
:PA:STATe ON
```

The query below returns ON.

```
:PA:STATe?
```

SOURce Command Subsystem

[:SOURce<n>] commands are used to set the related parameters of basic waveforms, arbitrary waveforms, harmonics as well as the output signals of Mod, Sweep and Burst. Wherein, **<n>** represents the corresponding channel (1 or 2) and if it is not set, the operation will be executed on CH1 by default.

The following types are contained:

[:SOURce<n>]:APPLy
[:SOURce<n>]:BURSt
[:SOURce<n>]:FREQuency
[:SOURce<n>]:FUNCtion
[:SOURce<n>]:HARMonic
[:SOURce<n>]:MARKer
[:SOURce<n>]:MOD
[:SOURce<n>]:PERiod
[:SOURce<n>]:PHASe
[:SOURce<n>]:PULSe
[:SOURce<n>]:SWEep
[:SOURce<n>]:VOLTage

[:SOURce<n>]:APPLy

[:SOURce<n>]:APPLy:CUSTom[<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy:HARMonic [<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy:NOISe [<amp>[,<offset>]]

[:SOURce<n>]:APPLy:PULSe [<freq>[,<amp>[,<offset>[,<delay>]]]]

[:SOURce<n>]:APPLy:RAMP [<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy:SINusoid [<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy:SQUare [<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy:USER [<freq>[,<amp>[,<offset>[,<phase>]]]]

[:SOURce<n>]:APPLy?

[:SOURce<n>]:APPLy:CUSTom

Syntax

[:SOURce<n>]:APPLy:CUSTom [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description

Output the user-defined waveform with the specified parameters (frequency, amplitude, DC offset and start phase).

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 µHz to 40 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Example

The command below sets the frequency, amplitude, DC offset and start phase of the user-defined waveform to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:CUSTom 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy:HARMonic

Syntax
[:SOURce<n>]:APPLy:HARMonic [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description
Output a harmonic with specified frequency, amplitude, DC offset and start phase.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 μHz to 80 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ" and the harmonic order is set to "2".

Example

The command below sets the frequency, amplitude, DC offset and start phase of the harmonic to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:HARMonic 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy:NOISe

Syntax

[:SOURce<n>]:APPLy:NOISe [<amp>[,<offset>]]

Description

Output a noise with specified amplitude and DC offset.

Parameter

Name	Type	Range[1]	Default
<amp>	Consecutive Real Number	0 Vpp to 10 Vpp (50 Ω)	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}

Note[1]: <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide).

Example

The command below sets the amplitude and DC offset of the noise to 2.5 Vpp and 0.5 V_{DC} respectively.

```
:APPLy:NOISe 2.5,0.5
```

[:SOURce<n>]:APPLy:PULSe

Syntax
[:SOURce<n>]:APPLy:PULSe [<freq>[,<amp>[,<offset>[,<delay>]]]]

Description
Output a pulse with specified frequency, amplitude, DC offset and delay.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 µHz to 40 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<delay>	Consecutive Real Number	0 ns to pulse period	0 ns

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Example

The command below sets the frequency, amplitude, DC offset and delay of the pulse to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 5 ms respectively.

```
:APPLy:PULSe 100,2.5,0.5,0.005
```

[:SOURce<n>]:APPLy:RAMP

Syntax

[:SOURce<n>]:APPLy:RAMP [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description

Output a ramp with specified frequency, amplitude, DC offset and start phase.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 μHz to 4 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Example

The command below sets the frequency, amplitude, DC offset and start phase of the ramp to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:RAMP 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy:SINusoid

Syntax
[:SOURce<n>]:APPLy:SINusoid [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description
Output a sine waveform with specified frequency, amplitude, DC offset and start phase.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 μHz to 160 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Example

The command below sets the frequency, amplitude, DC offset and start phase of the sine waveform to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:SINusoid 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy:SQUare

Syntax

[:SOURce<n>]:APPLy:SQUare [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description

Output a square waveform with specified frequency, amplitude, DC offset and start phase.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 µHz to 50 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Example

The command below sets the frequency, amplitude, DC offset and start phase of the square waveform to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:SQUare 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy:USER

Syntax

[:SOURce<n>]:APPLy:USER [<freq>[,<amp>[,<offset>[,<phase>]]]]

Description

Output an arbitrary waveform with specified frequency, amplitude, DC offset and start phase.

Parameter

Name	Type	Range[1]	Default
<freq>	Consecutive Real Number	1 µHz to 40 MHz	1 kHz
<amp>	Consecutive Real Number	--	5 Vpp
<offset>	Consecutive Real Number	--	0 V_{DC}
<phase>	Consecutive Real Number	0° to 360°	0°

Note[1]: for different models, the ranges of the parameters are different. Besides, <amp> is limited by the impedance and frequency/period settings and <offset> is limited by the impedance and amplitude/high level settings (for details, refer to the User's Guide). The ranges listed in the table are for DG4162 when the impedance is set to "HighZ".

Explanation

When the current arbitrary waveform is DC, the instrument will directly pick up the offset parameter to modify the DC offset while the frequency, amplitude and phase parameters will be discarded.

Example

The command below sets the frequency, amplitude, DC offset and start phase of the arbitrary waveform to 100 Hz, 2.5 Vpp, 0.5 V_{DC} and 90° respectively.

```
:APPLy:USER 100,2.5,0.5,90
```

[:SOURce<n>]:APPLy?

Syntax

[:SOURce<n>]:APPLy?

Description

Query the current configuration of the generator.

Return Format

The query returns a character string enclosed in double quotation marks in "Waveform Name, Frequency, Amplitude, Offset, Start Phase/Delay" format. If the corresponding item does not exist, it will be replaced by "DEF". For example, "NOISE,DEF,5.000000E+00,0.000000E+00,DEF".

[:SOURce<n>]:BURSt

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

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

[:SOURce<n>]:BURSt:INTernal:PERiod <period>|MINimum|MAXimum

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

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

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

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

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

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

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

[:SOURce<n>]:BURSt[:STATe] ON|OFF

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

[:SOURce<n>]:BURSt:TDELay <delay>|MINimum|MAXimum

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

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

[:SOURce<n>]:BURSt:TRIGger:SLOPe POSitive|NEGative

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

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

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

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

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

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

Syntax

```
[:SOURce<n>]:BURSt:GATE:POLarity NORMal|INVerted
[:SOURce<n>]:BURSt:GATE:POLarity?
```

Description

Set the generator to output a burst when the gated signal at the **[Mod/FSK/Trig]** connector at the rear panel is high level or low level.

Query the polarity setting.

Parameter

Name	Type	Range	Default
--	Keyword	NORMal| INVerted	NORMal

Explanation

This command is only available in gated Burst mode.

Return Format

The query returns NORM or INV.

Example

The command below sets the polarity to INVerted, namely the instrument outputs a burst when the gated signal at the **[Mod/FSK/Trig]** connector at the rear panel is low level.

```
:BURSt:GATE:POLarity INVerted
```

The query below returns INV.

```
:BURSt:GATE:POLarity?
```

Related Commands

[:SOURce<n>]:BURSt:MODE TRIGgered|GATed|INFinity
[: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 Burst period (namely the time from the start of a N cycle burst to the start of the next burst) and the default unit is "s".

Query the Burst period.

Parameter

Name	Type	Range	Default
<period>	Consecutive Real Number	≥ 1 µs + waveform period[1] × number of bursts	10 ms

Note[1] : waveform period is the period of the burst function (such as sine and square waveforms).

Explanation

This command is only applicable to N cycle burst mode in internal trigger.

If the burst period is too short, the generator will increase this period automatically to allow the output of the specified number of cycles.

Return Format

The query returns the period in scientific notation.

Example

The command below sets the burst period to 0.5 s.

```
:BURSt:INTernal:PERiod 0.5
```

The query below returns 5.000000E-01.

```
:BURSt:INTernal:PERiod?
```

Related Commands

[:SOURce<n>]:BURSt:MODE TRIGgered|GATed|INFinity
[:SOURce<n>]:BURSt:MODE?

[:SOURce<n>]:BURSt:MODE

Syntax

```
[:SOURce<n>]:BURSt:MODE TRIGgered|GATed|INFinity
[:SOURce<n>]:BURSt:MODE?
```

Description

Set the burst type to N cycle, gated or infinite.
Query the burst type.

Parameter

Name	Type	Range	Default
--	Keyword	TRIGgered|GATed|INFinity	TRIGgered

Return Format

The query returns TRIG, GAT or INF.

Example

The command below sets the burst type to GATed.

```
:SOURce:BURSt:MODE GATed
```

The query below returns GAT.

```
:SOURce:BURSt:MODE?
```

[:SOURce<n>]:BURSt:NCYCles

Syntax

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

Description

Set the cycles of the burst.
Query the cycles of the burst.

Parameter

Name	Type	Range	Default
<cycles>	Integer	1 to 1 000 000 (external or manual trigger) 1 to 500 000 (internal trigger)	1

Explanation
This command is only available in N cycle burst mode.

Return Format

The query returns an integer.

Example

The command below sets the cycles of the burst to 100.

```
:BURSt:NCYCles 100
```

The query below returns 100.

```
:BURSt:NCYCles?
```

Related Commands

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

[: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 and the default unit is "°".
Query the start phase of the burst.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	0°

Explanation
For sine, square and ramp, 0° is the point where the waveform passes through 0 V (or DC offset value) positively.
For arbitrary waveform, 0° is the first point of the waveform.
For pulse and noise, start phase is not available.

Return Format

The query returns the phase value in scientific notation.

Example

The command below sets the start phase to 10°.

```
:BURSt:PHASe 10
```

The query below returns 1.000000E+01.

```
:BURSt:PHASe?
```

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

Syntax

[:SOURce<n>]:BURSt[:STATe] ON|OFF
[:SOURce<n>]:BURSt[:STATe]?

Description

Enable or disable the Burst function.
Query the status of the Burst function.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation
When Burst is enabled, Sweep or Mod will be disabled automatically (if it is currently enabled).

Return Format

The query returns ON or OFF.

Example

The command below enables the Burst function.

```
:BURSt ON
```

The query below returns ON.

```
:BURSt?
```

[:SOURce<n>]:BURSt:TDELay

Syntax

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

Description

Set the time from when the generator receives the trigger signal to starts to output the N cycle (or infinite) burst and the default unit is "s".

Query the burst delay.

Parameter

Name	Type	Range[1]	Default
<delay>	Consecutive Real Number	0 s to 85 s	0 s

Note[1]: when internal trigger source is selected, the delay of the N cycle burst is also limited by the carrier period, pulse period and the number of cycles.

Explanation

This command is only available in N cycle and infinite burst modes.

Return Format

The query returns the time value in scientific notation.

Example

The command below sets the delay to 2.5 s.

```
:BURSt:TDELay 2.5
```

The query below returns 2.500000E+00.

```
:BURSt:TDELay?
```

Related Commands

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

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

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

Syntax

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

Description

Set the instrument to trigger immediately.

Explanation

This command is only available when manual trigger source is selected.

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

Syntax

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

Description

Set the generator to enable the burst output on the rising edge or falling edge of the external trigger signal.

Query the edge type of the external trigger signal.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive|NEGative	POSitive

Explanation
This command is only available when external trigger source is selected.

Return Format

The query returns POS or NEG.

Example
The query below returns NEG.
:BURS:TRIG:SLOP NEG

Related Commands
[:SOURce<n>]:BURSt:MODE TRIGgered|GATed|INFinity
[:SOURce<n>]:BURSt:MODE?

[: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 to internal, external or manual.
Query the trigger source of the Burst.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal|EXTernal|MANual	INTernal

Return Format

The query returns INT, EXT or MAN.

Example

The command below selects manual trigger source.

```
:BURSt:TRIGger:SOURce MANual
```

The query below returns MAN.

```
:BURSt:TRIGger:SOURce?
```

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

Syntax

[:SOURce<n>]:BURSt:TRIGger:TRIGOut OFF|POSitive|NEGative
[:SOURce<n>]:BURSt:TRIGger:TRIGOut?

Description

Specify the edge type of the trigger output signal.
Query the edge type of the trigger output signal.

Parameter

Name	Type	Range	Default
--	Keyword	OFF|POSitive|NEGative	OFF

Explanation

This command is only available when internal or manual trigger source is selected.

Return Format

The query returns OFF, POS or NEG.

Example

The command below sets the edge type of the trigger output signal to rising edge.

```
:BURSt:TRIGger:TRIGout POSitive
```

The query below returns POS.

```
:BURSt:TRIGger:TRIGout POSitive
```

Related Commands

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

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

[:SOURce<n>]:FREQuency

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

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

[:SOURce<n>]:FREQuency[:FIXed] <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:SPAN <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STARt <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STOP <frequency>|MINimum|MAXimum

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

[: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 and the default unit is "Hz".
Query the center frequency of the sweep.

Parameter

Name	Type	Range[1]	Default
<frequency>	Consecutive Real Number	Refer to the **Note** below	550 Hz

Note[1]: different sweep waveforms correspond to different center frequency ranges.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Arb: 1 μHz to 40 MHz (except DC in the built-in waveforms)

Explanation

In the sweep mode, the start frequency, end frequency, center frequency and frequency span are interrelated and their relations fulfill the following equations.
center frequency = (| start frequency + end frequency|) /2
frequency span = end frequency - start frequency

Return Format

The query returns the center frequency in scientific notation.

Example

The command below sets the center frequency to 600 Hz.

```
:FREQuency:CENTer 600
```

The query below returns 6.000000E+02.

```
:FREQuency:CENTer?
```

Related Commands

[:SOURce<n>]:FREQuency:SPAN <frequency>|MINimum|MAXimum
[:SOURce<n>]:FREQuency:SPAN? [MINimum|MAXimum]
[:SOURce<n>]:FREQuency:STARt <frequency>|MINimum|MAXimum
[:SOURce<n>]:FREQuency:STARt? [MINimum|MAXimum]
[:SOURce<n>]:FREQuency:STOP <frequency>|MINimum|MAXimum
[:SOURce<n>]:FREQuency:STOP? [MINimum|MAXimum]

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

Syntax

```
[:SOURce<n>]:FREQuency[:FIXed] <frequency>|MINimum|MAXimum
[:SOURce<n>]:FREQuency[:FIXed]? [MINimum|MAXimum]
```

Description

Set the frequency of the basic waveform and the default unit is "Hz".
Query the frequency of the basic waveform.

Parameter

Name	Type	Range[1]	Default
<frequency>	Consecutive Real Number	Refer to the **Note** blow	1 kHz

Note[1]: different waveforms correspond to different frequency ranges.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Pulse: 1 μHz to 40 MHz
Arb: 1 μHz to 40 MHz
Harmonic: 1 μHz to 80 MHz

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the frequency to 1.5 kHz.

```
:FREQuency 1500
```

The query below returns 1.500000E+03.

```
:FREQuency?
```

[: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 and the default unit is "Hz".
Query the frequency span.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	Refer to the introduction in the User's Guide	900 Hz

Explanation

In the sweep mode, the start frequency, end frequency, center frequency and frequency span are interrelated and their relations fulfill the following equations.

center frequency = (| start frequency + end frequency|) /2

frequency span = end frequency - start frequency

Return Format

The query returns the frequency span in scientific notation.

Example

The command below sets the frequency span to 1100 Hz.

```
:FREQuency:SPAN 1100
```

The query below returns 1.100000E+03.

```
:FREQuency:SPAN?
```

Related Commands

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

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

[:SOURce<n>]:FREQuency:STARt <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STOP <frequency>|MINimum|MAXimum

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

[: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 and the default unit is "Hz".
Query the start frequency of the sweep.

Parameter

Name	Type	Range[1]	Default
<frequency>	Consecutive Real Number	Refer to the **Note** below	100 Hz

Note[1]: different sweep waveforms correspond to different start frequency ranges.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Arb: 1 μHz to 40 MHz (except DC in the built-in waveforms)

Explanation

In the sweep mode, the start frequency, end frequency, center frequency and frequency span are interrelated and their relations fulfill the following equations.
center frequency = (| start frequency + end frequency|) /2
frequency span = end frequency - start frequency

Return Format

The query returns the start frequency in scientific notation.

Example

The command below sets the start frequency to 500 Hz.

```
:FREQuency:STARt 500
```

The query below returns 5.000000E+02.

```
:FREQuency:STARt?
```

Related Commands

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

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

[:SOURce<n>]:FREQuency:SPAN <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STOP <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STOP

Syntax

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

Description

Set the end frequency of the sweep and the default unit is "Hz".
The query returns the end frequency of the sweep.

Parameter

Name	Type	Range[1]	Default
<frequency>	Consecutive Real Number	Refer to the **Note** below	1 kHz

Note[1]: different sweep waveforms correspond to different end frequency ranges.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Arb: 1 μHz to 40 MHz (except DC in the built-in waveforms)

Explanation

In the sweep mode, the start frequency, end frequency, center frequency and frequency span are interrelated and their relations fulfill the following equations.
center frequency = (| start frequency + end frequency|) /2
frequency span = end frequency - start frequency

Return Format

The query returns the end frequency in scientific notation.

Example

The command below sets the end frequency to 5 kHz.

```
:FREQuency:STOP 5000
```

The query below returns 5.000000E+03.

```
:FREQuency:STOP?
```

Related Commands

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

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

[:SOURce<n>]:FREQuency:SPAN <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FREQuency:STARt <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:FUNCtion

[:SOURce<n>]:FUNCtion:ARB:STEP

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry <symmetry>|MINimum|MAXimum

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry? [MINimum|MAXimum]

[:SOURce<n>]:FUNCtion[:SHAPe] <wave>

[:SOURce<n>]:FUNCtion[:SHAPe]?

[:SOURce<n>]:FUNCtion:SQUare:DCYCle <percent>|MINimum|MAXimum

[:SOURce<n>]:FUNCtion:SQUare:DCYCle? [MINimum|MAXimum]

[:SOURce<n>]:FUNCtion:ARB:STEP

Syntax
[:SOURce<n>]:FUNCtion:ARB:STEP

Description
Enable the step-by-step output of arbitrary waveform.

Explanation
In step-by-step output mode, the generator calculates the frequency (30.517578125 kHz) of the output signal automatically according to the waveform length (16,384) and sample rate. The generator outputs waveform point by point at this fixed frequency. The step-by-step output mode can prevent the loss of important waveform points.
This command is only available when the arbitrary waveform function is enabled.

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry

Syntax

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry <symmetry>|MINimum|MAXimum
[:SOURce<n>]:FUNCtion:RAMP:SYMMetry? [MINimum|MAXimum]

Description

Set the symmetry of the ramp and the unit is %.
Query the symmetry of the ramp.

Parameter

Name	Type	Range	Default
<symmetry>	Consecutive Real Number	0% to 100%	50%

Return Format

The query returns the symmetry in scientific notation.

Example

The command below sets the symmetry of the ramp to 80%.

```
:FUNCtion:RAMP:SYMMetry 80
```

The query below returns 8.000000E+01.

```
:FUNCtion:RAMP:SYMMetry?
```

[:SOURce<n>]:FUNCtion[:SHAPe]

Syntax

```
[:SOURce<n>]:FUNCtion[:SHAPe] <wave>
[:SOURce<n>]:FUNCtion[:SHAPe]?
```

Description

Select waveform.
Query the waveform currently selected.

Parameter

Name	Type	Range
<wave>	Keyword	SINusoid| SQUare| RAMP| PULSe| NOISe| USER| HARMonic| CUSTom| DC| ABSSINE| ABSSINEHALF| AMPALT| ATTA NPULSE| PPULSE| SINETRA| SINEVER| STAIRDN| STAIRUD| STAIRUP| TRAPEZIA| BANDLIMITED| BUTTERWORTH| COMBIN| CPULSE| CWPULSE| DAMPEDOSC| DUALTONE| GAMMA| GATEVIBR| LFMPULSE| MCNOSIE| NIMHDISCH RIPPLE| ROUNDHALF| ROUNDPM| STEPRESP| SWINGOSC| TV| VOICE| THREEAM| THREEFM| THREEPM| THREEP EEG| EMG| PULSILOGRAM| RESSPEED| LFPULSE| TENS1| TENS2| TENS3| IGNITION| ISO167502SP| ISO167502V ISO76372TP2B| ISO76372TP3A| ISO76372TP3B| ISO76372TP4| ISO76372TP5A| ISO76372TP5B| SCR| SURGE CUBIC| DIRICHLET| ERF| ERFC| ERFCINV| ERFINV| EXPFALL| EXPRISE| GAUSS| HAVERSINE| LAGUERRE| LAPLACE LORENTZ| MAXWELL| RAYLEIGH| VERSIERA| WEIBULL| X2DATA| COSH| COSINT| COT| COTHCON| COTHPRO| CSC CSCHPRO| RECIPCON| RECIPPRO| SECCON| SECPRO| SECH| SINC| SINH| SININT| SQRT| TAN| TANH| ACOS| ACOSH ACOTHCON| ACOTHPRO| ACSCCON| ACSCPRO| ACSCHCON| ACSCHPRO| ASECCON| ASECPRO| ASECH| ASIN| AS BARTHANN| BLACKMAN| BLACKMANH| BOHMANWIN| BOXCAR| CHEBWIN| FLATTOPWIN| HAMMING| HANNING| PARZENWIN| TAYLORWIN| TRIANG| TUKEYWIN

Explanation

This command selects the output waveform of the instrument when Mod, Sweep and Burst are disabled.
This command selects the carrier waveform corresponding to the function when Mod, Sweep or Burst is currently enabled.
When the **:FUNCtion DC** command is received, the instrument will disable Mod, Sweep or Burst if it is currently enabled.

Return Format

The query returns SIN, SQU, RAMP, PULSE, NOISE, HARMONIC or CUSTOM.
When waveform other than SINusoid|SQUare|RAMP|PULSe|NOISe|USER|HARMonic|CUSTom| is selected, the return value is the corresponding parameter in the table above.
Note: when USER (arbitrary waveform) is currently selected, the query returns the return value corresponding to the built-in waveform currently selected in the arbitrary waveform.

Example

The command below selects square waveform.

```
:FUNCtion SQUare
```

The query below returns SQU.

```
:FUNCtion?
```

[:SOURce<n>]:FUNCtion:SQUare:DCYCle

Syntax

[:SOURce<n>]:FUNCtion:SQUare:DCYCle <percent>|MINimum|MAXimum
[:SOURce<n>]:FUNCtion:SQUare:DCYCle? [MINimum|MAXimum]

Description

Set the duty cycle of the square waveform and the unit is %.
Query the duty cycle of the square waveform.

Parameter

Name	Type	Range[1]	Default
<percent>	Consecutive Real Number	Refer to the **Note** below	50%

Note[1]: the range of the duty cycle is limited by the frequency/period setting.
frequency ≤ 10 MHz: 20% to 80%
10 MHz < frequency ≤ 40 MHz: 40% to 60%
frequency > 40 MHz: 50% (fixed)

Return Format

The query returns the duty cycle in scientific notation.

Example

The command below sets the duty cycle of the square waveform to 80%.
:FUNCtion:SQUare:DCYCle 80% or :FUNCtion:SQUare:DCYCle 80
The query below returns 8.000000E+01.
:FUNCtion:SQUare:DCYCle?

[:SOURce<n>]:HARMonic

[:SOURce<n>]:HARMonic:AMPL <sn>,<value>|MINimum|MAXimum

[:SOURce<n>]:HARMonic:AMPL? <sn>[,MINimum|MAXimum]

[:SOURce<n>]:HARMonic:ORDEr <value>|MINimum|MAXimum

[:SOURce<n>]:HARMonic:ORDEr? [MINimum|MAXimum]

[:SOURce<n>]:HARMonic:PHASe <sn>,<value>|MINimum|MAXimum

[:SOURce<n>]:HARMonic:PHASe? <sn>[,MINimum|MAXimum]

[:SOURce<n>]:HARMonic:TYPe EVEN|ODD|ALL|USER

[:SOURce<n>]:HARMonic:TYPe?

[:SOURce<n>]:HARMonic:USER <user>

[:SOURce<n>]:HARMonic:USER?

[: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.
Query the amplitude of the specified order of harmonic.

Parameter

Name	Type	Range	Default
<sn>	Integer	2 to 16	2
<value>	Integer	Limited by the impedance and frequency settings, please refer to the User's Guide	1.2647 Vpp

Return Format

The query returns the amplitude of the specified order of harmonic in scientific notation.

Example

The command below sets the amplitude of the second order of harmonic to 2.5 Vpp.

```
:HARMonic:AMPL 2,2.5
```

The query below returns 2.500000E+00.

```
:HARMonic:AMPL? 2
```

[:SOURce<n>]:HARMonic:ORDEr

Syntax
[:SOURce<n>]:HARMonic:ORDEr <value>|MINimum|MAXimum
[:SOURce<n>]:HARMonic:ORDEr? [MINimum|MAXimum]

Description
Set the order of the harmonic.
Query the order of the harmonic.

Parameter

Name	Type	Range[1]	Default
<value>	Integer	Refer to the **Note** below	2

Note[1]: 2 to the maximum output frequency ÷ fundamental waveform frequency of the instrument; it should be an integer and the maximum is 16.

Return Format

The query returns the order of the harmonic in scientific notation.

Example

The command below sets the order of the harmonic to 7.

```
:HARMonic:ORDEr 7
```

The query below returns 7.000000E+00.

```
:HARMonic:ORDEr?
```

[: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.
Query the phase of the specified order of harmonic.

Parameter

Name	Type	Range	Default
<sn>	Integer	2 to 16	2
<value>	Integer	0° to 360°	0°

Return Format

The query returns the phase of the specified order of harmonic in scientific notation.

Example

The command below sets the phase of the second order of harmonic to 90°.

```
:HARMonic:PHASe 2,90
```

The query below returns 9.000000E+01.

```
:HARMonic:PHASe? 2
```

[:SOURce<n>]:HARMonic:TYPe

Syntax

[:SOURce<n>]:HARMonic:TYPe EVEN|ODD|ALL|USER
[:SOURce<n>]:HARMonic:TYPe?

Description

Set the harmonic type to EVEN, ODD, ALL or USER.
Query the harmonic type.

Parameter

Name	Type	Range	Default
--	Keyword	EVEN| ODD| ALL| USER	EVEN

Return Format

The query returns EVEN, ODD, ALL or USER.

Example

The command below sets the harmonic type to ODD.

```
:HARMonic:TYPe ODD
```

The query below returns ODD.

```
:HARMonic:TYPe?
```

[: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	X000000000000000 to X111111111111111	X000000000000000

Explanation

In the user-defined harmonics ([:SOURce<n>]:HARMonic:TYPe), users can set the order of harmonic of the user-defined output harmonic and the highest order is 16. A 16-bit binary data is used to denote the output statuses of the 16 orders of harmonics with the leftmost bit denoting the fundamental waveform (it is always X and cannot be modified) and the remaining 15 bits denoting the second order of harmonic to the 16th order of harmonic respectively 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 16-bit data to X001000000000001 which denotes outputting the fundamental waveform, the 4th order of harmonic and the 16th order of harmonic.

When [:SOURce<n>]

is omitted, the command sets the related parameters of CH1 by default.

Return Format

The query returns a string between X000000000000000 and X111111111111111.

For example, X001000000000001.

Example

The command below sets the user-defined harmonic output of CH1 to the fundamental waveform, the 4th order of harmonic and the 16th order of harmonic.

```
:HARMonic:USER X001000000000001
```

The query below returns X001000000000001.

```
:HARMonic:USER?
```

[:SOURce<n>]:MARKer

[:SOURce<n>]:MARKer:FREQuency <frequency>|MINimum|MAXimum

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

[:SOURce<n>]:MARKer[:STATE] ON|OFF

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

[:SOURce<n>]:MARKer:FREQuency

Syntax

```
[:SOURce<n>]:MARKer:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MARKer:FREQuency? [MINimum|MAXimum]
```

Description

Set the mark frequency and the default unit is "Hz".
Query the mark frequency.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	Limited by the start frequency and end frequency	550 Hz

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the mark frequency to 800 Hz.

```
:MARKer:FREQuency 800
```

The query below returns 8.000000E+02.

```
:MARKer:FREQuency?
```

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

Syntax

[:SOURce<n>]:MARKer[:STATe] ON|OFF
[:SOURce<n>]:MARKer[:STATe]?

Description

Enable or disable the frequency mark function of the sweep.
Query the status of the frequency mark function.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

The frequency mark function is not available in step sweep mode.

Return Format

The query returns ON or OFF.

Example

The command below enables the frequency mark function of the sweep.

```
:MARKer ON
```

The query below returns ON.

```
:MARKer?
```

[:SOURce<n>]:MOD

[:SOURce<n>]:MOD[:STATe] ON|OFF
[:SOURce<n>]:MOD[:STATe]?
[:SOURce<n>]:MOD:TYPe
AM|FM|PM|ASK|FSK|PSK|PWM|BPSK|QPSK|3FSK|4FSK|OSK
[:SOURce<n>]:MOD:TYPe?
AM
[:SOURce<n>]:MOD:AM[:DEPTh] <depth>|MINimum|MAXimum
[:SOURce<n>]:MOD:AM[:DEPTh]? [MINimum|MAXimum]
[:SOURce<n>]:MOD:AM:INTernal:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:AM:INTernal:FREQuency? [MINimum|MAXimum]
[:SOURce<n>]:MOD:AM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:AM:INTernal:FUNCtion?
[:SOURce<n>]:MOD:AM:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:AM:SOURce?
FM
[:SOURce<n>]:MOD:FM[:DEViation] <deviation>|MINimum|MAXimum
[:SOURce<n>]:MOD:FM[:DEViation]? [MINimum|MAXimum]
[:SOURce<n>]:MOD:FM:INTernal:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:FM:INTernal:FREQuency? [MINimum|MAXimum]
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion?
[:SOURce<n>]:MOD:FM:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:FM:SOURce?
PM
[:SOURce<n>]:MOD:PM[:DEViation] <deviation>|MINimum|MAXimum
[:SOURce<n>]:MOD:PM[:DEViation]? [MINimum|MAXimum]
[:SOURce<n>]:MOD:PM:INTernal:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:PM:INTernal:FREQuency? [MINimum|MAXimum]
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion?
[:SOURce<n>]:MOD:PM:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:PM:SOURce?

ASK

[:SOURce<n>]:MOD:ASKey:AMPLitude <amplitude>| MINimum| MAXimum

[:SOURce<n>]:MOD:ASKey:AMPLitude? [MINimum| MAXimum]

[:SOURce<n>]:MOD:ASKey:INTernal[:RATE] <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:ASKey:INTernal[:RATE]? [MINimum| MAXimum]

[:SOURce<n>]:MOD:ASKey:SOURce INTernal| EXTernal

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

[:SOURce<n>]:MOD:ASKey:POLarity POSitive| NEGative

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

FSK

[:SOURce<n>]:MOD:FSKey[:FREQuency] <frequency>| MINimum| MAXimum

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

[:SOURce<n>]:MOD:FSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:FSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:FSKey:SOURce INTernal| EXTernal

[:SOURce<n>]:MOD:FSKey:SOURce?

[:SOURce<n>]:MOD:FSKey:POLarity POSitive| NEGative

[:SOURce<n>]:MOD:FSKey:POLarity?

PSK

[:SOURce<n>]:MOD:PSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:PSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:PSKey:PHASe <phase>| MINimum| MAXimum

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

[:SOURce<n>]:MOD:PSKey:POLarity POSitive| NEGative

[:SOURce<n>]:MOD:PSKey:POLarity?

[:SOURce<n>]:MOD:PSKey:SOURce INTernal| EXTernal

[:SOURce<n>]:MOD:PSKey:SOURce?

BPSK

[:SOURce<n>]:MOD:BPSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:BPSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:BPSKey:PHASe <phase>| MINimum| MAXimum

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

[:SOURce<n>]:MOD:BPSKey:DATA 01| 10| PN15| PN21

[:SOURce<n>]:MOD:BPSKey:DATA?

QPSK

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe1 <phase>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe1? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe2 <phase>|MINimum|MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe2? [MINimum|MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe3 <phase>|MINimum|MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe3? [MINimum|MAXimum]

[:SOURce<n>]:MOD:QPSKey:DATA PN15|PN21

[:SOURce<n>]:MOD:QPSKey:DATA?

3FSK

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE <rate>|MINimum|MAXimum

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE? [MINimum|MAXimum]

[:SOURce<n>]:MOD:3FSKey[:FREQuency] <n>, <frequency>|MINimum|MAXimum

[:SOURce<n>]:MOD:3FSKey[:FREQuency]? <n>[,MINimum|MAXimum]

4FSK

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE <rate>|MINimum|MAXimum

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE? [MINimum|MAXimum]

[:SOURce<n>]:MOD:4FSKey[:FREQuency] <n>, <frequency>|MINimum|MAXimum

[:SOURce<n>]:MOD:4FSKey[:FREQuency]? <n>[,MINimum|MAXimum]

OSK

[:SOURce<n>]:MOD:OSKey:SOURce INTernal|EXTernal

[:SOURce<n>]:MOD:OSKey:SOURce?

[:SOURce<n>]:MOD:OSKey:INTernal:RATE <rate>|MINimum|MAXimum

[:SOURce<n>]:MOD:OSKey:INTernal:RATE? [MINimum|MAXimum]

[:SOURce<n>]:MOD:OSKey:TIME <time>|MINimum|MAXimum

[:SOURce<n>]:MOD:OSKey:TIME? [MINimum|MAXimum]

PWM

[:SOURce<n>]:MOD:PWM:INTernal:FREQuency <frequency>|MINimum|MAXimum

[:SOURce<n>]:MOD:PWM:INTernal:FREQuency? [MINimum|MAXimum]

[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER

[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion?

[:SOURce<n>]:MOD:PWM:SOURce INTernal|EXTernal

[:SOURce<n>]:MOD:PWM:SOURce?

[:SOURce<n>]:MOD:PWM[:DEViation]:DCYCle <percent>|MINimum|MAXimum

[:SOURce<n>]:MOD:PWM[:DEViation]:DCYCle? [MINimum|MAXimum]

[:SOURce<n>]:MOD:PWM[:DEViation][:WIDTh] <deviation>|MINimum|MAXimum

[:SOURce<n>]:MOD:PWM[:DEViation][:WIDTh]? [MINimum|MAXimum]

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

Syntax

[:SOURce<n>]:MOD[:STATe] ON|OFF
[:SOURce<n>]:MOD[:STATe]?

Description

Enable or disable the modulation function.
Query the status of the modulation function.

Parameter

Name	Type	Range	Default
--	Bool	OFF|ON	OFF

Explanation
When Mod is enabled, Sweep or Burst will be disabled automatically (if it is currently enabled).

Return Format
The query returns ON or OFF.

Example
The command below enables the modulation function.

```
:MOD ON
```

The query below returns ON.

```
:MOD?
```

[:SOURce<n>]:MOD:TYPe

Syntax

```
[:SOURce<n>]:MOD:TYPe AM|FM|PM|ASK|FSK|PSK|PWM|BPSK|QPSK|3FSK|4FSK|OSK
[:SOURce<n>]:MOD:TYPe?
```

Description

Select the modulation mode.
Query the modulation mode.

Parameter

Name	Type	Range	Default
--	Keyword	AM|FM|PM|ASK|FSK|PSK|PWM|BPSK|QPSK|3FSK|4FSK|OSK	AM

Explanation

PWM is only available when Pulse is enabled.

OSK is only available when Sine is enabled.

Return Format

The query returns AM, FM, PM, ASK, FSK, PSK, PWM, BPSK, QPSK, 3FSK, 4FSK or OSK.

Example

The command below selects FSK.

```
:MOD:TYPe FSK
```

The query below returns FSK.

```
:MOD:TYPe?
```

[: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 in percentage.
Query the AM modulation depth.

Parameter

Name	Type	Range	Default
<depth>	Consecutive Real Number	0% to 120%	100%

Explanation

The range of <depth> is from 0% to 120% and setting without % is supported.
In 0% modulation, the output amplitude is half of the specified value.
In 100% modulation, the output amplitude is equal to the specified value.
In >100% modulation, the output amplitude of the instrument would not exceed 10 Vpp (50 Ω load).

Return Format

The query returns the modulation depth in scientific notation.

Example

The command below sets the modulation depth to 80%.

```
:MOD:AM 80
```

The query below returns 8.000000E+01.

```
:MOD:AM?
```

[: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 frequency of the AM modulating waveform and the default unit is "Hz".
Query the frequency of the AM modulating waveform.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 50 kHz	100 Hz

Explanation

This comamnd is only available when internal modulation source is selected.

Return Format

The query returns the frequency in scientific notation.

Example

The comamnd below sets the frequency of the modulating waveform to 25 Hz.

```
:MOD:AM:INTernal:FREQuency 25
```

The query below returns 2.500000E+01.

```
:MOD:AM:INTernal:FREQuency?
```

Related Commands

[:SOURce<n>]:MOD:AM:SOURce INTernal|EXTernal

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

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

Syntax

[:SOURce<n>]:MOD:AM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:AM:INTernal:FUNCtion?

Description

Select the AM modulating waveform.
Query the AM modulating waveform.

Parameter

Name	Type	Range	Default
--	Keyword	SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER	SINusoid

Explanation

This command is only available when internal modulation source is selected.

Return Format

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

Example

The command below selects square waveform as the modulating waveform.

```
:MOD:AM:INTernal:FUNCtion SQUare
```

The query below returns SQU.

```
:MOD:AM:INTernal:FUNCtion?
```

Related Commands

[:SOURce<n>]:MOD:AM:SOURce INTernal| EXTernal

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

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

Syntax

[:SOURce<n>]:MOD:AM:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:AM:SOURce?

Description

Set the AM modulation source to INTernal or EXTernal.
Query the AM modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal|EXTernal	INTernal

Return Format
The query returns INT or EXT.

Example
The command below sets the modulation source to EXTernal.

```
:MOD:AM:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:AM:SOURce?
```

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

Syntax
[:SOURce<n>]:MOD:FM[:DEViation] <deviation>|MINimum|MAXimum
[:SOURce<n>]:MOD:FM[:DEViation]? [MINimum|MAXimum]

Description
Set the frequency deviation of FM and the default unit is "Hz".
Query the frequency deviation of FM.

Parameter

Name	Type	Range	Default
<deviation>	Consecutive Real Number	Refer to the **Explanation** below	1 kHz

Explanation

The frequency deviation should fulfill the following requirements.

- It should be lower than or equal to the carrier frequency.
- Frequency deviation + carrier frequency ≤ the upper limit of the current carrier frequency + 1 kHz.

Return Format

The query returns the deviation in scientific notation.

Example

The command below sets the frequency deviation to 800 Hz.

```
:MOD:FM 800
```

The query below returns 8.000000E+02.

```
:MOD:FM?
```

[: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 frequency of the FM modulating waveform and the default unit is "Hz".
Query the frequency of FM modulating waveform.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 50 kHz	100 Hz

Explanation
This command is only available when internal modulation source is selected.

Return Format
The query returns the frequency in scientific notation.

Example
The command below sets the frequency of the modulating waveform to 25 Hz.

```
:MOD:FM:INTernal:FREQuency 25
```

The query below returns 2.500000E+01.

```
:MOD:FM:INTernal:FREQuency?
```

Related Commands
[:SOURce<n>]:MOD:FM:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:FM:SOURce?

[:SOURce<n>]:MOD:FM:INTernal:FUNCtion

Syntax

```
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion?
```

Description

Select the FM modulating waveform.
Query the FM modulating waveform.

Parameter

Name	Type	Range	Default
--	Keyword	SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER	SINusoid

Explanation

This command is only available when internal modulation source is selected.

Return Format

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

Example

The command below selects square waveform as the modulating waveform.

```
:MOD:FM:INTernal:FUNCtion SQUare
```

The query below returns SQU.

```
:MOD:FM:INTernal:FUNCtion?
```

Related Commands

[:SOURce<n>]:MOD:FM:SOURce INTernal| EXTernal

[: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 to INTernal or EXTernal.
Query the FM modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format

The query returns INT or EXT.

Example

The command below sets the modulation source to EXTernal.

```
:MOD:FM:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:FM:SOURce?
```

[:SOURce<n>]:MOD:PM[:DEViation]

Syntax

[:SOURce<n>]:MOD:PM[:DEViation] <deviation>|MINimum|MAXimum
[:SOURce<n>]:MOD:PM[:DEViation]? [MINimum|MAXimum]

Description

Set the phase deviation of PM and the default unit is "°".
Query the phase deviation of PM.

Parameter

Name	Type	Range	Default
<deviation>	Consecutive Real Number	0° to 360°	90°

Return Format

The query returns the phase deviation in scientific notation.

Example

The command below sets the phase deviation to 180°.

```
:MOD:PM 180
```

The query below returns 1.800000E+02.

```
:MOD:PM?
```

[:SOURce<n>]:MOD:PM:INTernal:FREQuency

Syntax

[:SOURce<n>]:MOD:PM:INTernal:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:PM:INTernal:FREQuency?

Description

Set the frequency of the PM modulating waveform and the default unit is "Hz".
Query the frequency of PM modulating waveform.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 50 kHz	100 Hz

Explanation

This command is only available when internal modulation source is selected.

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the frequency of the modulating waveform to 25 Hz.

```
:MOD:PM:INTernal:FREQuency 25
```

The query below returns 2.500000E+01.

```
:MOD:PM:INTernal:FREQuency?
```

Related Commands

[:SOURce<n>]:MOD:PM:SOURce INTernal|EXTernal

[:SOURce<n>]:MOD:PM:SOURce?

[:SOURce<n>]:MOD:PM:INTernal:FUNCtion

Syntax

```
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion?
```

Description

Select the PM modulating waveform.
Query the PM modulating waveform.

Parameter

Name	Type	Range	Default
--	Keyword	SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER	SINusoid

Explanation

This command is only available when internal modulation source is selected.

Return Format

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

Example

The command below selects square waveform as the modulating waveform.

```
:MOD:PM:INTernal:FUNCtion SQUare
```

The query below returns SQU.

```
:MOD:PM:INTernal:FUNCtion?
```

Related Commands

[:SOURce<n>]:MOD:PM:SOURce INTernal| EXTernal

[: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 to source to INTernal or EXTernal.
Query the PM modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format

The query returns INT or EXT.

Example

The command below sets the modulation source to EXTernal.

```
:MOD:PM:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:PM:SOURce?
```

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

Syntax

```
[:SOURce<n>]:MOD:ASKey:AMPLitude <amplitude>|MINimum|MAXimum
[:SOURce<n>]:MOD:ASKey:AMPLitude? [MINimum|MAXimum]
```

Description

Set the amplitude of the ASK modulating waveform and the default unit is "Vpp".
Query the amplitude of the ASK modulating waveform.

Parameter

Name	Type	Range	Default
<amplitude>	Consecutive Real Number	0 Vpp to 10 Vpp (HighZ)	2 Vpp

Return Format
The query returns the amplitude in scientific notation.

Example
The command below sets the amplitude of the modulating waveform to 2.5 Vpp.

```
:MOD:ASKey:AMPLitude 2.5
```

The query below returns 2.500000E+00.

```
:MOD:ASKey:AMPLitude?
```

[: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 rate and the default unit is "Hz".
Query the ASK rate.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Explanation
This command is only available when internal modulation source is selected.

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the ASK rate to 500 Hz.

```
:MOD:ASKey:INTernal 500
```

The query below returns 5.000000E+02.

```
:MOD:ASKey:INTernal?
```

Related Commands
[:SOURce<n>]:MOD:ASKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:ASKey:SOURce?

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

Syntax

[:SOURce<n>]:MOD:ASKey:POLarity POSitive|NEGative
[:SOURce<n>]:MOD:ASKey:POLarity?

Description

Select the positive or negative polarity of the modulating waveform to control the amplitude output.

Query the ASK modulating polarity.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive| NEGative	POSitive

Return Format

The query returns POS or NEG.

Example

The command below selects the negative polarity of the modulating waveform to control the amplitude output.

```
:MOD:ASKey:POLarity NEGative
```

The query below returns NEG.

```
:MOD:ASKey:POLarity?
```

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

Syntax

[:SOURce<n>]:MOD:ASKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:ASKey:SOURce?

Description

Set the ASK modulation source to INTernal or EXTernal.
Query the ASK modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format

The query returns INT or EXT.

Example

The command below sets the modulation source to EXTernal.

```
:MOD:ASKey:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:ASKey:SOURce?
```

[: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.
Query the FSK hop frequency.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	Refer to the **Explanation** below	100 Hz

Explanation

For different carrier waveforms, the frequency ranges <frequency> are different.
Sine: 1 µHz to 160 MHz
Square: 1 µHz to 50 MHz
Ramp: 1 µHz to 4 MHz
Arb: 1 µHz to 40 MHz (except DC in the built-in waveforms)

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the FSK hop frequency to 300 Hz.

```
:MOD:FSKey 300
```

The query below returns 3.000000E+02.

```
:MOD:FSKey?
```

[: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 rate and the default unit is "Hz".
Query the FSK rate.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Explanation
This command is only available when internal modulation source is selected.

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the FSK rate to 150 Hz.

```
:MOD:FSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:FSKey:INTernal:RATE?
```

Related Commands
[:SOURce<n>]:MOD:FSKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:FSKey:SOURce?

[:SOURce<n>]:MOD:FSKey:POLarity

Syntax

[:SOURce<n>]:MOD:FSKey:POLarity POSitive|NEGative
[:SOURce<n>]:MOD:FSKey:POLarity?

Description

Select the positive or negative polarity of the modulating waveform to control the frequency output.

Query the FSK modulating polarity.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive|NEGative	POSitive

Return Format

The query returns POS or NEG.

Example

The command below selects the negative polarity of the modulating waveform to control the frequency output.

```
:MOD:FSKey:POLarity NEGative
```

The query below returns NEG.

```
:MOD:FSKey:POLarity?
```

[:SOURce<n>]:MOD:FSKey:SOURce

Syntax

[:SOURce<n>]:MOD:FSKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:FSKey:SOURce?

Description

Set the FSK modulation source to INTernal or EXTernal.
Query the FSK modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format

The query returns INT or EXT.

Example

The command below sets the modulation source to EXTernal.

```
:MOD:FSKey:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:FSKey:SOURce?
```

[: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 rate and the default unit is "Hz".
Query the PSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Explanation
This command is only available when internal modulation source is selected.

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the PSK rate to 150 Hz.

```
:MOD:PSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:PSKey:INTernal:RATE?
```

Related Commands
[:SOURce<n>]:MOD:PSKey:SOURce INTernal|EXTernal
[: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 phase of the PSK modulating waveform.
Query the phase of the PSK modulating waveform.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	180°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the phase of the PSK modulating waveform to 90°.

```
:MOD:PSKey:PHASe 90
```

The query below returns 9.000000E+01.

```
:MOD:PSKey:PHASe?
```

[:SOURce<n>]:MOD:PSKey:POLarity

Syntax

[:SOURce<n>]:MOD:PSKey:POLarity POSitive|NEGative
[:SOURce<n>]:MOD:PSKey:POLarity?

Description

Select the positive or negative polarity of the modulating waveform to control the phase output.

Query the PSK modulating polarity.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive|NEGative	POSitive

Return Format

The query returns POS or NEG.

Example

The command below selects the negative polarity of the modulating waveform to control the phase output.

```
:MOD:PSKey:POLarity NEGative
```

The query below returns NEG.

```
:MOD:PSKey:POLarity?
```

[:SOURce<n>]:MOD:PSKey:SOURce

Syntax

[:SOURce<n>]:MOD:PSKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:PSKey:SOURce?

Description

Set the PSK modulation source to INTernal or EXTernal.
Query the PSK modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format

The query returns INT or EXT.

Example

The command below sets the modulation source to EXTernal.

```
:MOD:PSKey:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:PSKey:SOURce?
```

[:SOURce<n>]:MOD:BPSKey:DATA

Syntax

```
[:SOURce<n>]:MOD:BPSKey:DATA 01|10|PN15|PN21
[:SOURce<n>]:MOD:BPSKey:DATA?
```

Description

Set the modulation source of BPSK.
Query the modulation source of BPSK.

Parameter

Name	Type	Range	Default
--	Keyword	01|10|PN15|PN21	PN15

Return Format

The query returns 01, 10, PN15 or PN21.

Example

The command below sets the modulation source to PN21.

```
:MOD:BPSKey:DATA PN21
```

The query below returns PN21.

```
:MOD:BPSKey:DATA?
```

[:SOURce<n>]:MOD:BPSKey:INTernal:RATE

Syntax

```
[:SOURce<n>]:MOD:BPSKey:INTernal:RATE <rate>|MINimum|MAXimum
[:SOURce<n>]:MOD:BPSKey:INTernal:RATE? [MINimum|MAXimum]
```

Description

Set the BPSK rate.
Query the BPSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the BPSK rate to 150 Hz.

```
:MOD:BPSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:BPSKey:INTernal:RATE?
```

[:SOURce<n>]:MOD:BPSKey:PHASe

Syntax

```
[:SOURce<n>]:MOD:BPSKey:PHASe <phase>|MINimum|MAXimum
[:SOURce<n>]:MOD:BPSKey:PHASe? [MINimum|MAXimum]
```

Description

Set the BPSK phase.
Query the BPSK phase.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	180°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the BPSK phase to 90°.

```
:MOD:BPSKey:PHASe 90
```

The query below returns 9.000000E+01.

```
:MOD:BPSKey:PHASe?
```

[:SOURce<n>]:MOD:QPSKey:DATA

Syntax

[:SOURce<n>]:MOD:QPSKey:DATA PN15|PN21
[:SOURce<n>]:MOD:QPSKey:DATA?

Description

Set the modulation source of QPSK.
Query the modulation source of QPSK.

Parameter

Name	Type	Range	Default
--	Keyword	PN15|PN21	PN15

Return Format

The query returns PN15 or PN21.

Example

The command below sets the modulation source to PN21.

```
:MOD:QPSKey:DATA PN21
```

The query below returns PN21.

```
:MOD:QPSKey:DATA?
```

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE

Syntax

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE <rate>|MINimum|MAXimum
[:SOURce<n>]:MOD:QPSKey:INTernal:RATE? [MINimum|MAXimum]

Description

Set the QPSK rate.
Query the QPSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Return Format

The query returns the rate in scientific notation.

Example

The command below sets the QPSK rate to 150 Hz.

```
:MOD:QPSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:QPSKey:INTernal:RATE?
```

[:SOURce<n>]:MOD:QPSKey:PHASe1

Syntax

[:SOURce<n>]:MOD:QPSKey:PHASe1 <phase>|MINimum|MAXimum
[:SOURce<n>]:MOD:QPSKey:PHASe1? [MINimum|MAXimum]

Description

Set the QPSK modulating phase 1.
Query the QPSK modulating phase 1.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	45°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the QPSK modulating phase 1 to 90°.

```
:MOD:QPSKey:PHASe1 90
```

The query below returns 9.000000E+01.

```
:MOD:QPSKey:PHASe1?
```

[:SOURce<n>]:MOD:QPSKey:PHASe2

Syntax

[:SOURce<n>]:MOD:QPSKey:PHASe2 <phase>|MINimum|MAXimum
[:SOURce<n>]:MOD:QPSKey:PHASe2? [MINimum|MAXimum]

Description

Set the QPSK modulating phase 2.
Query the QPSK modulating phase 2.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	135°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the QPSK modulating phase 2 to 180°.

```
:MOD:QPSKey:PHASe2 180
```

The query below returns 1.800000E+02.

```
:MOD:QPSKey:PHASe2?
```

[:SOURce<n>]:MOD:QPSKey:PHASe3

Syntax

[:SOURce<n>]:MOD:QPSKey:PHASe3 <phase>|MINimum|MAXimum
[:SOURce<n>]:MOD:QPSKey:PHASe3? [MINimum|MAXimum]

Description

Set the QPSK modulating phase 3.
Query the QPSK modulating phase 3.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	225°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the QPSK modulating phase 3 to 280°.

```
:MOD:QPSKey:PHASe3 280
```

The query below returns 2.800000E+02.

```
:MOD:QPSKey:PHASe3?
```

[:SOURce<n>]:MOD:3FSKey[:FREQuency]

Syntax

[:SOURce<n>]:MOD:3FSKey[:FREQuency] <n>,
<frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:3FSKey[:FREQuency]? <n>[,MINimum|MAXimum]

Description

Set the hop frequencies of 3FSK.
Query the hop frequencies of 3FSK.

Parameter

Name	Type	Range	Default
<n>	Integer	1 to 2	1
<frequency>	Consecutive Real Number	Refer to the **Explanation** below	100 Hz

Explanation

For different carrier waveforms, the frequency ranges <frequency> are different.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Arb: 1 μHz to 40 MHz (except DC in the built-in waveforms)

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the 3FSK hop frequency 1 to 300 Hz.

```
:MOD:3FSKey 1, 300
```

The query below returns 3.000000E+02.

```
:MOD:3FSKey? 1
```

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE

Syntax

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE <rate>|MINimum|MAXimum
[:SOURce<n>]:MOD:3FSKey:INTernal:RATE? [MINimum|MAXimum]

Description

Set the 3FSK rate.
Query the 3FSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Return Format

The query returns the rate in scientific notation.

Example

The command below sets the 3FSK rate to 150 Hz.

```
:MOD:3FSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:3FSKey:INTernal:RATE?
```

[:SOURce<n>]:MOD:4FSKey[:FREQuency]

Syntax

[:SOURce<n>]:MOD:4FSKey[:FREQuency] <n>,
<frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:4FSKey[:FREQuency]? <n>[,MINimum|MAXimum]

Description

Set the hop frequencies of 4FSK.
Query the hop frequencies of 4FSK.

Parameter

Name	Type	Range	Default
<n>	Integer	1 to 3	1
<frequency>	Consecutive Real Number	Refer to the **Explanation** below	100 Hz

Explanation

For different carrier waveforms, the frequency ranges <frequency> are different.
Sine: 1 μHz to 160 MHz
Square: 1 μHz to 50 MHz
Ramp: 1 μHz to 4 MHz
Arb: 1 μHz to 40 MHz (except DC in the built-in waveforms)

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the 4FSK hop frequency 1 to 300 Hz.

```
:MOD:4FSKey 1, 300
```

The query below returns 3.000000E+02.

```
:MOD:4FSKey? 1
```

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE

Syntax

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE <rate>|MINimum|MAXimum
[:SOURce<n>]:MOD:4FSKey:INTernal:RATE? [MINimum|MAXimum]

Description

Set the 4FSK rate.
Query the 4FSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	100 Hz

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the 4FSK rate to 150 Hz.

```
:MOD:4FSKey:INTernal:RATE 150
```

The query below returns 1.500000E+02.

```
:MOD:4FSKey:INTernal:RATE?
```

[:SOURce<n>]:MOD:OSKey:INTernal:RATE

Syntax

```
[:SOURce<n>]:MOD:OSKey:INTernal:RATE <rate>|MINimum|MAXimum
[:SOURce<n>]:MOD:OSKey:INTernal:RATE? [MINimum|MAXimum]
```

Description

Set the OSK rate and the default unit is "Hz".
Query the OSK rate.

Parameter

Name	Type	Range	Default
<rate>	Consecutive Real Number	2 mHz to 1 MHz	1 kHz

Explanation
This command is only available when internal modulation source is selected.

Return Format
The query returns the rate in scientific notation.

Example
The command below sets the OSK rate to 500 Hz.

```
:MOD:OSKey:INTernal:RATE 500
```

The query below returns 5.000000E+02.

```
:MOD:OSKey:INTernal:RATE?
```

Related Commands
[:SOURce<n>]:MOD:OSKey:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:OSKey:SOURce?

[:SOURce<n>]:MOD:OSKey:SOURce

Syntax

[:SOURce<n>]:MOD:OSKey:SOURce INTernal|EXTernal
[:SOURce<n>]:MOD:OSKey:SOURce?

Description

Set the OSK modulation source to INTernal or EXTernal.
Query the OSK modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format
The query returns INT or EXT.

Example
The command below sets the modulation source to EXTernal.

```
:MOD:OSKey:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:OSKey:SOURce?
```

[:SOURce<n>]:MOD:OSKey:TIME

Syntax

[:SOURce<n>]:MOD:OSKey:TIME <time>|MINimum|MAXimum
[:SOURce<n>]:MOD:OSKey:TIME? [MINimum|MAXimum]

Description

Set the oscillate period of OSK.
Query the oscillate period of OSK.

Parameter

Name	Type	Range[1]	Default
<time>	Consecutive Real Number	8 ns to 200 s	100 μs

Note[1]: the range of the oscillate period is limited by the current OSK rate.

Return Format

The query returns the period in scientific notation.

Example

The command below sets the OSK oscillate period to 150 μs.

```
:MOD:OSKey:TIME 0.00015
```

The query below returns 1.500000E-04.

```
:MOD:OSKey:TIME?
```

[: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 duty cycle deviation of PWM.
Query the duty cycle deviation of PWM.

Parameter

Name	Type	Range	Default
<percent>	Consecutive Real Number	0% to 50%	20%

Explanation

The duty cycle deviation <percent> fulfills the following requirements:

The duty cycle deviation can not exceed the duty cycle of the current pulse.

The duty cycle deviation is limited by the minimum duty cycle and the current edge time.

Return Format

The query returns the duty cycle deviation in scientific notation.

Example

The command below sets the duty cycle deviation to 45%.

```
:MOD:PWM:DCYCle 45%
```

The query below returns 4.500000E+01.

```
:MOD:PWM:DCYCle?
```

[: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 pulse width deviation of PWM.
Query the pulse width deviation of PWM.

Parameter

Name	Type	Range	Default
<deviation>	Consecutive Real Number	0 ns to 500 ks	200 μs

Explanation

The pulse width deviation <deviation> fulfills the following requirements:
The pulse width deviation can not exceed the current pulse width.
The pulse width deviation is limited by the minimum pulse width and the current edge time.

Return Format

The query returns the current pulse width deviation in scientific notation.

Example

The command below sets the pulse width deviation to 10 μs.

```
:MOD:PWM 0.00001
```

The query below returns 1.000000E-05.

```
:MOD:PWM?
```

[:SOURce<n>]:MOD:PWM:INTernal:FREQuency

Syntax

```
[:SOURce<n>]:MOD:PWM:INTernal:FREQuency <frequency>|MINimum|MAXimum
[:SOURce<n>]:MOD:PWM:INTernal:FREQuency?
```

Description

Set the frequency of the PWM modulating waveform.
Query the frequency of the PWM modulating waveform.

Parameter

Name	Type	Range	Default
<frequency>	Consecutive Real Number	2 mHz to 50 kHz	100 Hz

Return Format

The query returns the frequency in scientific notation.

Example

The command below sets the frequency of the PWM modulating waveform to 300 Hz.

```
:MOD:PWM:INTernal:FREQuency 300
```

The query below returns 3.000000E+02.

```
:MOD:PWM:INTernal:FREQuency?
```

[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion

Syntax

```
[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion
SINusoid|SQUare|TRIangle|RAMP|NRAMp|NOISe|USER
[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion?
```

Description

Select the PWM modulating waveform.
Query the PWM modulating waveform.

Parameter

Name	Type	Range	Default
--	Keyword	SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER	SINusoid

Explanation

This command is only available when internal modulation source is selected.

Return Format

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

Example

The command below selects square waveform as the modulating waveform.

```
:MOD:PWM:INTernal:FUNCtion SQUare
```

The query below returns SQU.

```
:MOD:PWM:INTernal:FUNCtion?
```

Related Commands

[:SOURce<n>]:MOD:PWM:SOURce INTernal| EXTernal

[: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 to INTernal or EXTernal.
Query the PWM modulation source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal	INTernal

Return Format
The query returns INT or EXT.

Example
The command below sets the modulation source to EXTernal.

```
:MOD:PWM:SOURce EXTernal
```

The query below returns EXT.

```
:MOD:PWM:SOURce?
```

[:SOURce<n>]:PERiod

[:SOURce<n>]:PERiod[:FIXed] <period>

[:SOURce<n>]:PERiod[:FIXed]?

[:SOURce<n>]:PERiod[:FIXed]

Syntax

[:SOURce<n>]:PERiod[:FIXed] <period>
[:SOURce<n>]:PERiod[:FIXed]?

Description

Set the period of the basic waveform and the default unit is "s".
Query the period of the basic waveform.

Parameter

Name	Type	Range	Default
<period>	Consecutive Real number	Refer to the **Explanation** below	1 ms

Explanation

Different waveforms correspond to different period ranges.
Sine: 6.2 ns to 1.0000 Ms
Square: 20.0 ns to 1.0000 Ms
Ramp: 250.0 ns to 1.0000 Ms
Pulse: 25.0 ns to 1.0000 Ms
Arb: 25.0 ns to 1.0000 Ms
Harmonic: 12.5 ns to 1.0000 Ms

Return Format

The query returns the period in scientific notation.

Example

The command below sets the period to 100 ms.

```
:PERiod 0.1
```

The query below returns 1.000000E-01.

```
:PERiod?
```

[:SOURce<n>]:PHASe

[:SOURce<n>]:PHASe[:ADJust] <phase>|MINimum|MAXimum

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

[:SOURce<n>]:PHASE:INITiate

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

Syntax

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

Description

Set the start phase of the basic waveform.
Query the start phase.

Parameter

Name	Type	Range	Default
<phase>	Consecutive Real Number	0° to 360°	0°

Return Format

The query returns the phase in scientific notation.

Example

The command below sets the start phase to 90°.

```
:PHASe 90
```

The query below returns 9.000000E+01.

```
:PHASe?
```

[:SOURce<n>]:PHASe:INITiate

Syntax

[:SOURce<n>]:PHASe:INITiate

Description

Execute align phase.

Explanation

This setting is invalid when any of the two channels is in modulation mode.

[:SOURce<n>]:PULSe

[:SOURce<n>]:PULSe:DCYCle <percent>| MINimum| MAXimum

[:SOURce<n>]:PULSe:DCYCle? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:DELay <delay>| MINimum| MAXimum

[:SOURce<n>]:PULSe:DELay? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:HOLD WIDTh| DUTY

[:SOURce<n>]:PULSe:HOLD?

[:SOURce<n>]:PULSe:TRANsition[:LEADing] <seconds>| MINimum| MAXimum

[:SOURce<n>]:PULSe:TRANsition[:LEADing]? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:TRANsition:TRAiling <seconds>| MINimum| MAXimum

[:SOURce<n>]:PULSe:TRANsition:TRAiling? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:WIDTh <seconds>| MINimum| MAXimum

[:SOURce<n>]:PULSe:WIDTh? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:DCYCle

Syntax

```
[:SOURce<n>]:PULSe:DCYCle <percent>|MINimum|MAXimum
[:SOURce<n>]:PULSe:DCYCle? [MINimum|MAXimum]
```

Description

Set the pulse duty cycle and the unit is %.
Query the pulse duty cycle.

Parameter

Name	Type	Range	Default
<percent>	Consecutive Real Number	Refer to the **Explanation** below	50%

Explanation

This parameter is related to the pulse width and when any of them is changed, the other will be modified automatically.

The pulse duty cycle is limited by the minimum pulse width (4 ns) and pulse period.

pulse duty cycle ≥ 100 × minimum pulse width ÷ pulse period

pulse duty cycle ≤ 100 × (1 - 2 × minimum pulse width ÷ pulse period)

Return Format

The query returns the duty cycle in scientific notation.

Example

The command below sets the duty cycle to 60%.

```
:PULSe:DCYCle 60
```

The query below returns 6.000000E+01.

```
:PULSe:DCYCle?
```

Related Commands

[:SOURce<n>]:PULSe:HOLD WIDTh| DUTY

[:SOURce<n>]:PULSe:HOLD?

[:SOURce<n>]:PULSe:WIDTh <seconds>| MINimum| MAXimum

[:SOURce<n>]:PULSe:WIDTh? [MINimum| MAXimum]

[:SOURce<n>]:PULSe:DELay

Syntax

[:SOURce<n>]:PULSe:DELay <delay>|MINimum|MAXimum
[:SOURce<n>]:PULSe:DELay? [MINimum|MAXimum]

Description

Set the delay of the pulse and the default unit is "s".
Query the delay of the pulse.

Parameter

Name	Type	Range	Default
<delay>	Consecutive Real Number	0 ns to pulse period	0 ns

Return Format

The query returns the delay of the pulse in scientific notation.

Example

The command below sets the delay of the pulse to 8 ms.

```
:PULSe:DELay 0.008
```

The query below returns 8.000000E-03.

```
:PULSe:DELay?
```

[:SOURce<n>]:PULSe:HOLD

Syntax

```
[:SOURce<n>]:PULSe:HOLD WIDTh|DUTY
[:SOURce<n>]:PULSe:HOLD?
```

Description

Select the pulse width or duty cycle of the pulse.
Query the pulse parameter currently selected.

Parameter

Name	Type	Range	Default
--	Discrete	WIDTh|DUTY	DUTY

Explanation

The pulse width and duty cycle are related and when any one of them is changed, the other will be modified automatically.

Return Format

The query returns WIDT or DUTY.

Example

The command below selects pulse width.

```
:PULSe:HOLD WIDTh
```

The query below returns WIDT.

```
:PULSe:HOLD?
```

Related Commands

[:SOURce<n>]:PULSe:DCYCle <percent>|MINimum|MAXimum

[:SOURce<n>]:PULSe:DCYCle? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:WIDTh <seconds>|MINimum|MAXimum

[:SOURce<n>]:PULSe:WIDTh? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:TRANsition[:LEADing]

Syntax

[:SOURce<n>]:PULSe:TRANsition[:LEADing] <seconds>|MINimum|MAXimum
[:SOURce<n>]:PULSe:TRANsition[:LEADing]? [MINimum|MAXimum]

Description

Set the leading (rising) edge time of the pulse and the default unit is "s".
Query the leading edge time of the pulse.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	Refer to the **Explanation** below	1.9531 µs

Explanation
The range available is limited by the pulse width currently specified. The relation fulfills the inequality: leading/falling edge time ≤ 0.625 × pulse width.
DG4000 will automatically adjust the edge time to match the specified pulse width if the value currently set exceeds the limit value.

Return Format
The query returns the time in scientific notation and the default unit is "s".

Example
The command below sets the leading edge time to 10 µs.

```
:PULSe:TRANsition 0.00001
```

The query below returns 1.000000E-05.

```
:PULSe:TRANsition?
```

[:SOURce<n>]:PULSe:TRANsition:TRAiling

Syntax

[:SOURce<n>]:PULSe:TRANsition:TRAiling <seconds>|MINimum|MAXimum

[:SOURce<n>]:PULSe:TRANsition:TRAiling? [MINimum|MAXimum]

Description

Set the trailing (falling) edge time of the pulse and the default unit is "s".

Query the trailing edge time of the pulse.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	Refer to the **Explanation** below	1.9531 μs

Explanation

The range available is limited by the pulse width currently specified. The relation fulfills the inequality: leading/falling edge time ≤ 0.625 × pulse width.
DG4000 will automatically adjust the edge time to match the specified pulse width if the value currently set exceeds the limit value.

Return Format

The query returns the time in scientific notation and the default unit is "s".

Example

The command below sets the trailing edge time to 10 μs.

```
:PULSe:TRANsition:TRAiling 0.00001
```

The query below returns 1.000000E-05.

```
:PULSe:TRANsition:TRAiling?
```

[:SOURce<n>]:PULSe:WIDTh

Syntax

```
[:SOURce<n>]:PULSe:WIDTh <seconds>|MINimum|MAXimum
[:SOURce<n>]:PULSe:WIDTh? [MINimum|MAXimum]
```

Description

Set the pulse width and the default unit is "s".
Query the pulse width.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	Refer to the **Explanation** below	500 µs

Explanation

This parameter is related to the duty cycle and when any of them is changed, the other will be modified automatically.

The pulse width is limited by the minimum pulse width (4 ns) and pulse period.

pulse width ≥ minimum pulse width

pulse width ≤ pulse period - 2 × minimum pulse width

Return Format

The query returns the pulse width in scientific notation.

Example

The command below sets the pulse width to 600 µs.

```
:PULSe:WIDTh 0.0006
```

The query below returns 6.000000E-04.

```
:PULSe:WIDTh?
```

Related Commands

[:SOURce<n>]:PULSe:HOLD WIDTh|DUTY

[:SOURce<n>]:PULSe:HOLD?

[:SOURce<n>]:PULSe:DCYCle <percent>|MINimum|MAXimum

[:SOURce<n>]:PULSe:DCYCle? [MINimum|MAXimum]

[:SOURce<n>]:SWEep

[:SOURce<n>]:SWEep:HTIMe:STARt <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:HTIMe:STARt? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:HTIMe:STOP <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:HTIMe:STOP? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:RTIMe <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:RTIMe? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:SPACing LINear|LOGarithmic|STEp

[:SOURce<n>]:SWEep:SPACing?

[:SOURce<n>]:SWEep:STATe OFF|ON

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

[:SOURce<n>]:SWEep:STEP <steps>|MINimum|MAXimum

[:SOURce<n>]:SWEep:STEP? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:TIME <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:TIME? [MINimum|MAXimum]

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

[:SOURce<n>]:SWEep:TRIGger:SLOPe POSitive|NEGative

[:SOURce<n>]:SWEep:TRIGger:SLOPe?

[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual

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

[:SOURce<n>]:SWEep:TRIGger:TRIGOut OFF|POSitive|NEGative

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

[: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 and the unit is "s".
Query the start hold of the sweep.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	0 s to 300 s	0 s

Return Format

The query returns the time value in scientific notation.

Example

The command below sets the start hold to 1 s.

```
:SWEep:HTIMe:STARt 1
```

The query returns 1.000000E+00.

```
:SWEep:HTIMe: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 end hold of the sweep and the default unit is "s".

Query the end hold of the sweep.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	0 s to 300 s	0 s

Return Format

The query returns the time value in scientific notation.

Example

The command below sets the end hold to 1 s.

```
:SWEep:HTIMe:STOP 1
```

The query below returns 1.000000E+00.

```
:SWEep:HTIMe: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 and the default unit is "s".
Query the return time.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	0 s to 300 s	0 s

Return Format
The query returns the time value in scientific notation.

Example
The command below sets the return time to 5 s.

```
:SWEep:RTIMe 5
```

The query returns 5.000000E+00.

```
:SWEep:RTIMe?
```

[:SOURce<n>]:SWEep:SPACing

Syntax

[:SOURce<n>]:SWEep:SPACing LINear|LOGarithmic|STEp
[:SOURce<n>]:SWEep:SPACing?

Description

Set the sweep type to LINear, LOGarithmic or STEp.
Query the sweep type.

Parameter

Name	Type	Range	Default
--	Keyword	LINear|LOGarithmic|STEp	LINear

Return Format

The query returns LIN, LOG or STE.

Example

The command below selects log sweep.

```
:SWEep:SPACing LOGarithmic
```

The query returns LOG.

```
:SWEep:SPACing?
```

[:SOURce<n>]:SWEep:STATe

Syntax

[:SOURce<n>]:SWEep:STATe OFF|ON
[:SOURce<n>]:SWEep:STATe?

Description

Enable or disable the sweep function.
Query the status of the sweep function.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

When Sweep is enabled, Mod or Burst will be disabled automatically (if it is currently enabled).

Return Format

The query returns OFF or ON.

Example

The command below enables the sweep function.

```
:SWEep:STATe ON
```

The query below returns ON.

```
:SWEep:STATe?
```

[:SOURce<n>]:SWEep:STEP

Syntax

[:SOURce<n>]:SWEep:STEP <steps>|MINimum|MAXimum
[:SOURce<n>]:SWEep:STEP? [MINimum|MAXimum]

Description

Set the step number of step sweep.
Query the step number of step sweep.

Parameter

Name	Type	Range	Default
<steps>	Integer	2 to 2048	2

Return Format

The query returns the step number in scientific notation.

Example

The command below sets the step number to 5.

```
:SWEep:STEP 5
```

The query below returns 5.000000E+00.

```
:SWEep:STEP?
```

[:SOURce<n>]:SWEep:TIME

Syntax
[:SOURce<n>]:SWEep:TIME <seconds>|MINimum|MAXimum
[:SOURce<n>]:SWEep:TIME? [MINimum|MAXimum]

Description
Set the sweep time and the default unit is "s".
Query the sweep time.

Parameter

Name	Type	Range	Default
<seconds>	Consecutive Real Number	1 ms to 300 s	1 s

Return Format

The query returns the time value in scientific notation.

Example

The command below sets the sweep time to 5 s.

```
:SWEep:TIME 5
```

The query below returns 5.000000E+00.

```
:SWEep:TIME?
```

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

Syntax

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

Description

Set the instrument to trigger immediately.

Explanation

This command is only available when manual trigger source is selected.

Related Commands

[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual
[: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 generator to enable the sweep output on the rising (POSitive) or falling (NEGative) edge of the external trigger signal.
Query the edge type of the external trigger signal for the sweep output.

Parameter

Name	Type	Range	Default
--	Keyword	POSitive| NEGative	POSitive

Explanation

This command is only available when external trigger source is selected.

Return Format

The query returns POS or NEG.

Example

The command below sets the edge type to falling edge.

```
:SWEep:TRIGger:SLOPe NEGative
```

The query returns NEG.

```
:SWEep:TRIGger:SLOPe?
```

Related Commands

[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal| EXTernal| MANual
[: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 to INTernal, EXTernal or MANual.
Query the trigger source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal| EXTernal| MANual	INTernal

Return Format

The query returns INT, EXT or MAN.

Example

The command below selects manual trigger source.

```
:SWEep:TRIGger:SOURce MANual
```

The query below returns MAN.

```
:SWEep:TRIGger:SOURce?
```

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

Syntax

[:SOURce<n>]:SWEep:TRIGger:TRIGOut OFF|POSitive|NEGative
[:SOURce<n>]:SWEep:TRIGger:TRIGOut?

Description

Set the edge type of the sweep trigger output to rising (POSitive) or falling (NEGative) edge or disable the trigger output signal (OFF).
Query the edge type of the sweep trigger output.

Parameter

Name	Type	Range	Default
--	Keyword	OFF|POSitive|NEGative	OFF

Explanation

This command is only available when internal or manual trigger source is selected.

Return Format

The query returns OFF, POS or NEG.

Example

The command below sets the trigger output edge to falling edge.

```
:SWEep:TRIGger:TRIGout NEGative
```

The query below returns NEG.

```
:SWEep:TRIGger:TRIGout?
```

Related Commands

[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual
[:SOURce<n>]:SWEep:TRIGger:SOURce?

[:SOURce<n>]:VOLTage

[: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 amplitude of the basic waveform and the default unit is "Vpp".
Query the amplitude of the basic waveform.

Parameter

Name	Type	Range	Default
<amplitude>	Consecutive Real Number	Refer to the **Explanation** below	5 Vpp

Explanation
The amplitude range is limited by the impedance and frequency/period settings (refer to the related User's Guide).

Return Format
The query returns to the amplitude in scientific notation.

Example
The command below sets the amplitude to 2.5 Vpp.

```
:VOLTage 2.5
```

The query below returns 2.500000E+00.

```
:VOLTage?
```

[: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 of the basic waveform and the default unit is "V".
Query the high level of the basic waveform.

Parameter

Name	Type	Range	Default
<voltage>	Consecutive Real Number	The current low level to 10 V (HighZ) / 5 V (50 Ω)	2.5 V

Return Format
The query returns the high level in scientific notation.

Example
The command below sets the high level to 5 V.

```
:VOLTage:HIGH 5
```

The query below returns 5.000000E+00.

```
:VOLTage:HIGH?
```

Related Commands
[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:LOW <voltage>|MINimum|MAXimum
[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:LOW? [MINimum|MAXimum]

[: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 of the basic waveform and the default unit is "V".
Query the low level of the basic waveform.

Parameter

Name	Type	Range	Default
<voltage>	Consecutive Real Number	-10 V (HighZ) / -5 V (50 Ω) to the current high level	-2.5 V

Return Format

The query returns the low level in scientific notation.

Example

The command below sets the low level to -5 V.

```
:VOLTage:LOW -5
```

The query below returns -5.000000E+00.

```
:VOLTage:LOW?
```

Related Commands

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:HIGH <voltage>|MINimum|MAXimum
[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:HIGH? [MINimum|MAXimum]

[: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 DC offset voltage and the default unit is "V_{DC}".

Query the DC offset voltage.

Parameter

Name	Type	Range	Default
<voltage>	Consecutive Real Number	Refer to the **Explanation** below	0 V_{DC}

Explanation

The offset range is limited by the impedance and amplitude/high level settings (refer to the related User's Guide).

Return Format

The query returns the offset voltage in scientific notation.

Example

The command below sets the offset voltage to 100 mV_{DC}.

```
:VOLTage:OFFSet 0.1
```

The query returns 1.000000E-01.

```
:VOLTage:OFFSet?
```

[:SOURce<n>]:VOLTage:UNIT

Syntax

[:SOURce<n>]:VOLTage:UNIT VPP|VRMS|DBM
[:SOURce<n>]:VOLTage:UNIT?

Description

Set the amplitude unit to VPP, VRMS or DBM.
Query the amplitude unit.

Parameter

Name	Type	Range	Default
--	Keyword	VPP|VRMS|DBM	VPP

Explanation
DBM is not available when the impedance is set to HighZ.

Return Format
The query returns VPP, VRMS or DBM.

Example
The command below sets the amplitude unit to VRMS.

```
:VOLTage:UNIT VRMS
```

The query below returns VRMS.

```
:VOLTage:UNIT?
```

SYSTem Command Subsystem

:SYSTem:LANGuage ENGLish|SCHinese

:SYSTem:LANGuage?

:SYSTem:POWeron DEFault|LAST

:SYSTem:POWeron?

:SYSTem:POWSet AUTO|USER

:SYSTem:POWSet?

:SYSTem:PRESet

DEFault|USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10

:SYSTem:RESTART

:SYSTem:ROSCillator:SOURce INTernal|EXTernal

:SYSTem:ROSCillator:SOURce?

:SYSTem:SHUTDOWN

:SYSTem:VERSion?

:SYSTem:BEEPer[:IMMediate]

Syntax

:SYSTem:BEEPer[:IMMediate]

Description

The beeper generates a beep immediately.

Explanation

This command is only available when the beeper is enabled (refer to the :SYSTem:BEEPer:STATe ON|OFF command).

Related Commands

:SYSTem:BEEPer:STATe ON|OFF
:SYSTem:BEEPer:STATe?

:SYSTem:BEEPer:STATe

Syntax

:SYSTem:BEEPer:STATe ON|OFF
:SYSTem:BEEPer:STATe?

Description

Enable or disable the beeper.
Query the status of the beeper.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	ON

Return Format

The query returns ON or OFF.

Example

The command below enables the beeper.
:SYSTem:BEEPer:STATe ON

The query below returns ON.
:SYSTem:BEEPer:STATe?

:SYSTem:COMMunicate:LAN:AUTOip[:STATe]

Syntax

```
:SYSTem:COMMunicate:LAN:AUTOip[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:AUTOip[:STATe]?
```

Description

Enable or disable the AUTOIP mode.
Query the status of the AUTOIP mode.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	ON

Return Format

The query returns ON or OFF.

Example

The command below enables the AUTOIP mode.

```
:SYSTem:COMMunicate:LAN:AUTOip ON
```

The query below returns ON.

```
:SYSTem:COMMunicate:LAN:AUTOip?
```

:SYSTem:COMMunicate:LAN:DHCP[:STATe]

Syntax

```
:SYSTem:COMMunicate:LAN:DHCP[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:DHCP[:STATe]?
```

Description

Enable or disable the DHCP mode.
Query the status of the DHCP mode.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	ON

Explanation

In DHCP mode, the DHCP server in the current network assigns LAN parameters (such as IP address) for the generator.

Return Format

The query returns ON or OFF.

Example

The command below enables the DHCP mode.

```
:SYSTem:COMMunicate:LAN:DHCP ON
```

The query below returns ON.

```
:SYSTem:COMMunicate:LAN:DHCP?
```

:SYSTem:COMMunicate:LAN:DNS

Syntax

:SYSTem:COMMunicate:LAN:DNS <address>
:SYSTem:COMMunicate:LAN:DNS?

Description

Set the DNS address for the generator.
Query the DNS address.

Parameter

Name	Type	Range[1]	Default
<address>	ASCII Character String	0.0.0.0 to 255.255.255.255	--

Note[1]: according to the TCP/IP protocol, the effective range of DNS is from 0.0.0.0 to 223.255.255.255 and the first segment of number can not be 127.

Explanation

This command is only available when manual IP mode is enabled (refer to the :SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF command).
The setting is only valid when the instrument is connected to the LAN successfully.
Generally, users do not need to set the domain name server address of the network and the setting of this parameter can be ignored.

Return Format

The query returns the current domain name server address in nnn.nnn.nnn.nnn format.

Example

The command below sets the DNS address to 202.106.46.151.

```
:SYSTem:COMMunicate:LAN:DNS 202.106.46.151
```

The query below returns 202.106.46.151.

```
:SYSTem:COMMunicate:LAN:DNS?
```

Related Commands

:SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:STATic[:STATe]?

:SYSTem:COMMunicate:LAN:GATEway

Syntax

```
:SYSTem:COMMunicate:LAN:GATEway <address>
:SYSTem:COMMunicate:LAN:GATEway?
```

Description

Set the default gateway for the generator.

Query the default gateway.

Parameter

Name	Type	Range[1]	Default
<address>	ASCII Character String	0.0.0.0 to 255.255.255.255	--

Note[1]: according to the TCP/IP protocol, the effective range of the default gateway is from 0.0.0.0 to 223.255.255.255 and the first segment of number can not be 127.

Explanation

This command is only available when manual IP mode is enabled (refer to the :SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF command).
The setting is only valid when the instrument is connected to the LAN successfully.

Return Format

The query returns the current default gateway in nnn.nnn.nnn.nnn format.

Example

The command below sets the default gateway to 172.16.3.1.

```
:SYSTem:COMMunicate:LAN:GATEway 172.16.3.1
```

The query below returns 172.16.3.1.

```
:SYSTem:COMMunicate:LAN:GATEway?
```

:SYSTem:COMMunicate:LAN:IPADdress

Syntax

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

Description

Set the IP address for the generator.

Query the IP address.

Parameter

Name	Type	Range[1]	Default
<ip_addr>	ASCII Character String	0.0.0.0 to 255.255.255.255	--

Note[1]: according to the TCP/IP protocol, the effective range of the IP address is from 0.0.0.0 to 223.255.255.255 and the first segment of number can not be 127.

Explanation

This command is only available when manual IP mode is enabled (refer to the :SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF command).
The setting is only valid when the instrument is connected to the LAN successfully.

Return Format

The query returns the current IP address in nnn.nnn.nnn.nnn format.

Example
The command below sets the IP address to 172.16.3.145.

```
:SYSTem:COMMunicate:LAN:IPADdress 172.16.3.145
```

The query below returns 172.16.3.145.

```
:SYSTem:COMMunicate:LAN:IPADdress?
```

Related Commands
:SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:STATic[:STATe]?

:SYSTem:COMMunicate:LAN:MAC?

Syntax

:SYSTem:COMMunicate:LAN:MAC?

Description

Query the MAC address.

Return Format

The query returns the MAC address, such as 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 for the generator.
Query the subnet mask.

Parameter

Name	Type	Range	Default
<mask>	ASCII Character String	0.0.0.0 to 255.255.255.255	--

Explanation

This command is only available when manual IP mode is enabled (refer to the :SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF command).
The setting is only valid when the instrument is connected to the LAN successfully.

Return Format

The query returns the current subnet mask in nnn.nnn.nnn.nnn format.

Example

The command below sets the subnet mask to 255.255.255.0.

```
:SYSTem:COMMunicate:LAN:SMASk 255.255.255.0
```

The query below returns 255.255.255.0.

```
:SYSTem:COMMunicate:LAN:SMASk?
```

Related Commands

:SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:STATic[:STATe]?

:SYSTem:COMMunicate:LAN:STATic[:STATe]

Syntax

```
:SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF
:SYSTem:COMMunicate:LAN:STATic[:STATe]?
```

Description

Enable or disable the ManualIP mode.
Query the status of the ManualIP mode.

Parameter

Name	Type	Range	Default
--	Bool	ON| OFF	OFF

Explanation

In this mode, the LAN parameters (such as the IP address) of the generator are defined by users.

Return Format

The query returns ON or OFF.

Example

The command below enables the ManualIP mode.

```
:SYSTem:COMMunicate:LAN:STATic ON
```

The query below returns ON.

```
:SYSTem:COMMunicate:LAN:STATic?
```

:SYSTem:COMMunicate:USB:INFormation?

Syntax

:SYSTem:COMMunicate:USB:INFormation?

Description

Query the USB information.

Return Format

The query returns the USB information in character string, such as :USB0::0X1AB1::0X0640::DG41620000::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 instrument connected to the USB Device interface to COMPuter or PRINter.
Query the type of the instrument connected to the USB Device interface.

Parameter

Name	Type	Range	Default
--	Keyword	COMPuter| PRINter	COMPuter

Explanation

DG4000 provides a USB Device interface at the rear panel. Computer or Printer can be connected to this interface to control the instrument remotely or print the content on the screen.

Return Format

The query returns COMP or PRIN.

Example

The command below sets the type of the instrument to COMPuter.

```
:SYSTem:COMMunicate:USB:CLASs COMPuter
```

The query below returns COMP.

```
:SYSTem:COMMunicate:USB:CLASs?
```

:SYSTem:CSCopy

Syntax

:SYSTem:CSCopy CH1,CH2|CH2,CH1

Description

Copy the configuration state of CH1 (CH2) to CH2 (CH1).

Parameter

Name	Type	Range	Default
--	Keyword	CH1,CH2|CH2,CH1	CH1,CH2

Explanation

DG4000 supports state copy or waveform copy between its two channels, namely copy the state (parameters and output configuration) or arbitrary waveform parameters of one channel to the other or swap the states of the two channels.
State includes waveform (except volatile waveform) and waveform parameters (such as frequency and amplitude), functions (such as modulation, sweep and burst) as well as output configurations (such as sync, impedance and polarity) of the channel.
The channel copy function is not available in coupling mode.

Example
The command below copies the configuration state of CH1 to CH2.

```
:SYSTem:CSCopy CH1,CH2
```

:SYSTem:CWCopy

Syntax

:SYSTem:CWCopy CH1|CH2,CH2|CH1

Description

Copy the arbitrary waveform data (not include the waveform parameters) of CH1 (CH2) to CH2 (CH1).

Parameter

Name	Type	Range	Default
--	Keyword	CH1,CH2|CH2,CH1	CH1,CH2

Explanation

DG4000 supports state copy or waveform copy between its two channels, namely copy the state (parameters and output configuration) or arbitrary waveform parameters of one channel to the other or swap the states of the two channels.

Waveform copy is only available when both of the channels select arbitrary waveform.

The channel copy function is not available in coupling mode.

Example

The command below copies the waveform of CH1 to CH2.

```
:SYSTem:CWCopy CH1,CH2
```

:SYSTem:ERRor?

Syntax

```
:SYSTem:ERRor?
```

Description

Query the error event queue.

Return Format

The query returns the error event information, such as -113, "Undefined header; keyword cannot be found".
If error does not exist, the query returns 0, "No Error".

:SYSTem:KLOCk

Syntax

```
:SYSTem:KLOCk[:STATe] ON|OFF
:SYSTem:KLOCk[:STATe]?
```

Description

Lock or unlock the front panel remotely.
Query whether the front panel is in remote lock mode.

Parameter

Name	Type	Range	Default
--	Bool	ON|OFF	OFF

Explanation

By default, the remote lock mode of the front panel is disabled (OFF) and ⇄ is displayed at the upper right corner of the screen. You can press **Burst** to return to local operation mode.

When the remote lock mode of the front panel is enabled, ⇄ is displayed at the upper right corner of the screen and at this point, you can not return to local operation mode by pressing **Burst**.

Return Format

The query returns ON or OFF.

Example

The command below enables the remote lock mode.

```
:SYSTem:KLOCk ON
```

The query below returns ON.

```
:SYSTem:KLOCk?
```

: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
--	Keyword	ENGLish|SCHinese	ENGLish

Return Format

The query returns ENG or SCH.

Example

The command below sets the system language to ENGLish.

```
:SYSTem:LANGuage ENGLish
```

The query below returns ENGL.

```
:SYSTem:LANGuage?
```

:SYSTem:POWeron

Syntax

```
:SYSTem:POWeron DEFault|LASt
:SYSTem:POWeron?
```

Description

Set the configuration to be used by the instrument at power-on to DEFault or LASt.

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

Parameter

Name	Type	Range	Default
--	Keyword	DEFault|LASt	DEFault

Return Format

The query returns DEFAULT or LAST.

Example

The command below sets the configuration to be used by the instrument at power-on to LASt.

```
:SYSTem:POWeron LASt
```

The query below returns LAST.

```
:SYSTem:POWeron?
```

:SYSTem:POWSet

Syntax

:SYSTem:POWSet AUTO|USER
:SYSTem:POWSet?

Description

Set the start-up mode after the instrument is powered on to auto (AUTO) or manual (USER).

Query the start-up mode after the instrument is powered on.

Parameter

Name	Type	Range	Default
--	Keyword	AUTO|USER	AUTO

Explanation

Auto (AUTO): the instrument starts automatically after power-on.

Manual (USER): users need to press the power switch at the front panel to start the instrument after power-on.

Return Format

The query returns AUTO or USER.

Example

The command below sets the start-up mode to manual (USER).

```
:SYSTem:POWSet USER
```

The query below returns USER.

```
:SYSTem:POWSet?
```

:SYSTem:PRESet

Syntax

:SYSTem:PRESet

DEFault|USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER1

0

Description

Restore the system to its default state (DEFault) or user-defined state (USER1, USER2, USER3, USER4, USER5, USER6, USER7, USER8, USER9 or USER10).

Parameter

Name	Type	Range	Default
--	Keyword	DEFault|USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10	DEFault

Explanation

When resorting the instrument to user-defined state, this command is only valid when valid state file is stored in the specified storage location.

Example

The command below restores the system to its default state.

```
:SYSTem:PRESet DEFault
```

:SYSTem:RESTART

Syntax

:SYSTem:RESTART

Description

Restart the instrument.

:SYSTem:ROSCillator:SOURce

Syntax

```
:SYSTem:ROSCillator:SOURce INTernal|EXTernal
:SYSTem:ROSCillator:SOURce?
```

Description

Set the reference clock source to INTernal or EXTernal.
Query the reference clock source.

Parameter

Name	Type	Range	Default
--	Keyword	INTernal|EXTernal	INTernal

Explanation

DG4000 provides internal 10MHz clock source and accepts external clock source input 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.

Return Format

The query returns INT or EXT.

Example

The command below sets the reference clock source to EXTernal (this setting is valid when the system detects external clock source).

```
:SYSTem:ROSCillator:SOURce EXTernal
```

The query below returns EXT.

```
:SYSTem:ROSCillator:SOURce?
```

:SYSTem:SHUTDOWN

Syntax

```
:SYSTem:SHUTDOWN
```

Description

Shut down the instrument.

:SYSTem:VERSion?

Syntax

:SYSTem:VERSion?

Description

Query and return the SCPI version information.

Return Format

The query returns the SCPI version information, such as 1999.0.

TRACe Command Subsystem

[:TRACe]:DATA:DAC16 VOLATILE,<flag>,<binary_block_data>

[:TRACe]:DATA:DAC VOLATILE,[<binary_block_data>| <value>,<value>,
<value>...]

[:TRACe]:DATA[:DATA] VOLATILE,<value>{,<value>}

[:TRACe]:DATA:POINts:INTerpolate LINear| OFF [:TRACe]:DATA:POINts:INTerpolate?

[:TRACe]:DATA:POINts VOLATILE,<value>| MINimum| MAXimum

[:TRACe]:DATA:POINts? VOLATILE[,MINimum| MAXimum]

[:TRACe]:DATA:VALue? VOLATILE,<point>

[:TRACe]:DATA:VALue VOLATILE,<point>,<data>

[:TRACe]:DATA:LOAD? VOLATILE

[:TRACe]:DATA:LOAD? <num>

[:TRACe]:DATA:DAC16

Syntax

[:TRACe]:DATA:DAC16 VOLATILE,<flag>,<binary_block_data>

Description

Download the waveform edited into the DDRII.

Explanation

This command consists of two parts. The first part is the command character string ([:TRACe]:DATA:DAC16 VOLATILE,<flag>,) and the second part is the binary data (<binary_block_data>).
<flag> represents the data transmission state and can be set to "CON" or "END". "CON": there are still data packets after the current one; "END": this is the last data packet and the data transmission is finished.
<binary_block_data> is the binary data to be downloaded and the range is from 0000 to 3FFF. The data length must be 16 kpts (32 kBytes).
The binary data block starts with #.
For example, send **:DATA:DAC16 VOLATILE,CON,#532768binary data**
The number **5** following **#** represents that the data length information **32768** holds 5 characters and **32768** represents the number of bytes of the **binary data**. As each waveform point holds two bytes, the number of bytes must be an even number.
When the <flag> in the command received is END, the instrument will automatically switch to arbitrary waveform output.
If the total length of the waveform to be downloaded is 16 kpts and the waveform is downloaded into the instrument in one operation, users can edit the data on the instrument. Otherwise, local editing is not supported.

[:TRACe]:DATA:DAC

Syntax

[:TRACe]:DATA:DAC VOLATILE,[<binary_block_data>|<value>,<value>,<value>...]

Description

Download binary data block or decimal DAC value to the volatile memory.

Explanation

<binary_block_data> is the binary data to be downloaded. The range is from 0000 to 3FFF and the data length is 4 Bytes (2 pts) to 32768 Bytes (16 kpts).
The binary data block starts with #.
For example, send **:DATA:DAC VOLATILE,#516384binary data**
The number **5** following **#** represents that the data length information **16384** holds 5 characters and **16384** represents the number of bytes of the **binary data**. As each waveform point holds two bytes, the number of bytes must be an even number.
<value>,<value>,<value>...: represent the decimal DAC to be downloaded.
When the data does not start with #, the decimal DAC value can be sent in character string format.
For example, send **:DATA:DAC VOLATILE,0,16883,8192,0,16383**
5 data points are sent totally.
For data with less than 16384 points, the instrument will extend the data to 16384 points using uniform interpolation automatically.
After this command is sent, the instrument will switch the current channel to output volatile waveform automatically and modify the interpolation mode and the number of editable points. The data downloaded using this command can be edited on the instrument.

[:TRACe]:DATA[:DATA]

Syntax

```
[:TRACe]:DATA[:DATA] VOLATILE,<value>{,<value>}
```

Description

Download the floating voltage values to the volatile memory. The range of the number of the floating points is from -1 to +1 and the data length can not exceed 512 kpts.

Parameter

Name	Type	Range	Default
<value>	Consecutive Real number	-1 to 1	--

Explanation

Each time, 1 to 16384 (16k) points can be downloaded.
-1 and 1 correspond to the maximum and minimum of the waveform respectively (assume that the offset is set to 0). For example, when the amplitude is set to 5 Vpp, 1 corresponds to 2.5 V and -1 corresponds to -2.5 V.
This command will overwrite the previous waveform in the volatile memory without generating any error.
After the command is sent, the instrument will switch the current channel to output volatile waveform automatically and modify the interpolation mode and the number of editable points at the same time. The data downloaded using this command can be edited on the instrument.

Example

The command below downloads 4 points (-0.5, -0.25, 0.25 and 0.5) to the volatile memory.

```
:DATA VOLATILE,-0.5,-0.25,0.25,0.5
```

[:TRACe]:DATA:POINts:INTerpolate

Syntax

```
[:TRACe]:DATA:POINts:INTerpolate LINear|OFF
[:TRACe]:DATA:POINts:INTerpolate?
```

Description

Set the interpolation method between the defined waveform points.
Query the interpolation method.

Parameter

Name	Type	Range	Default
--	Keyword	LINear|OFF	OFF

Explanation

LINear: linear interpolation. The waveform editor will connect the two defined points with a straight line.

OFF: disable the interpolation. The waveform editor will hold a constant voltage level between the two points and create a step waveform.

The interpolation method can be modified only when the instrument is in volatile waveform output mode.

Return Format

The query returns LINEAR or OFF.

Example

The command below selects linear interpolation method.

```
:DATA:POINts:INTerpolate LINear
```

The query below returns LINEAR.

```
:DATA:POINts:INTerpolate?
```

[:TRACe]:DATA:POINts

Syntax

[:TRACe]:DATA:POINts VOLATILE,<value>|MINimum|MAXimum
[:TRACe]:DATA:POINts? VOLATILE[,MINimum|MAXimum]

Description

Set the number of the initial points of the edited waveform.
Query the number of the initial points of the edited waveform.

Parameter

Name	Type	Range	Default
<value>	Integer	2 to 16384	--

Explanation

This command changes the current output to volatile waveform output automatically and initialize the volatile waveform to 0.
After sending this command, you can send the [:TRACe]:DATA:VALue VOLATILE,<point>,<data> command to modify the voltage of the specified point.

Return Format

The query returns an integer between 2 and 16384.

[:TRACe]:DATA:VALue?

Syntax

[:TRACe]:DATA:VALue? VOLATILE,<point>

Description

Query the decimal integer value of a certain point in the volatile memory.

Parameter

Name	Type	Range	Default
<point>	Integer	1 to 16384	--

Explanation

This command is only available when the current output waveform is volatile.

Return Format

The query returns a decimal number.

Example

The command below queries the decimal integer value of point 1 and returns 0.

```
:DATA:VALue? VOLATILE,1
```

[:TRACe]:DATA:VALue

Syntax

[:TRACe]:DATA:VALue VOLATILE,<point>,<data>

Description

Modify the decimal integer value of a certain point in the volatile memory.

Parameter

Name	Type	Range	Default
<point>	Integer	1 to 16384	--
<data>	Integer	0 to 16383	--

Explanation

This command is only available when the current output waveform is volatile.

Example

The command below changes point 1 to 10.

```
:DATA:VALue VOLATILE,1,10
```

The query below returns 10.

```
:DATA:VALue? VOLATILE,1
```

Related Command

[:TRACe]:DATA:VALue? VOLATILE,<points>

[:TRACe]:DATA:LOAD?

Syntax

[:TRACe]:DATA:LOAD? VOLATILE
[:TRACe]:DATA:LOAD? <num>

Description

Query the number of arbitrary waveform data packets in the volatile memory.
Load the specified data packet in the volatile memory.

Explanation

First, send the [:TRACe]:DATA:LOAD? VOLATILE command to acquire the total number of data packets and the command returns a decimal number.
Then, send the [:TRACe]:DATA:LOAD? <num> command to load the data of the numth data packet, wherein, the range of num is from 1 to the number of data packets.

Programming Demos

This chapter lists some programming demos to illustrate how to use commands to realize the common functions of the generator in the development environments of Visual C++ 6.0, Visual Basic 6.0 and LabVIEW

8.6. All demos are based on NI (National Instrument)-VISA (Virtual Instrument Software Architecture) library.

NI-VISA is an API (application programming interface) written by NI on the basis of VISA standards. You can use NI-VISA to realize the communication between the generator and the PC via instrument buses such as USB. As VISA has defined a set of software commands, users can control the instrument without understanding how the interface bus works. For more details, please refer to NI-VISA help.

Topics of this chapter:

Programming Preparations

First make sure your computer has installed the VISA library of NI (download it from http://www.ni.com/visa/). Here, the default installation path is C:\Program Files\IVI Foundation\VISA.

Here, the USB Device interface of the generator is used to communicate with the PC and please use a USB cable to connect the USB

Device interface at the rear panel of the generator to the USB interface of the PC.

After the generator and PC are successfully connected, turn on the instrument. At this point, the "**Found New Hardware Wizard**"

dialog box appears on the PC at the first connection. Please follow the instructions to install the "USB Test and Measurement Device (IVI)"

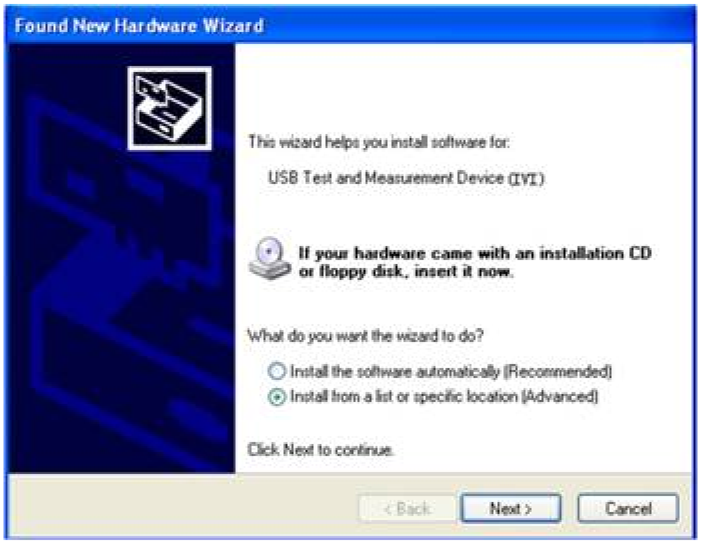
(the installation procedures are as follows).

1. Select "Install from a list or specific

location (Advanced)";

2. Click

"Next";



Found New Hardware Wizard

This wizard helps you install software for:

USB Test and Measurement Device (IVI)

If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?

○ Install the software automatically (Recommended)

● Install from a list or specific location (Advanced)

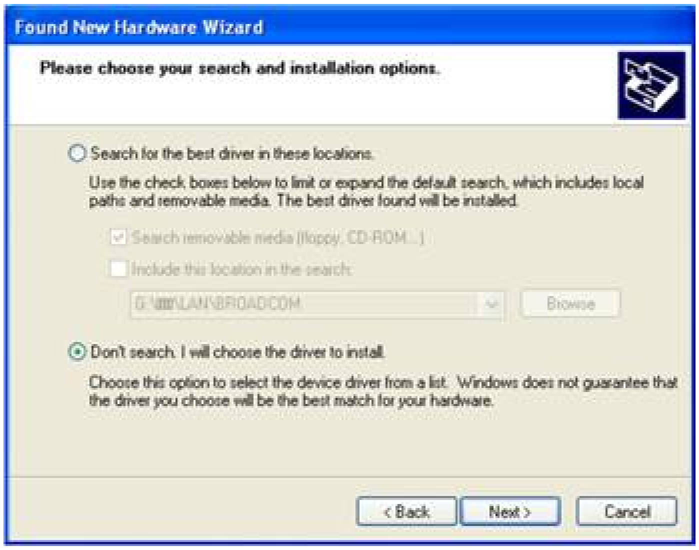
Click Next to continue.

3. Select "Do

not search. I will choose the device to install.";

4. Click

"Next";



Found New Hardware Wizard

Please choose your search and installation options.

○ Search for the best driver in these locations.

Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

☑ Search removable media (floppy, CD-ROM...)

□ Include this location in the search:

G:\[illegible]\LAN\BROADCOM

● Don't search. I will choose the driver to install.

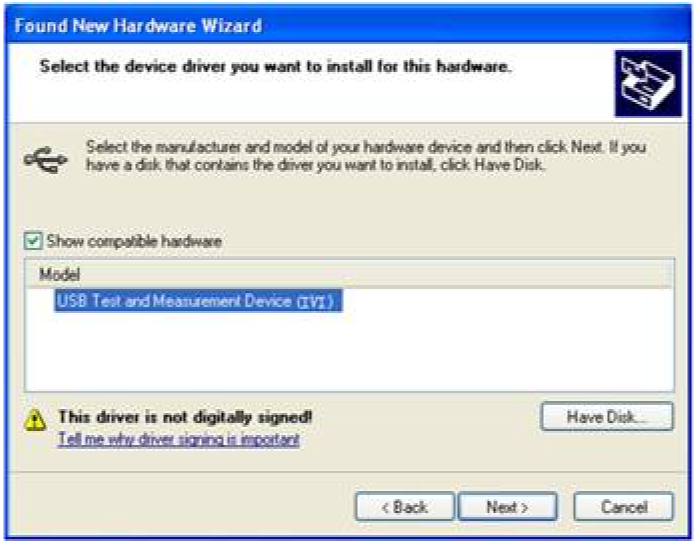
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.

5. Select

"USB Test and Measurement Device (IVI)";

6. Click

"Next";



Found New Hardware Wizard

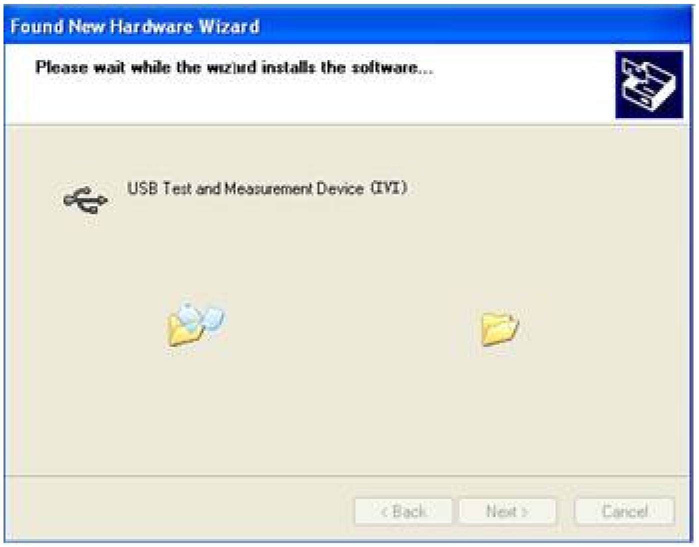
Select the device driver you want to install for this hardware.

Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.

☑ Show compatible hardware

Model
USB Test and Measurement Device (IVI)

This driver is not digitally signed!
Tell me why driver signing is important



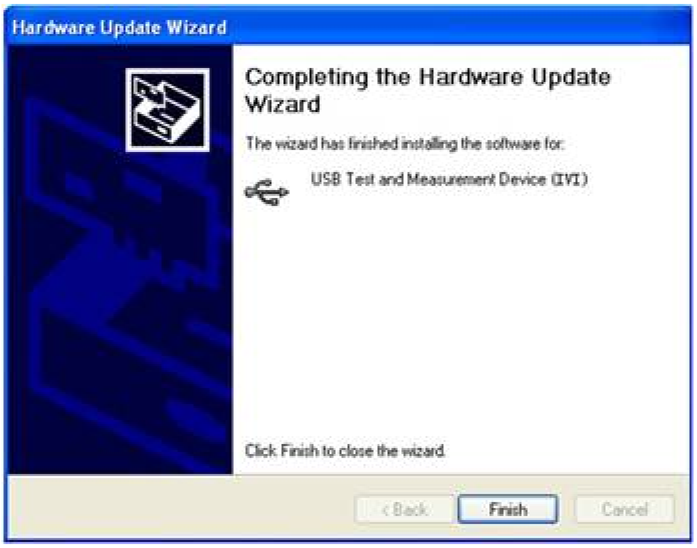
Found New Hardware Wizard

Please wait while the wizard installs the software...

USB Test and Measurement Device (IVI)

7. When the

installation finishes, click "Finish".



Hardware Update Wizard

Completing the Hardware Update Wizard

The wizard has finished installing the software for:

USB Test and Measurement Device (IVI)

Click Finish to close the wizard.

By now, the programming preparations are finished. In the following part, the programming demos in Visual C++ 6.0, Visual Basic 6.0

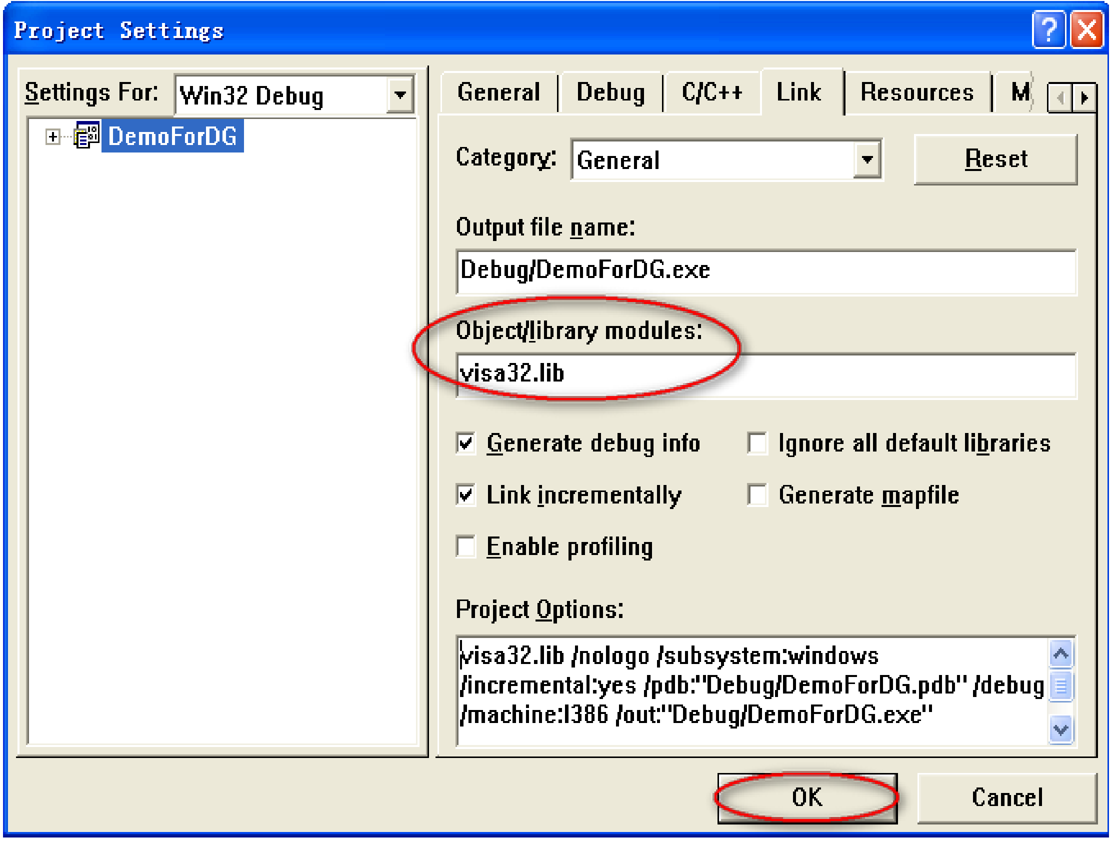
and LabVIEW 8.6 development environments are introduced in detail.

Visual C++ 6.0 Programming Demo

Enter the Visual C++6.0 programming environment and follow the steps below.

1. Build a MFC project based on dialog box.

2. Open the **Link** tab in **Project→Settings** and add **visa32.lib** to the **Object/library modules** manually.



Settings For: Win32 Debug

DemoForDG

Category: General

Output file name: Debug/DemoForDG.exe

Object/library modules: visa32.lib

☑ Generate debug info
☐ Ignore all default libraries
☑ Link incrementally
☐ Generate mapfile
☐ Enable profiling

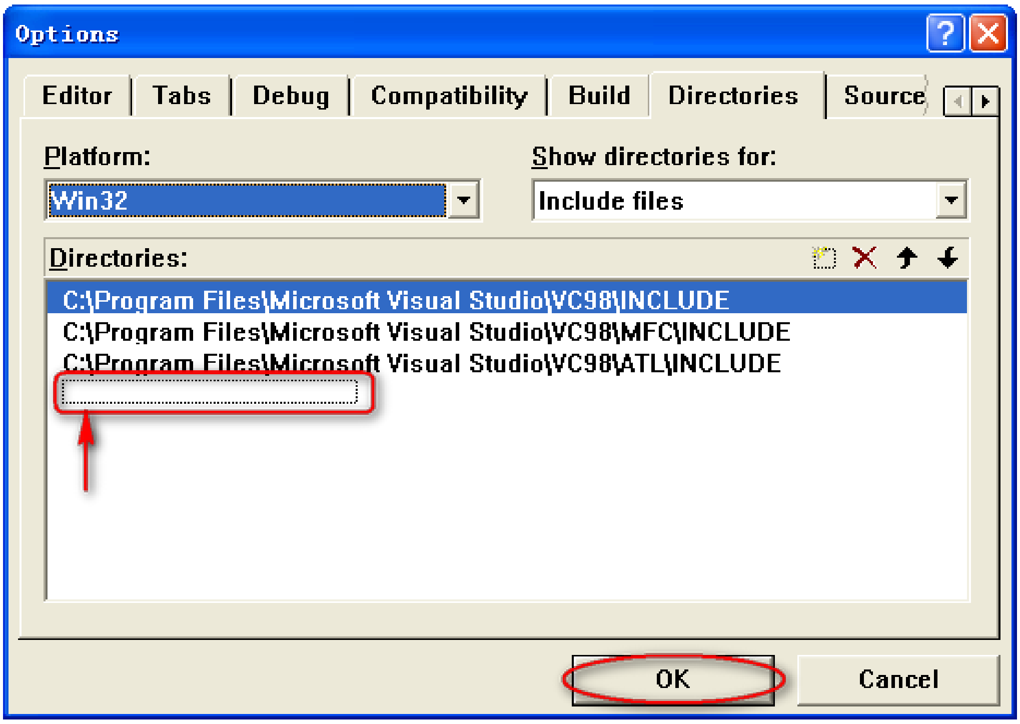
Project Options:

```
visa32.lib /nologo /subsystem:windows
/incremental:yes /pdb:"Debug/DemoForDG.pdb" /debug
/machine:I386 /out:"Debug/DemoForDG.exe"
```

3. Open the **Directories** tab in **Tools→Options**.

Select **Include files** in **Show directories for** and double-click at the place pointed out by the red arrow 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 at the place pointed out by the red arrow in **Directories** to add the path of **Lib**: C:\Program Files\IVI Foundation\VISA\WinNT\lib\msc.



Platform: Win32

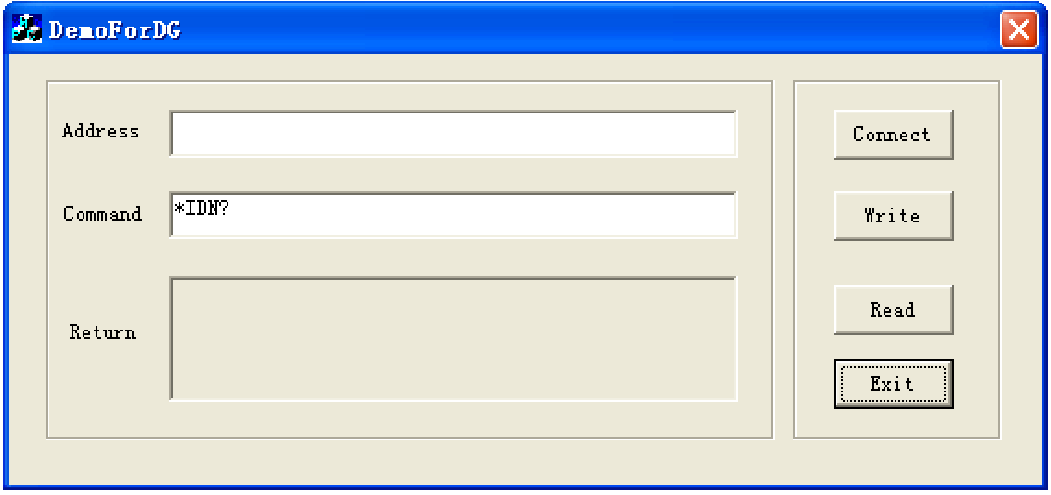
Show directories for: Include files

Directories:

C:\Program Files\Microsoft Visual Studio\VC98\INCLUDE
C:\Program Files\Microsoft Visual Studio\VC98\MFC\INCLUDE
C:\Program Files\Microsoft Visual Studio\VC98\ATL\INCLUDE

Note: at present, VISA library has been added.

4. Add the **Text**, **Edit** and **Button** controls as shown in the figure below.



Address

Command *IDN?

Return

5. Add the control variables.
Open the **Member Variables** tab in **View→ClassWizard** and add the following three variables: Instrument address: CString m_strInstrAddr
Command: CString m_strCommand
Return Value: CString m_strResult

6. Encapsulate the read and write operations of VISA.
1) Encapsulate the write operation of VISA for easier operation.

```
bool  CDemoForDGDlg::InstrWrite(CString  strAddr,  CString  strContent)  //Write
//operation
{
   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 a VISA resource
    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
    AfxMessageBox("No VISA resource 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 system
    status = viClose(instr);
    status = viClose(defaultRM);

    return bWriteOK;
}
```

2) Encapsulate the read operation of VISA for easier operation.

```
bool CDemoForDGDlg::InstrRead(CString strAddr, CString *pstrResult) //Read
//operation
{
    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 a VISA resource
    status = viOpenDefaultRM(&defaultRM);
    if (status < VI_SUCCESS)
    {
    // Error Initializing VISA...exiting
    AfxMessageBox("No VISA resource 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 system
    status = viClose(instr);
    status = viClose(defaultRM);

    (*pstrResult).Format("%s",RecBuf);

    return bReadOK;
}
```

7. Add the control message response codes.

1) Connect to the instrument

```
void CDemoForDGDlg::OnBtConnectInstr() // Connect to the instrument
{
    // 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 bFindDG = 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 DG series then jump out
        //from the loop
    strInstr.MakeUpper();
    if (strInstr.Find("DG") >= 0)
    {
    bFindDG = true;
    m_strInstrAddr = strSrc;
    break;
    }

    //Find next instrument
    status = viFindNext(*findList,instrDesc);
    }

    if (bFindDG == false)
    {
    MessageBox("Didn't find any DG!");
    }
    UpdateData(false);
}
```

2) Write Operation

```
void CDemoForDGDlg::OnBtWrite() //Write operation

{

    // 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);

}
```

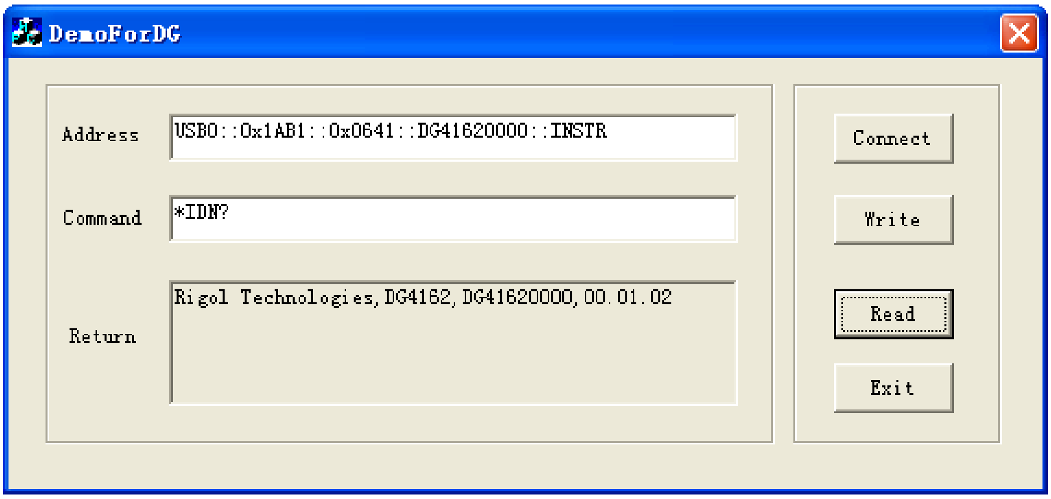
3) Read Operation

```
void CDemoForDGDlg::OnBtRead() //Read operation
```

```
{
    // TODO: Add your control notification handler code here
    UpdateData(true);
    InstrRead(m_strInstrAddr,&m_strResult);
    UpdateData(false);
}
```

8. Execution Result 1) Click "Connect" to search for the generator;
2) Input "*IDN?" in the "Command" edit box;
3) Click "Write" to write the command into the generator;
4) Click "Read" to read the return value.

The execution result is as shown in the figure below.



Address USB0::0x1AB1::0x0641::DG41620000::INSTR

Command *IDN?

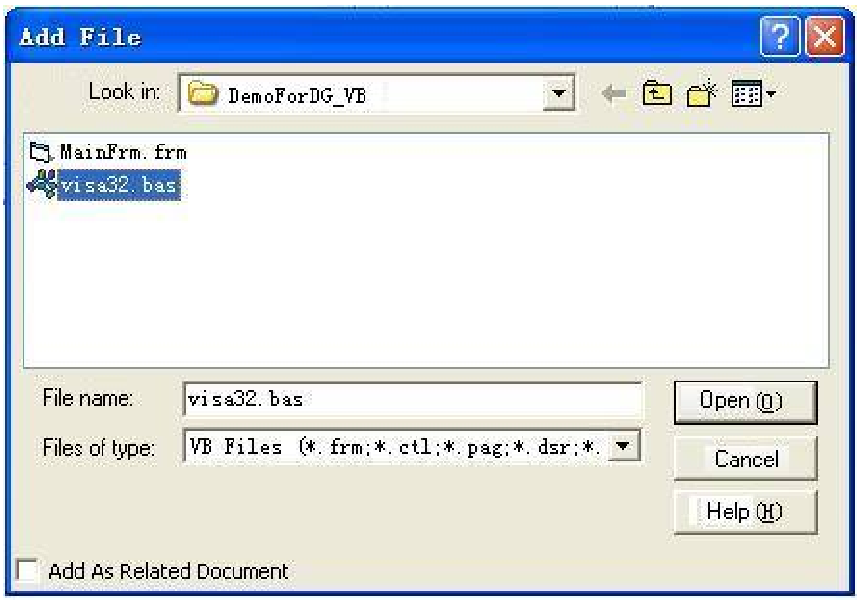
Return Rigol Technologies,DG4162,DG41620000,00.01.02

Visual Basic 6.0 Programming Demo

Enter the Visual Basic 6.0 programming environment and follow the steps below.

1. Build a standard application program project (Standard EXE).

2. Open **Project→Add File...** and add **visa32.bas** which contains all VISA functions and constant statements to the project.



Look in: DemoForDG_VB

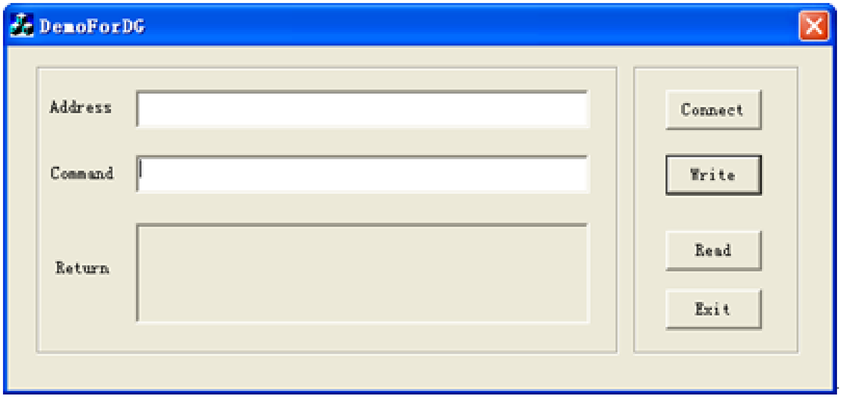
MainFrm.frm
visa32.bas

File name: visa32.bas

Files of type: VB Files (*.frm;*.ctl;*.pag;*.dsr;*.

Then add the **Declare Sub Sleep Lib "kernel32" (ByVal dwMilliseconds As Long)** statement into the **visa32.bas**, or create a new module to declare the **Sleep** function.

3. Add the **Text**, **Edit** and **Button** controls as shown in the figure below.



4. Encapsulate the write and read operations of VISA.

1) Encapsulate the write operation of VISA for easier operation.

```
'-------------------------------------------------------------
'Function Name : InstrWrite
'Function :  Send command to the instrument
'Input :  rsrcName,instrument(resource) name
```

```
            strCmd,Command
'-----------------------------------------------------------
Public Sub InstrWrite(rsrcName As String, strCmd As String)
    Dim status As Long
    Dim dfltRM As Long
    Dim sesn As Long
    Dim rSize As Long

      'Initialize the system
      status = viOpenDefaultRM(dfltRM)
    'Failed to initialize the system
    If (status < VI_SUCCESS) Then
    MsgBox " No VISA resource was opened ! "
    Exit Sub
    End If
    ‘Open the VISA instrument
    status = viOpen(dfltRM, rsrcName, VI_NULL, VI_NULL, sesn)
    'Failed to open the instrument
    If (status < VI_SUCCESS) Then
    MsgBox "Failed to open the instrument ! "
    Exit Sub
    End If

    'Write command to the instrument
    status = viWrite(sesn, strCmd, Len(strCmd), rSize)
      'Failed to write to the instrument
      If (status < VI_SUCCESS) Then
    MsgBox " Faild to write to the instrument ! "
    Exit Sub
    End If

    'Close the system
    status = viClose(sesn)
    status = viClose(dfltRM)

End Sub
```

2) Encapsulate the read operation of VISA for easier operation.

```
'-----------------------------------------------------------
'Function Name : InstrRead
'Function :  Read the return value from the instrument
'Input :  rsrcName,Resource name
'Return : The string gotten from the instrument
'-----------------------------------------------------------
Public Function InstrRead(rsrcName As String) As String
    Dim status As Long
    Dim dfltRM As Long
    Dim sesn As Long
    Dim strTemp0 As String * 256
    Dim strTemp1 As String
    Dim rSize As Long
    'Begin by initializing the system
    status = viOpenDefaultRM(dfltRM)
    'Initial failed
    If (status < VI_SUCCESS) Then
    MsgBox " Failed to open the instrument! "
    Exit Function
    End If
    'Open the instrument
    status = viOpen(dfltRM, rsrcName, VI_NULL, VI_NULL, sesn)
    'Open instrument failed
    If (status < VI_SUCCESS) Then
    MsgBox " Failed to open the instrument! "
    Exit Function
    End If

    ' Read from the instrument
    stasus = viRead(sesn, strTemp0, 256, rSize)
    ' Read failed
    If (status < VI_SUCCESS) Then
    MsgBox " Failed to read from the instrument! "
    Exit Function
    End If

    'Close the system
    status = viClose(sesn)
    status = viClose(dfltRM)

    ' Remove the space at the end of the string
    strTemp1 = Left(strTemp0, rSize)
    InstrRead = strTemp1
End Function
```

5. Add the control event codes.

1) Connect to the instrument

```
' Connect to the instrument
Private Sub CmdConnect_Click()
    Const MAX_CNT = 200
    Dim status As Long
    Dim dfltRM As Long
    Dim sesn As Long
    Dim fList As Long
    Dim buffer As String * MAX_CNT, Desc As String * 256
    Dim nList As Long, retCount As Long
    Dim rsrcName(19) As String * VI_FIND_BUFLEN, instrDesc As String * VI_FIND_BUFLEN
    Dim i, j As Long
      Dim strRet As String
    Dim bFindDG As Boolean

    ‘Initialize the system
    status = viOpenDefaultRM(dfltRM)
    ' Initialize failed
    If (status < VI_SUCCESS) Then
    MsgBox " No VISA resource was opened  ! "
    Exit Sub
    End If

    ' Find instrument resource
    Call viFindRsrc(dfltRM, "USB?*INSTR", fList, nList, rsrcName(0))
    ' Get the list of the instrument(resource)
    strRet = ""
    bFindDG = False
    For i = 0 To nList - 1
    ' Get the instrument name
    InstrWrite rsrcName(i), "*IDN?"
    Sleep 200
    strRet = InstrRead(rsrcName(i))
    ' Continue to switch the resource until find a DG instrument
    strRet = UCase(strRet)
    j = InStr(strRet, "DG")
    If (j >= 0) Then
    bFindDG = True
    Exit For
    End If

    Call viFindNext(fList + i - 1, rsrcName(i))
    Next i
    'Dispaly
    If (bFindDG = True) Then
    TxtInsAddr.Text = rsrcName(i)
    Else
    TxtInsAddr.Text = ""
    End If
End Sub
```

2) Write Operation

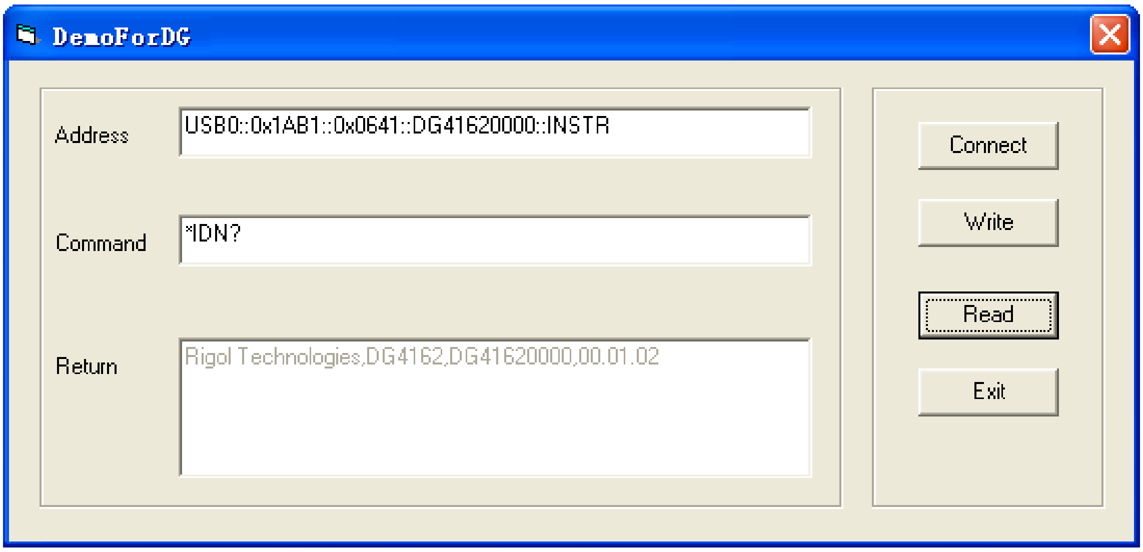
```
'Write the command to the instrument
Private Sub CmdWrite_Click()
    If (TxtInsAddr.Text = "") Then
    MsgBox ("Please write the instrument address ! ")
    End If

    InstrWrite TxtInsAddr.Text, TxtCommand.Text
End Sub
```

3) Read Operation

```
'Read the return value from the instrument
Private Sub CmdRead_Click()
    Dim strTemp As String
    strTemp = InstrRead(TxtInsAddr.Text)
    TxtReturn.Text = strTemp
End Sub
```

6. Execution Result 1) Click "Connect" to search for the generator;
2) Input "*IDN?" in the "Command" edit box;
3) Click "Write" to write the command into the generator;
4) Click "Read" to read the return value.

The execution result is as shown in the figure below.



DemoForDG

Address USB0::0x1AB1::0x0641::DG41620000::INSTR

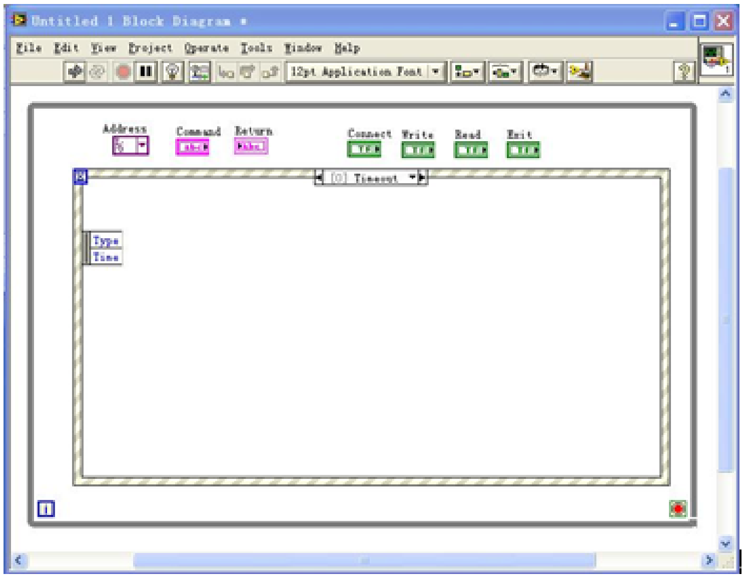
Command *IDN?

Return Rigol Technologies,DG4162,DG41620000,00.01.02

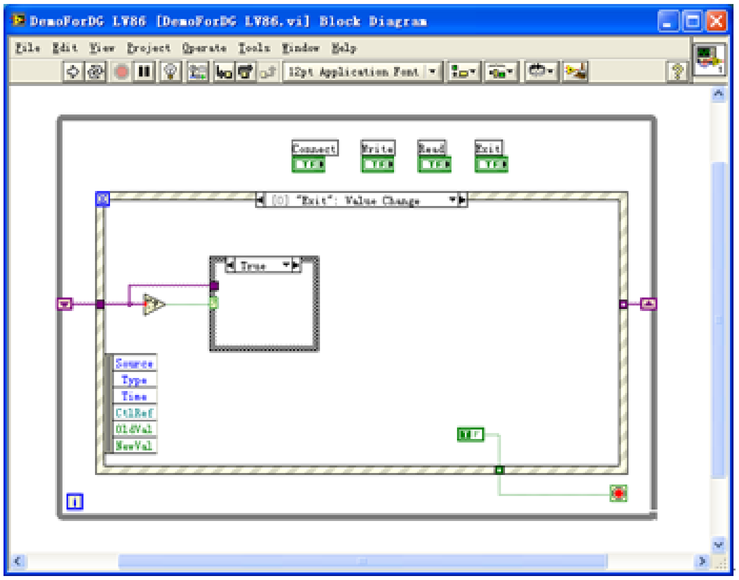
LabVIEW 8.6 Programming Demo

Enter the Labview 8.6 programming environment and follow the steps below.

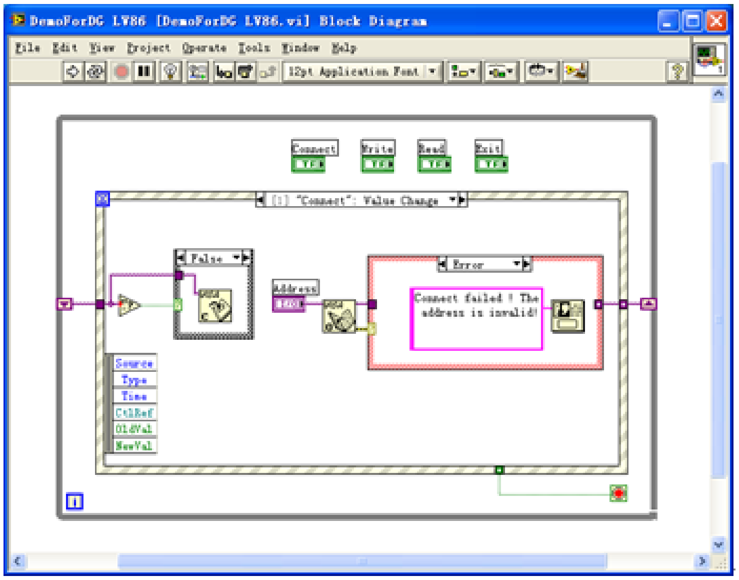
1. Create the event structure



2. Add the events (including read operation, write operation, connect to the instrument and exit)

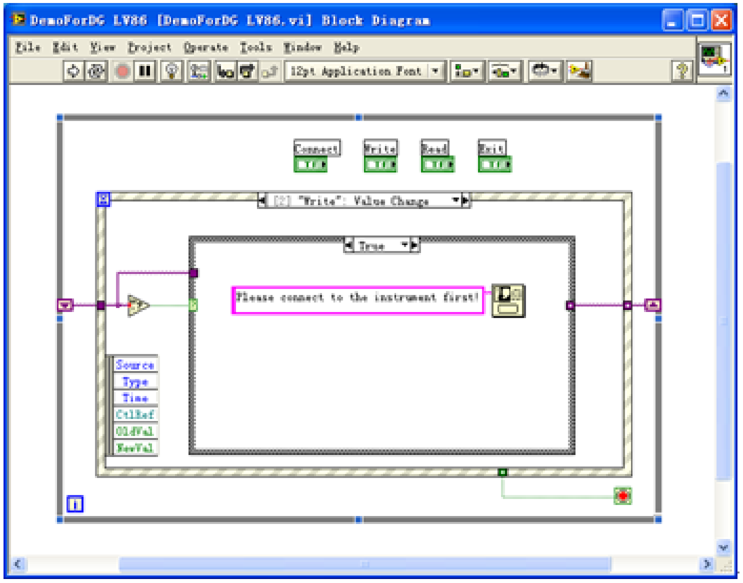


3. Connect to the instrument

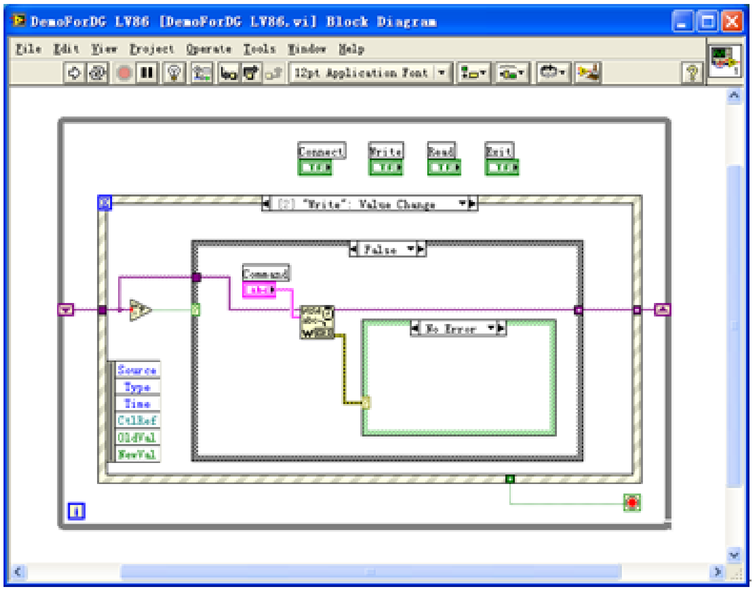

DemoForDG LV86 [DemoForDG LV86.vi] Block Diagram
File Edit View Project Operate Tools Window Help
12pt Application Font
Connect
Write
Read
Exit
[1] "Connect": Value Change
False
Address
Error
Source
Type
Time
CtlRef
OldVal
NewVal

Connect failed ! The address is invalid!

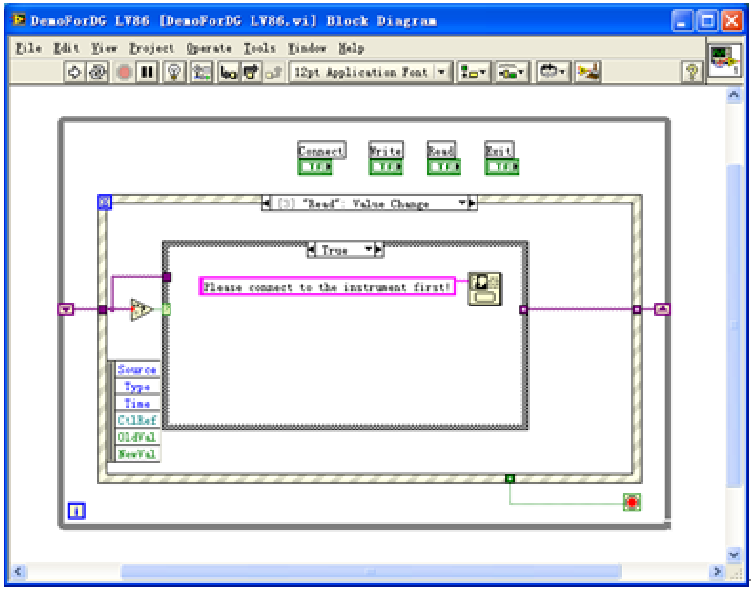
4. Write Operation (include error judgment)


DemoForDG LV86 [DemoForDG LV86.vi] Block Diagram
File Edit View Project Operate Tools Window Help
12pt Application Font
Connect
Write
Read
Exit
[2] "Write": Value Change
True
Source
Type
Time
CtlRef
OldVal
NewVal

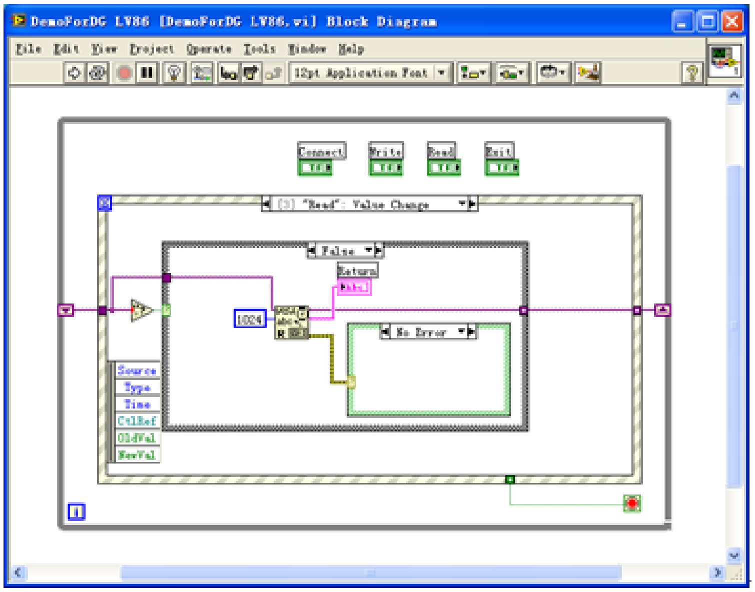
Please connect to the instrument first!


DemoForDG LV86 [DemoForDG LV86.vi] Block Diagram
File Edit View Project Operate Tools Window Help
12pt Application Font
Connect
Write
Read
Exit
[2] "Write": Value Change
False
Command
No Error
Source
Type
Time
CtlRef
OldVal
NewVal

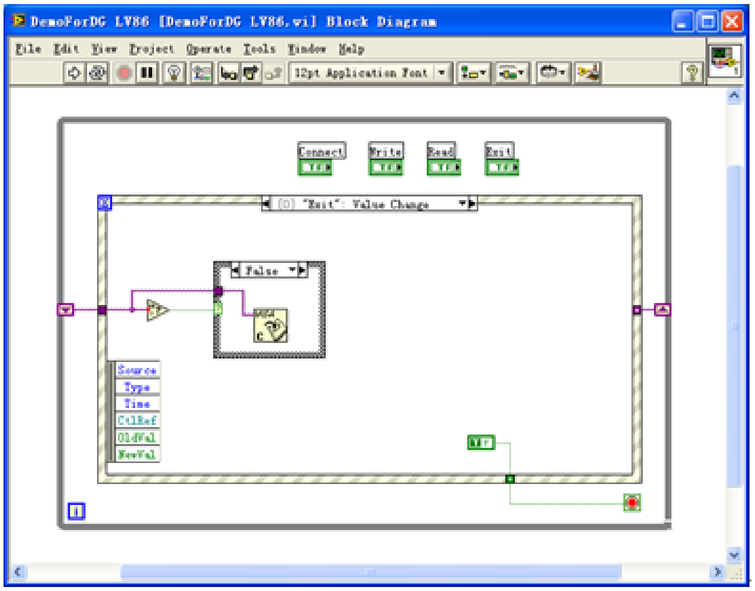
5. Read Operation (include error processing)



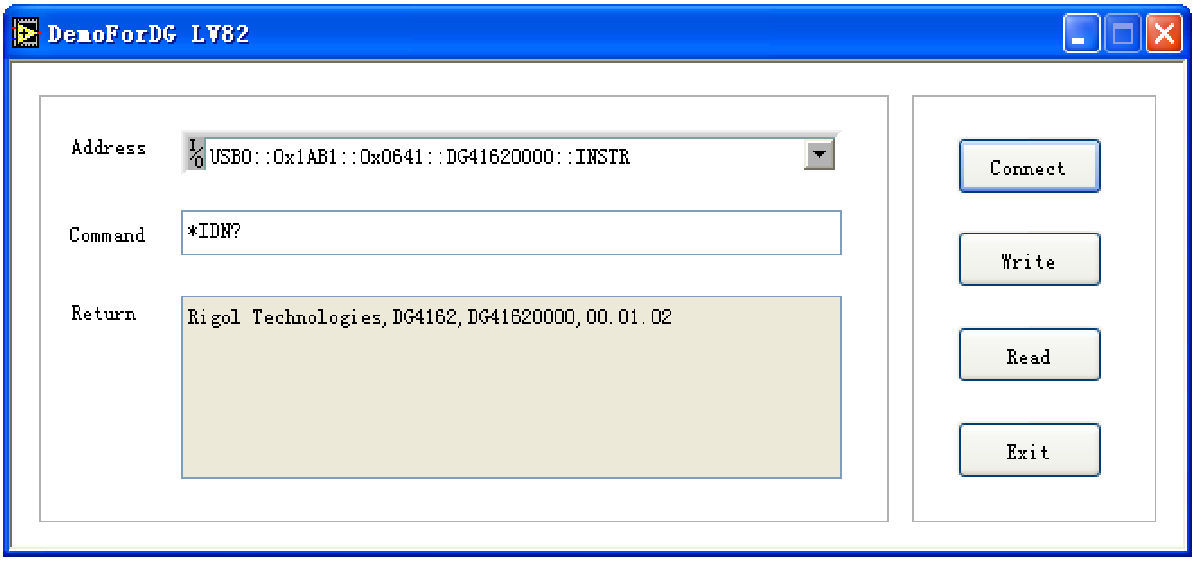
Please connect to the instrument first!



6. Exit



7. Execution Result



Address USB0::0x1AB1::0x0641::DG41620000::INSTR

Command *IDN?

Return Rigol Technologies,DG4162,DG41620000,00.01.02

Command Quick Reference A-Z

*IDN?

*RCL

USER1| USER2| USER3| USER4| USER5| USER| 6USER7| USER8| USER9| USER10

*RST

*SAV

USER1| USER2| USER3| USER4| USER5| USER6| USER7| USER8| USER9| USER10

*TRG

:COUPling[:STATe] ON|OFF

:COUPling[:STATe]?

[:SOURce<n>]:FREQuency:STOP <frequency>| MINimum| MAXimum

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

[:SOURce<n>]:FUNCtion:ARB:STEP

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry <symmetry>| MINimum| MAXimum

[:SOURce<n>]:FUNCtion:RAMP:SYMMetry? [MINimum| MAXimum]

[:SOURce<n>]:FUNCtion[:SHAPe] <wave>

[:SOURce<n>]:FUNCtion[:SHAPe]?

[:SOURce<n>]:FUNCtion:SQUare:DCYCle <percent>| MINimum| MAXimum

[:SOURce<n>]:FUNCtion:SQUare:DCYCle? [MINimum| MAXimum]

[:SOURce<n>]:HARMonic:AMPL <sn>,<value>| MINimum| MAXimum

[:SOURce<n>]:HARMonic:AMPL? <sn>[,MINimum| MAXimum]

[:SOURce<n>]:HARMonic:ORDEr <value>| MINimum| MAXimum

[:SOURce<n>]:HARMonic:ORDEr? [MINimum| MAXimum]

[:SOURce<n>]:HARMonic:PHASe <sn>,<value>| MINimum| MAXimum

[:SOURce<n>]:HARMonic:PHASe? <sn>[,MINimum| MAXimum]

[:SOURce<n>]:HARMonic:TYPe EVEN| ODD| ALL| USER

[:SOURce<n>]:HARMonic:TYPe?

[:SOURce<n>]:HARMonic:USER <user>

[:SOURce<n>]:HARMonic:USER?

[:SOURce<n>]:MARKer:FREQuency <frequency>| MINimum| MAXimum

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

[:SOURce<n>]:MARKer[:STATE] ON| OFF

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

[:SOURce<n>]:MOD[:STATe] ON| OFF

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

[:SOURce<n>]:MOD:TYPe AM| FM| PM| ASK| FSK| PSK| PWM| BPSK| QPSK| 3FSK| 4FSK| OSK

[:SOURce<n>]:MOD:TYPe?

[:SOURce<n>]:MOD:AM[:DEPTh] <depth>| MINimum| MAXimum

[:SOURce<n>]:MOD:AM[:DEPTh]? [MINimum| MAXimum]

[:SOURce<n>]:MOD:AM:INTernal:FREQuency <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:AM:INTernal:FREQuency? [MINimum| MAXimum]

[:SOURce<n>]:MOD:AM:INTernal:FUNCtion SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER

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

[:SOURce<n>]:MOD:AM:SOURce INTernal| EXTernal

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

[:SOURce<n>]:MOD:FM[:DEViation] <deviation>| MINimum| MAXimum

[:SOURce<n>]:MOD:FM[:DEViation]? [MINimum| MAXimum]

[:SOURce<n>]:MOD:FM:INTernal:FREQuency <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:FM:INTernal:FREQuency? [MINimum| MAXimum]
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion
SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER
[:SOURce<n>]:MOD:FM:INTernal:FUNCtion?
[:SOURce<n>]:MOD:FM:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:FM:SOURce?
[:SOURce<n>]:MOD:PM[:DEViation] <deviation>| MINimum| MAXimum
[:SOURce<n>]:MOD:PM[:DEViation]? [MINimum| MAXimum]
[:SOURce<n>]:MOD:PM:INTernal:FREQuency
<frequency>| MINimum| MAXimum
[:SOURce<n>]:MOD:PM:INTernal:FREQuency? [MINimum| MAXimum]
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion
SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER
[:SOURce<n>]:MOD:PM:INTernal:FUNCtion?
[:SOURce<n>]:MOD:PM:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:PM:SOURce?
[:SOURce<n>]:MOD:ASKey:AMPLitude <amplitude>| MINimum| MAXimum
[:SOURce<n>]:MOD:ASKey:AMPLitude? [MINimum| MAXimum]
[:SOURce<n>]:MOD:ASKey:INTernal[:RATE] <frequency>| MINimum| MAXimum
[:SOURce<n>]:MOD:ASKey:INTernal[:RATE]? [MINimum| MAXimum]
[:SOURce<n>]:MOD:ASKey:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:ASKey:SOURce?
[:SOURce<n>]:MOD:ASKey:POLarity POSitive| NEGative
[:SOURce<n>]:MOD:ASKey:POLarity?
[:SOURce<n>]:MOD:FSKey[:FREQuency] <frequency>| MINimum| MAXimum
[:SOURce<n>]:MOD:FSKey[:FREQuency]? [MINimum| MAXimum]
[:SOURce<n>]:MOD:FSKey:INTernal:RATE <rate>| MINimum| MAXimum
[:SOURce<n>]:MOD:FSKey:INTernal:RATE? [MINimum| MAXimum]
[:SOURce<n>]:MOD:FSKey:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:FSKey:SOURce?
[:SOURce<n>]:MOD:FSKey:POLarity POSitive| NEGative
[:SOURce<n>]:MOD:FSKey:POLarity?
[:SOURce<n>]:MOD:PSKey:INTernal:RATE <rate>| MINimum| MAXimum
[:SOURce<n>]:MOD:PSKey:INTernal:RATE? [MINimum| MAXimum]
[:SOURce<n>]:MOD:PSKey:PHASe <phase>| MINimum| MAXimum
[:SOURce<n>]:MOD:PSKey:PHASe? [MINimum| MAXimum]
[:SOURce<n>]:MOD:PSKey:POLarity POSitive| NEGative
[:SOURce<n>]:MOD:PSKey:POLarity?
[:SOURce<n>]:MOD:PSKey:SOURce INTernal| EXTernal
[:SOURce<n>]:MOD:PSKey:SOURce?
[:SOURce<n>]:MOD:BPSKey:INTernal:RATE <rate>| MINimum| MAXimum
[:SOURce<n>]:MOD:BPSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:BPSKey:PHASe <phase>| MINimum| MAXimum

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

[:SOURce<n>]:MOD:BPSKey:DATA 01| 10| PN15| PN21

[:SOURce<n>]:MOD:BPSKey:DATA?

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe1 <phase>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe1? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe2 <phase>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe2? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:PHASe3 <phase>| MINimum| MAXimum

[:SOURce<n>]:MOD:QPSKey:PHASe3? [MINimum| MAXimum]

[:SOURce<n>]:MOD:QPSKey:DATA PN15| PN21

[:SOURce<n>]:MOD:QPSKey:DATA?

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:3FSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:3FSKey[:FREQuency] <n>, <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:3FSKey[:FREQuency]? <n>[,MINimum| MAXimum]

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:4FSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:4FSKey[:FREQuency] <n>, <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:4FSKey[:FREQuency]? <n>[,MINimum| MAXimum]

[:SOURce<n>]:MOD:OSKey:SOURce INTernal| EXTernal

[:SOURce<n>]:MOD:OSKey:SOURce?

[:SOURce<n>]:MOD:OSKey:INTernal:RATE <rate>| MINimum| MAXimum

[:SOURce<n>]:MOD:OSKey:INTernal:RATE? [MINimum| MAXimum]

[:SOURce<n>]:MOD:OSKey:TIME <time>| MINimum| MAXimum

[:SOURce<n>]:MOD:OSKey:TIME? [MINimum| MAXimum]

[:SOURce<n>]:MOD:PWM:INTernal:FREQuency <frequency>| MINimum| MAXimum

[:SOURce<n>]:MOD:PWM:INTernal:FREQuency? [MINimum| MAXimum]

[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion SINusoid| SQUare| TRIangle| RAMP| NRAMp| NOISe| USER

[:SOURce<n>]:MOD:PWM:INTernal:FUNCtion?

[:SOURce<n>]:MOD:PWM:SOURce INTernal| EXTernal

[:SOURce<n>]:MOD:PWM:SOURce?

[:SOURce<n>]:MOD:PWM[:DEViation]:DCYCle <percent>| MINimum| MAXimum

[:SOURce<n>]:MOD:PWM[:DEViation]:DCYCle? [MINimum| MAXimum]

[:SOURce<n>]:MOD:PWM[:DEViation][:WIDTh] <deviation>|MINimum|MAXimum

[:SOURce<n>]:MOD:PWM[:DEViation][:WIDTh]? [MINimum|MAXimum]

[:SOURce<n>]:PERiod[:FIXed] <period>

[:SOURce<n>]:PERiod[:FIXed]?

[:SOURce<n>]:PHASe[:ADJust] <phase>|MINimum|MAXimum

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

[:SOURce<n>]:PHASE:INITiate

[:SOURce<n>]:PULSe:DCYCle <percent>|MINimum|MAXimum

[:SOURce<n>]:PULSe:DCYCle? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:DELay <delay>|MINimum|MAXimum

[:SOURce<n>]:PULSe:DELay? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:HOLD WIDTh|DUTY

[:SOURce<n>]:PULSe:HOLD?

[:SOURce<n>]:PULSe:TRANsition[:LEADing] <seconds>|MINimum|MAXimum

[:SOURce<n>]:PULSe:TRANsition[:LEADing]? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:TRANsition:TRAiling <seconds>|MINimum|MAXimum

[:SOURce<n>]:PULSe:TRANsition:TRAiling? [MINimum|MAXimum]

[:SOURce<n>]:PULSe:WIDTh <seconds>|MINimum|MAXimum

[:SOURce<n>]:PULSe:WIDTh? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:HTIMe:STARt <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:HTIMe:STARt? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:HTIMe:STOP <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:HTIMe:STOP? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:RTIMe <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:RTIMe? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:SPACing LINear|LOGarithmic|STEp

[:SOURce<n>]:SWEep:SPACing?

[:SOURce<n>]:SWEep:STATe OFF|ON

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

[:SOURce<n>]:SWEep:STEP <steps>|MINimum|MAXimum

[:SOURce<n>]:SWEep:STEP? [MINimum|MAXimum]

[:SOURce<n>]:SWEep:TIME <seconds>|MINimum|MAXimum

[:SOURce<n>]:SWEep:TIME? [MINimum|MAXimum]

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

[:SOURce<n>]:SWEep:TRIGger:SLOPe POSitive|NEGative

[:SOURce<n>]:SWEep:TRIGger:SLOPe?

[:SOURce<n>]:SWEep:TRIGger:SOURce INTernal|EXTernal|MANual

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

[:SOURce<n>]:SWEep:TRIGger:TRIGOut OFF|POSitive|NEGative

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

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude] <amplitude>|MINimum|MAXimum

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate][:AMPLitude]? [MINimum|MAXimum]

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:HIGH <voltage>|MINimum|MAXimum

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:HIGH? [MINimum|MAXimum]

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:LOW <voltage>|MINimum|MAXimum

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:LOW? [MINimum|MAXimum]

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet <voltage>|MINimum|MAXimum

[:SOURce<n>]:VOLTage[:LEVel][:IMMediate]:OFFSet? [MINimum|MAXimum]

[:SOURce<n>]:VOLTage:UNIT VPP|VRMS|DBM

[:SOURce<n>]:VOLTage:UNIT?

:SYSTem:BEEPer[:IMMediate]

:SYSTem:BEEPer:STATe ON|OFF

:SYSTem:BEEPer:STATe?

:SYSTem:COMMunicate:LAN:AUTOip[:STATe] ON|OFF

:SYSTem:COMMunicate:LAN:AUTOip[:STATe]?

:SYSTem:COMMunicate:LAN:DHCP[:STATe] ON|OFF

:SYSTem:COMMunicate:LAN:DHCP[:STATe]?

:SYSTem:COMMunicate:LAN:DNS <address>

:SYSTem:COMMunicate:LAN:DNS?

:SYSTem:COMMunicate:LAN:GATEway <address>

:SYSTem:COMMunicate:LAN:GATEway?

:SYSTem:COMMunicate:LAN:IPADdress <ip_addr>

:SYSTem:COMMunicate:LAN:IPADdress?

:SYSTem:COMMunicate:LAN:MAC?

:SYSTem:COMMunicate:LAN:SMASk <mask>

:SYSTem:COMMunicate:LAN:SMASk?

:SYSTem:COMMunicate:LAN:STATic[:STATe] ON|OFF

:SYSTem:COMMunicate:LAN:STATic[:STATe]?

:SYSTem:COMMunicate:USB:INFormation?

:SYSTem:COMMunicate:USB[:SELF]:CLASs COMPuter|PRINter

:SYSTem:COMMunicate:USB[:SELF]:CLASs?

:SYSTem:CSCopy CH1|CH2,CH2|CH1

:SYSTem:CWCopy CH1|CH2,CH2|CH1

:SYSTem:ERRor?

:SYSTem:KLOCk[:STATe] ON|OFF

:SYSTem:KLOCk[:STATe]?

:SYSTem:LANGuage ENGLish|SCHinese

:SYSTem:LANGuage?

:SYSTem:POWeron DEFault|LAST

:SYSTem:POWeron?

:SYSTem:POWSet AUTO|USER

:SYSTem:POWSet?

:SYSTem:PRESet DEFault|USER1|USER2|USER3|USER4|USER5|USER6|USER7|USER8|USER9|USER10

:SYSTem:RESTART

:SYSTem:ROSCillator:SOURce INTernal|EXTernal

:SYSTem:ROSCillator:SOURce?

:SYSTem:SHUTDOWN

:SYSTem:VERSion?