Representations and Warranties

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1. Introduction to the SCPI Language

1.1. Communication Interfaces

Computers communicate with the AG series generator by sending and receiving commands over USB or RS232 interface. Command is sent and identified in the form of ASCII character strings for users to easily control the generator and do user-defined development. Operations that you can do with a computer and a generator include: Set the generator and output waveforms from the generator.

Connection: Please connect the USB Device port at the rear panel of the generator with the corresponding USB interface on the computer using an USB cable, or connect the RS232 port at the rear panel of the generator with the corresponding RS232 interface on the computer using an RS232 cable.

1.2. Command Syntax

The command systems of AG series present a hierarchy structure (tree system) and each command consists of a "Root" keyword and one or multiple sub-keywords. 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,

:FUNCtion:SQUare:DTYCycle   {<percent> }

:FUNCtion:SQUare:DTYCycle?

FUNCtion is the root keyword of the command, SQUare and DTYCycle are the second-level and third-level keywords respectively, all the keywords are separated by ":". <percent> denotes the parameter that users can set, the default unit of the numerical parameters are listed in *Appendix I* ; "?" denotes query; the command FUNCtion:SQUare:DTYCycle and parameter are separated by "space". All the command strings begin with ":" or "*" and have no terminator ("\n" or "\r \n" can be recognized as terminator also). The commands can be sent continuously (have command execution queue), the program will be executed in sequence. If the command is correct, "->\n" will be returned; if wrong, "=?\n" will be returned. If the parameter is invalid or the command does not work, "NULL\n" will be returned.

After one of the complete commands, if the following command has the same first-level keyword or the same first-level and second-level keywords (keywords have 3 levels most), the same keywords in the following command can be omit, the command can be written as the rest parts.

E.g.

　　:func:sine:freq 1000 //Complete command

      :ampl 2   //Omit first-level **func** and second-level **sine**

      :squ:offset 1   //Omit first-level **func**

1.3. Symbol Description

Following symbols are usually used to assist to explain the parameters contained in a command.

a) Braces { }

The options enclosed in a { } are parameters available in the command. Only one option could be selected every time, and all the options are separated by "|". For example, {ON|OFF} indicateds that ON or OFF can be selected.

b) Triangle Brackets < >

The parameter enclosed in < > must be replaced by an effective value.

For example,

:FUNCtion:SINE:FREQuency <value>

wherein, <value> must be a numerical value, such as:

:FUNCtion:SINE:FREQuency 1000

1.4. Programmed Parameter Type

The commands contain 5 kinds of parameters, different parameters have different setting methods.

a) Boolean Parameters

The parameters could be "OFF" or "ON" ("0" or "1"), for example,

:CHANnel:CH1 {OFF|ON}

"OFF" denotes disabling the output of CH1. "On" denotes enabling the output of CH1.

b) Consecutive Integer Parameters

The parameters could be a consecutive integer, for example,

:FUNCtion:ARB:BUILtinwform <value>

<value> could be any integer between 0 and 25(including 0 and 25).

c) Consecutive Real Number Parameters

The parameters could be any value within the effective range and with the required precision, for example,

FREQuency {<frequency>}

For sine wave, <frequency> could be any real number between 1uHz and 25MHz.

d) ASCII Character String

The parameters should be the combinations of ASCII characters, for example,

:AM:SOURce <modulation signal source>

<modulation signal source> is a character string defined inside.

1.5.　Command Abbreviation

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

FUNCtion:SQUare:AMPLitude? also can be:

FUNC:SQU:AMPL? or func:squ:ampl? or fUnC:sQu:AmPL?

1.6.　Available Command for Different Model

a) AG1022

This model does not have these functions: AM / FM / PM / FSK / PWM / SWEEP / BURST / COUNTER. The corresponding commands of these functions are invalid.

b) AG1022F

This model does not have DC button on the front panel (DC is in the build-in waveform of Arbitrary Signals), no PWM for CH1, no modulation function for CH2. The corresponding commands are invalid.

c) AG2052F

This model does not have DC button on the front panel (DC is in the build-in waveform of Arbitrary Signals), no modulation function for CH2. The corresponding commands are invalid.

2. Common Commands

AG Series support following IEEE488.2 commands:

1. *IDN

Syntax	***IDN?**
Function	Query ID character string of instrument.
Explanations	The query returns 4 character segments separated by commas ",": manufacturer, model, serial number and the edition number.
Example	***IDN?** returns **OWON,AG1022,AG10221331030,V_4.0.1**

2. *RST

Syntax	***RST**
Function	Restore the instrument to its default value.
Explanations	
Example	***RST**

3.:FUNCtion Commands

The control commands of waveform function are as follows:

1. :FUNCtion

Syntax	**:FUNCtion?** **:FUNCtion** **{SINE|SQUare|RAMP|PULSe|NOISe|ARB|DC|AM|FM|PM|FSK|PWM|S WEep|BURSt}**
Function	Query/set the waveform function for current channel.
Explanations	This command work on the current selected channel by default. If you want to set the other channel, you need switch channel first (refer to the command of channel control, such as CHANnel CH2).
Example	**:FUNCtion RAMP**

2. :FUNCtion:SINE:LOAD

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB|DC}:LOAD?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB|DC}:LOAD {ON|OFF|<ohm>}**
Function	Query/set the load of current channel.
Explanations	Ω is the unit of <ohm>, the default is 50Ω. "OFF" sets the output terminal as "High Z"; "ON" sets it as the setting value. {SINE|SQUare|RAMP|PULSe|NOISe|ARB|DC} have the public parameter "LOAD". Only take SINE for instance here, other waveforms will not be repeated.
Example	**:FUNCtion:SINE:LOAD 123**

3. :FUNCtion:{SINE\|SQUare\|RAMP\|PULSe\|ARB}:FREQuency

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:FREQuency?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:FREQuency {<frequency>}**
Function	Query/set the frequency of output function for current channel.

Explanations	<frequency> is the frequency set by user, the default unit is Hz. NOISE does not have frequency parameter. The query returns the frequency set in scientific notation, such as: 1.000000E+04。
Example	**:FUNCtion:RAMP:FREQuency 10000**

4. :FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:PERiod

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:PERiod?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:PE**Riod {<period>}
Function	Query/set the period of output function for current channel.
Explanations	<period> is the setting value of period, the default unit is S.
Example	**:FUNCtion:RAMP:PERi**od? returns 1.000000E-03

5. :FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB}:AMPLitude

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:AMPLitude?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:AMPLit**ude {<amplitude>}
Function	Query/set the amplitude (PK-PK) of output function for current channel.
Explanations	<amplitude> is the amplitude set by users, the default unit is Vpp.
Example	**:FUNCtion:RAMP:AMPLitu**de 2 sets the amplitude as 2Vpp

6. :FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB}:OFFSet

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:OFFSet?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:OFFSet** {<offset>}
Function	Query/set the offset voltage of output function for current channel.
Explanations	< offset >is the offset voltage set by users, the default unit is V.
Example	**:FUNCtion:RAMP:OFFSet** 2 sets the offset voltage as 2V.

7. :FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB}:HIGHt

Syntax	**:FUNCtion:{SINE|SQUare|RAMP|PULSe|ARB}:HIGHt?** **:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:HIGHt** {<high level>}
Function	Query/set the high level of output function for current channel.
Explanations	<high level> is the high level set by users, the default unit is V.
Example	**:FUNCtion:RAMP:HIGHt** 2 sets the high level as 2V.

8. :FUNCtion:{SINE|SQUare|RAMP|PULSe|NOISe|ARB}:LOW

Syntax	**:FUNCtion**:**{SINE|SQUare|RAMP|PULSe|ARB}:LOW?**
	:FUNCtion:{SINE|SQUare|RAMP|PULSe |ARB}:LOW {<low level>}
Function	Query/set the low level of output function for current channel.
Explanations	<low level> is the low level set by users, the default unit is V.
Example	**:FUNCtion:RAMP:LOW** 2 sets the low level as 2V.

9. :FUNCtion:{SQUare|PULSe}:DTYCycle

Syntax	**:FUNCtion**:**{ SQUare|PULSe }:DTYCycle?**
	:FUNCtion:{ SQUare|PULSe }:DTYCycle {<duty cycle>}
Function	Query/set the duty cycle of square/pulse wave for current channel.
Explanations	<percent> is the percent of duty cycle set by users, the default unit is %.
Example	**:FUNCtion:SQUare:DTYCycle** 20 sets the duty cycle of square wave as 20%

10. :FUNCtion:RAMP:SYMMetry

Syntax	**:FUNCtion:RAMP:SYMMetry?**
	:FUNCtion:RAMP:SYMMetry {<symmetry>}
Function	Query/set the symmetry of ramp wave for current channel.
Explanations	<symmetry> is the percent of symmetry set by users, the default unit is %.
Example	**:FUNCtion:RAMP:SYMMetry** 20 sets the symmetry of ramp wave as 20%

11. :FUNCtion:PULSe:WIDTh

Syntax	**:FUNCtion:PULSe:WIDTh?**
	:FUNCtion:PULSe:WIDTh {<width>}
Function	Query/set the width of pulse wave for current channel.
Explanations	<width> is the width set by users, the default unit is S.
Example	**:FUNCtion:PULSe:WIDTh 1.0E-04** sets the width of pulse wave as 100μs

12.   :FUNCtion:ARB:BUILtinwform

Syntax	:FUNCtion:ARB:BUILtinwform? :FUNCtion:ARB:BUILtinwform {<name of build-in wave>|<number of build-in wave>}
Function	Query/set the build-in arbitrary wave for current channel.
Explanations	<name of build-in wave> is listed in *Appendix I*. <number of build-in wave> is an integer between 0 and 25 corresponding to <name of build-in wave>. The query returns <name of build-in wave>,<number of build-in wave>.
Example	:FUNCtion:ARB:BUILtinwform ExpRise sets the arbitrary wave as Exponential Rise waveform :FUNCtion:ARB:BUILtinwform? Returns x^2,15 (if the output arbitrary wave is selected from the file data stored in flash, the query returns NULL).

13.   :FUNCtion:ARB:FILE

Syntax	:FUNCtion:ARB:FILE? :FUNCtion:ARB:FILE {<file name>}
Function	Query/read the data file of arbitrary wave stored in the root directory of flash for current channel.
Explanations	If the arbitrary wave is selected as the data file stored in flash, the query returns the name of data file; read outputs the wave stored in flash with the name <file name>.
Example	:FUNCtion:ARB:FILE 999.bin sets the arbitrary wave as 999.bin in flash. :FUNCtion:ARB:FILE? returns 999.bin

14.   :FUNCtion:DC:VOLTage

Syntax	:FUNCtion:DC:VOLTage? :FUNCtion:DC:VOLTage {<voltage>}
Function	Query/set the DC voltage for current channel
Explanations	<voltage> is the voltage set by users, the default unit is V. This command is only for AG1022.
Example	:FUNCtion:DC:VOLTage -2 sets the DC voltage as -2V.

15. :FUNCtion:{AM|FM|PM|PWM}:SHAPe

Syntax	:FUNCtion:{AM|FM|PM|PWM}:SHAPe?
	:FUNCtion:{AM|FM|PM|PWM}:SHAPe
	{<SINE|SQUare|RAMP|NOISe|ARB>}
Function	Query/set the internal modulating wave of {AM|FM|PM|PWM}
Explanations	In internal modulation mode, the modulating wave could be sine, square, ramp, noise or arbitrary wave, the default is sine. Noise cannot be set for PWM
Example	:FUNCtion:AM:SHAPe SQU sets the modulating wave of AM as square.

16. :FUNCtion:{AM|FM|PM|PWM}:FREQuency

Syntax	:FUNCtion:{AM|FM|PM|PWM}:FREQuency?
	:FUNCtion:{AM|FM|PM|PWM}:FREQuency {<modulating frequency>}
Function	Query/set the internal modulating frequency of {AM|FM|PM|PWM}.
Explanations	The unit of <modulating frequency> is Hz. Frequency range: 2mHz to 20kHz
Example	:FUNCtion:AM:FREQuency 100 sets the modulating frequency of AM as 100Hz

17. :FUNCtion:AM:DEPTh

Syntax	:FUNCtion:AM:DEPTh?
	:FUNCtion:AM:DEPTh {<depth percent>}
Function	Query/set the depth of AM modulation.
Explanations	The unit of <depth percent> is %. Depth range: 0% to 100%
Example	:FUNCtion:AM:DEPTh 100 sets the depth of AM modulation as 100%

18. :FUNCtion:{AM|FM|PM|FSK|PWM}:SOURce

Syntax	:FUNCtion:{AM|FM|PM|FSK|PWM}:SOURce?
	:FUNCtion:{AM|FM|PM|FSK|PWM}:SOURce {INTernal|EXTernal}
Function	Query/set internal or external modulation source of {AM|FM|PM|FSK|PWM}
Explanations	

Example	:FUNCtion:AM:SOURce EXT sets the modulation source of AM as external.

19.   :FUNCtion:FM:DEViation

Syntax	:FUNCtion:FM:DEViation? :FUNCtion:FM:DEViation {<frequency deviation>}
Function	Query/set the frequency deviation of FM.
Explanations	The unit of <frequency deviation> is Hz.
Example	:FUNCtion:FM:DEViation 100 sets the frequency deviation of FM as 100Hz

20.   :FUNCtion:PM:PHASe

Syntax	:FUNCtion:PM:PHASe? :FUNCtion:PM:PHASe {<phase deviation>}
Function	Query/set the phase deviation of PM.
Explanations	The unit of <phase deviation> is degree (°). Range: 0° to 180°
Example	:FUNCtion:PM:PHASe 100 set the phase deviation of PM as 100°

21.   :FUNCtion:FSK:RATE

Syntax	:FUNCtion:FSK:RATE? :FUNCtion:FSK:RATE {<rate>}
Function	Query/set the modulating rate of FSK.
Explanations	The unit of <rate> is Hz. Rate range: 2mHz～100kHz。
Example	:FUNCtion:FSK:RATE 100 set the modulating rate of FSK as 100Hz

22.   :FUNCtion:FSK:HOPFreq

Syntax	:FUNCtion:FSK:HOPFreq? :FUNCtion:FSK:HOPFreq {<frequency>}
Function	Query/set the hop frequency of FSK.
Explanations	The unit of <frequency> is Hz.
Example	:FUNCtion:FSK:HOPFreq 200 sets the hop frequency of FSK as 200Hz

23. :FUNCtion:PWM:DEViation

Syntax	:FUNCtion:FSK:DEViation? :FUNCtion:FSK:DEViation {<width deviation>}
Function	Query/set the width deviation of PWM.
Explanations	The unit of <width deviation> is s.
Example	:FUNCtion:PWM:DEViation 2.00E-04 sets the width deviation of PWM as 200μs

24. :FUNCtion:SWEep:SWEeptime

Syntax	:FUNCtion:SWEep:SWEeptime? :FUNCtion:SWEep:SWEeptime {<sweep time>}
Function	Query/set the sweep time needed for the generator to sweep from the start frequency to the stop frequency.
Explanations	The unit of <sweep time> is s. Range: 1ms～500s。
Example	:FUNCtion:SWEep:SWEeptime 4 sets the sweep time as 4s.

25. :FUNCtion:SWEep:SPACing

Syntax	:FUNCtion:SWEep:SPACing? :FUNCtion:SWEep:SPACing {LINear|LOGarithmic}
Function	Query/set linear or logarithmic spacing for the sweep, the default is LINear.
Explanations	
Example	:FUNCtion:SWEep:SPACing LINear sets linear spacing for the sweep

26. :FUNCtion:SWEep:STARtfreq

Syntax	:FUNCtion:SWEep:STARtfreq? :FUNCtion:SWEep:STARtfreq {<start frequency>}
Function	Query/set the start frequency for the sweep.
Explanations	The start frequency can be greater than the stop frequency; <start frequency> is used with <stop frequency> together.
Example	:FUNCtion:SWEep:STARtfreq 100 sets the start frequency of sweep as 100Hz

27. :FUNCtion:SWEep:STOPfreq

Syntax	:FUNCtion:SWEep:STOPfreq?
	:FUNCtion:SWEep:STOPfreq {<stop frequency>}
Function	Query/set the stop frequency for the sweep.
Explanations	
Example	:FUNCtion:SWEep:STOPfreq 1000 sets the stop frequency of sweep as 1000Hz

28. :FUNCtion:SWEep:CENTrefreq

Syntax	:FUNCtion:SWEep:CENTrefreq?
	:FUNCtion:SWEep:CENTrefreq {<center frequency>}
Function	Query/set the center frequency for the sweep.
Explanations	<center frequency> is used with <frequency span> together.
Example	:FUNCtion:SWEep:CENTrefreq 1000 sets the center frequency of sweep as 1000Hz

29. :FUNCtion:SWEep:SPAN

Syntax	:FUNCtion:SWEep:SPAN?
	:FUNCtion:SWEep:SPAN{<frequency span>}
Function	Query/set the frequency span for the sweep.
Explanations	
Example	:FUNCtion:SWEep:SPAN 500 sets the frequency span of sweep as 500Hz

30. :FUNCtion:SWEep:SOURce

Syntax	:FUNCtion:SWEep:SOURce?
	:FUNCtion:SWEep:SOURce {INTernal|EXTernal|MANual}
Function	Query/set the source for the sweep.

Explanations	INTernal: always sweep from the start frequency to the stop frequency. EXTernal: sweep once when there is an external trigger (if the period of the trigger signal is shorter than the sweep time, the sweep cannot be done once). MANual: choosing manual trigger; in Sweep interface, press the **knob** on the front panel (or send a trigger command) to sweep from the start frequency to the stop frequency once.
Example	:FUNCtion:SWEep:SOURce EXTernal sets the source of the sweep as external.

31.   :FUNCtion: SWEep:TRIGger

Syntax	:FUNCtion: SWEep: TRIGger 1
Function	The generator is triggered once for sweep
Explanations	This command is valid only when the source is set as manual. The parameter 1 is meaningless; it can be any other value. This command only trigger once every time.
Example	:FUNCtion: SWEep: TRIGger 1

32.   :FUNCtion:BURSt:PERiod

Syntax	:FUNCtion:BURSt:PERiod? :FUNCtion:BURSt:PERiod {<burst period>}
Function	Query/set the period of burst.
Explanations	When the source is not internal or the mode is gated, this command is invalid. Range: 1ms～500s.
Example	:FUNCtion:BURSt:PERiod 2 sets the period of burst as 2s

33.   :FUNCtion:BURSt:PHASe

Syntax	:FUNCtion:BURSt:PHASe? :FUNCtion:BURSt:PHASe {<start phase>}
Function	Query/set the start phase of burst.
Explanations	Range: -360°～+360°
Example	:FUNCtion:BURSt:PHASe 120 sets the start phase of burst as 120°

34.　:FUNCtion:BURSt:MODE

Syntax	:FUNCtion:BURSt:MODE? :FUNCtion:BURSt:MODE { NCYCles|GATed}
Function	Query/set the burst mode (N-Cycle or Gated).
Explanations	
Example	:FUNCtion:BURSt:MODE GATed sets the burst mode as N-Cycle.

35.　:FUNCtion:BURSt:NCYCle

Syntax	:FUNCtion:BURSt:NCYCle? :FUNCtion:BURSt:NCYCle {<cycle number>}
Function	Query/set the cycle number of burst.
Explanations	This command is invalid in gated mode or the cycle number is infinite.
Example	:FUNCtion:BURSt:NCYCle 110 sets the cycle number of burst as 110 cycle

36.　:FUNCtion:BURSt:INFinite

Syntax	:FUNCtion:BURSt:INFinite? :FUNCtion:BURSt:INFinite {CYCLes|INFinite }
Function	Query/set the cycle number of burst (finite or infinite).
Explanations	This command is invalid in gated mode.
Example	:FUNCtion:BURSt:INFinite INFinite sets the cycle number of burst as infinite.

37.　:FUNCtion:BURSt:POLarity

Syntax	:FUNCtion:BURSt:POLarity? :FUNCtion:BURSt:POLarity { POSitive | NEGative }
Function	Query/set the polarity of burst in gated mode.
Explanations	This command is invalid in N-Cycle mode.
Example	:FUNCtion:BURSt:POLarity NEGative sets the polarity of burst in gated mode as negative.

38. :FUNCtion:BURSt:SOURce

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Syntax	:FUNCtion:BURSt:SOURce?
	:FUNCtion:BURSt:SOURce { INTernal|EXTernal|MANual}
Function	Query/set the source of burst in N-Cycle mode.
Explanations	This command is invalid in gated mode.
Example	:FUNCtion:BURSt:SOURce EXTernal sets the source of burst as external.

39. :FUNCtion:BURSt:TRIGger

Syntax	:FUNCtion:BURSt: TRIGger 1
Function	The generator is triggered once for burst
Explanations	This command is valid only when the source is set as manual. The parameter 1 is meaningless; it can be any other value. This command only trigger once every time.
Example	:FUNCtion:BURSt: TRIGger 1

4. :FILE Commands

The commands used for controlling data file of arbitrary waves are as follows:

1. :FILE:UPLoad

Syntax	:FILE:UPLoad <uploading file size>,<uploading file name>
Function	Upload a data file of arbitrary wave (from PC to the generator).
Explanations	The uploading file shouldn't be too large and should be the recognized format by the generator.
Example	:FILE:UPLoad 1234,sine.bin

2. :FILE:DOWNload

Syntax	:FILE:DOWNload <downloading file name>
Function	Download a data file of arbitrary wave (from the generator to PC).
Explanations	After finding the file, send the value of file size (unsigned int type, 4 bytes), then send the whole file.
Example	:FILE:DOWNload 999.bin

3. :FILE:FILEname

Syntax	:FILE:FILEname?
Function	Query the names of all waveforms in current storage medium.
Explanations	The query returns the names of data file in current storage medium.
Example	:FILE:FILEname? returns "999.bin,abc.bin"

4. :FILE:DELete

Syntax	:FILE: DELete < file name to be deleted>
Function	Delete the specified file from the flash of the generator
Explanations	The file name must be complete and is case-sensitive. Return NULL if the specified file does not exist.
Example	:FILE: DELete 123.bin

5.:SYSTem Commands

The commands of system control are as follows:

1. :SYSTem:VERSion

Syntax	:SYSTem:VERSion?
Function	Query the software edition number of the instrument.
Explanations	
Example	:SYSTem:VERSion? returns "V_4.0.1"

2. :SYSTem:CLKSrc

Syntax	:SYSTem:CLKSrc? :SYSTem:CLKSrc {INTernal|EXTernal}
Function	Query/set the system clock source.
Explanations	When the clock source is selected as external, the setting will fail if the interface of clock source on the rear panel is not connected correctly.
Example	:SYSTem:CLKSrc? returns "INT" or "EXT". :SYSTem:CLKSrc EXTernal

3. :SYSTem:LANGuage

Syntax	:SYSTem:LANGuage? :SYSTem:LANGuage {SIMPchinese|TRADchinese|ENGLish}
Function	Query/set the system language.
Explanations	
Example	:SYSTem:LANGuage?(returns {SIMP|TRAD|ENGL}) :SYSTem:LANGuage TRADchinese

6.:CHANnel Commands

The commands of channel control are as follows:

1. :CHANnel

Syntax	:CHANnel? :CHANnel {CH1|CH2}
Function	Query/set current channel.
Explanations	
Example	:CHANnel?(returns {CH1|CH2}) :CHANnel CH2

2. :CHANnel:CH1

Syntax	:CHANnel:CH1? :CHANnel:CH1{ON|OFF|1|0}
Function	Query/set the state of CH1 output.
Explanations	
Example	:CHANnel:CH1?(returns {ON|OFF}) :CHANnel:CH1 ON

3. :CHANnel:CH2

Syntax	:CHANnel:CH2? :CHANnel:CH2{ON|OFF|1|0}
Function	Query/set the state of CH2 output.
Explanations	
Example	:CHANnel:CH2?(returns {ON|OFF}) :CHANnel:CH2 ON

7. :COUNter Commands

The commands of counter control are as follows:

1. :COUNter:FREQuency

Syntax	:COUNter:FREQuency?
Function	Query the frequency measurement value of the counter.
Explanations	
Example	:COUNter:FREQuency? returns "1.000006E+03"

2. :COUNter:PERiod

Syntax	:COUNter:PERiod?
Function	Query the period measurement value of the counter.
Explanations	
Example	:COUNter:PERiod? returns "9.999793E-04"

3. :COUNter:PWIDth

Syntax	:COUNter:PWIDth?
Function	Query the positive pulse width measurement value of the counter.
Explanations	
Example	:COUNter:PWIDth? returns "5.020240E-04"

4. :COUNter:DTYCycle

Syntax	:COUNter:DTYCycle?
Function	Query the duty cycle measurement value of the counter.
Explanations	
Example	:COUNter:DTYCycle? returns "5.000000E+01"

5. :COUNter:COUPling

Syntax	:COUNter:COUPling?
	:COUNter:COUPling {AC|DC}
Function	Query/set the coupling mode.
Explanations	
Example	:COUNter:COUPling?(returns {AC|DC})　:COUNter:COUPling AC

6. :COUNter:SENSitivity

Syntax	:COUNter:SENSitivity?
	:COUNter:SENSitivity {LOW,MIDD,HIGH}
Function	Query/set the trigger sensitivity.
Explanations	
Example	:COUNter:SENSitivity?(returns {LOW,MIDD,HIGH}) :COUNter:SENSitivity LOW

7. :COUNter:HFR

Syntax	:COUNter:HFR?
	:COUNter:HFR {ON|OFF}
Function	Query/set the state of high-frequency reject.
Explanations	
Example	:COUNter:HFR?(returns {ON|OFF})　:COUNter:HFR ON

8. :COUNter:TRIGlev

Syntax	:COUNter:TRIGlev?
	:COUNter:TRIGlev <trigger level>
Function	Query/set the trigger level of the counter.
Explanations	
Example	:COUNter:TRIGlev?(returns "0.000000E+00")　:COUNter:TRIGlev 1.00

8. Application Examples

E.g. 1: To Generate a Sine Wave via CH1

Target: Generate a sine wave with 20 kHz frequency, 2.5 Vpp amplitude, 500mV offset via CH1.

Step	SCPI Command	Comment
0	*IDN?	/*Query ID to check the operating state*/
1	:CHAN CH1	/*Set current channel as CH1*/
2	:FUNC:SINE:LOAD OFF	/*Set the load as High Z*/
3	:FUNC:SINE:FREQ 20000	/*Set the frequency of the sine wave*/
4	:FUNC:SINE:AMPL 2.5	/*Set the amplitude*/
5	:FUNC:SINE:OFFS 0.5	/*Set the offset*/
6	:CHAN:CH1 ON	/*Enable the connector of CH1 at front panel*/

Note: When setting frequency in step 3, the waveform has been select as sine. Step 3, 4, 5 do not require the fixed order; you can adjust based on your operating habits.

E.g. 2: To Generate a Built-in Arbitrary Wave via CH2

Target: Generate an ExpRise wave with 2MHz frequency, 5Vpp amplitude, 10mV offset and 100Ω load via CH2.

Step	SCPI Command	Comment
0	*IDN?	/*Query ID to check the operating state*/
1	:CHAN CH2	/*Set current channel as CH2*/
2	:FUNC:SINE:LOAD 100	/*Set the load as 100Ω*/
3	:FUNC:ARB:FREQ 2.0E+06	/*Set the frequency of the arbitrary wave*/
4	:FUNC:ARB:AMPL 5	/*Set the amplitude*/
5	:FUNC:ARB:OFFS 0.01	/*Set the offset*/
6	:FUNC:ARB:BUIL ExpRise	/*Select built-in wave function*/
7	:CHAN:CH2 ON	/*Enable the connector of CH2 at front panel*/

E.g. 3: To Generate a FSK Wave via CH1

Target: Generate a FSK wave with 10 kHz, 5 Vpp, 0 V offset carrier wave (Sine), internal modulation source, 800 Hz hop frequency and 200 Hz FSK rate via CH1.

Step	SCPI Command	Comment
0	*IDN?	/*Query ID to check the operating state*/
1	:CHAN CH1	/*Set current channel as CH1*/
2	:FUNC:SINE:LOAD OFF	/*Set the load as High Z*/
3	:FUNC:SINE:FREQ 10000	/*Set the frequency of carrier*/
4	:FUNC:SINE:AMPL 5	/*Set the amplitude of carrier*/
5	:FUNC:SINE:OFFS 0	/*Set the offset of carrier*/
6	:FUNC:FSK:source internal	/*Select internal modulation source*/
7	:FUNC:FSK:hopfreq 800	/* Set the hop frequency*/
8	:FUNC:FSK:RATE 200	/* Set the FSK rate*/
9	:CHAN:CH1 1	/*Enable the connector of CH1 at front panel*/

E.g. 4: To Generate a Linear Sweep Wave via CH1 and a Ramp Wave via CH2

Target: Generate a sweep square wave with 100Hz to 1kHz frequency, internal trigger, linear mode and 5s sweep time via CH1. Generate a 1.5kHz, 5Vpp, 1V, 33% symmetry ramp wave via CH2.

Step	SCPI Command	Comment
0	*IDN?	/*Query ID to check the operating state*/
1	:CHAN CH1	/*Set current channel as CH1*/
2	:FUNC:SINE:LOAD OFF	/*Set the load as High Z*/
3	:FUNC SQUARE	/*Square should be selected before enabling frequency sweep*/
4	:FUNC SWEEP	/*Enable frequency sweep*/
5	:FUNC:SWEEP:SWEEPTIME 5	/*Set the sweep time*/
6	:FUNC:SWEEP:SPAC LIN	/*Select linear sweep mode*/
7	:FUNC:SWEEP:STAR 100	/*Set the start frequency*/
8	:FUNC:SWEEP:STOP 1000	/*Set the stop frequency*/
9	:FUNC:SWEEP:SOURCE INT	/*Select internal trigger source*/
10	:CHAN:CH1 ON	/*Enable the connector of CH1 at front panel*/
11	:CHAN CH2	/*Set current channel as CH2*/
12	:FUNC:RAMP:LOAD OFF	/*Set the load as High Z*/
13	:FUNC:RAMP:FREQ 1500	/*Set the frequency of the ramp wave*/
14	:FUNC:RAMP:AMPL 5	/*Set the amplitude*/
15	:FUNC:RAMP:OFFSET 1	/*Set the offset*/
16	:FUNC:RAMP:SYMM 33	/*Set the symmetry*/
17	:CHAN:CH2 ON	/*Enable the connector of CH2 at front panel*/

Note:

If the parameters of the generator are not explicit, all the relevant parameters of the output waveform should be set; if the parameters are explicit and meet the set requirements of the output waveform, you do not need to set them.

Appendix Ⅰ

a) Default unit of numerical parameters

Parameter Type	Default Unit
Frequency	Hertz/Hz
Time	Second/S
Amplitude	PK-PK/Vpp
Offset voltage, level	Volt/V
Load	ohm/Ω
percent	%
Phase	Degree/°
Cycle number	Cycle

b) Number and name of build-in arbitrary wave

No.	Name of build-in wave
0	StairD
1	StairU
2	StairUD
3	Trapezia
4	RoundHalf
5	AbsSine
6	AbsSineHalf
7	SineTra
8	SineVer
9	ExpRise
10	ExpFall
11	Sinc
12	Tan
13	Cot
14	Sqrt
15	x^2
16	Rectangle
17	Gauss
18	Hamming
19	Hann
20	Bartlett
21	Blackman
22	Laylight
23	DC
24	Heart
25	Round

Appendix Ⅱ：Commands Reference