Programming Manual

4060B Series
Dual Channel Function/Arbitrary Waveform Generators

B&K PRECISION

Contents

About Commands & Queries

This section lists and describes the remote control commands and queries recognized by the instrument. All commands and queries can be executed in either local or remote state.

The description for each command or query, with syntax and other information, begins on a new page. The name (header) is given in both long and short form, and the subject is indicated as a command or query or both. Queries perform actions such as obtaining information, and are recognized by the question mark (?) following the header.

1.1 How They are Listed

The descriptions are listed in alphabetical order according to their short form.

1.2 How They are Described

In the descriptions themselves, a brief explanation of the function performed is given. This is followed by a presentation of the formal syntax, with the header given in Upper-and-Lower-Case characters and the short form derived from it in ALL UPPER-CASE characters. Where applicable, the syntax of the query is given with the format of its response.

1.3 When can they be used?

The commands and queries listed here can be used for 4060B Series arbitrary/function waveform generators.

1.4 Command Notation

The following notation is used in the commands:

$< >$ Angular brackets enclose words that are used placeholders, of which there are two types: the header path and the data parameter of a command.

:= A colon followed by an equals sign separates a placeholder from the description of the type and range of values that may be used in a command instead of the placeholder.

Braces enclose a list of choices, one of which one must be made.

[ ] Square brackets enclose optional items.

… An ellipsis indicates that the items both to its left and right may be repeated a number of times.

Common Command Introduction

IEEE standard defines the common commands used for querying the basic information of the instrument or executing basic operations. These commands usually start with "*" and the length of the keywords of the command is usually 3 characters.

Short	Long Form	Subsystem	What Command/Query does
*IDN	*IDN	SYSTEM	Gets identification from device.
*OPC	*OPC	SYSTEM	Gets or sets the OPC bit (0) in the Event Status Register (ESR).
*CLS	*CLS	SYSTEM	Clears all the status data registers.
*ESE	*ESE	SYSTEM	Sets or gets the Standard Event Status Enable register (ESE).
*ESR	*ESR	SYSTEM	Reads and clears the contents of the Event Status Register (ESR).
*RST	*RST	SYSTEM	Initiates a device reset.
*SRE	*SRE	SYSTEM	Sets the Service Request Enable register (SRE).
*STB	*STB	SYSTEM	Gets the contents of the IEEE 488.2 defined status register.
*TST	*TST	SYSTEM	Performs an internal self-test.
*WAI	*WAI	SYSTEM	Wait to continue command.
CHDR	COMM_HEADER	SIGNAL	Sets or gets the command returned format OUTP OUTPUT SIGNAL Sets or gets output state.
BSWV	BASIC_WAVE	SIGNAL	Sets or gets basic wave parameters.
MDWV	MODULATEWAVE	SIGNAL	Sets or gets modulation parameters.
SWWV	SWEEPWAVE	SIGNAL	Sets or gets sweep parameters.
BTWV	BURSTWAVE	SIGNAL	Sets or gets burst parameters.
PACP	PARACOPY	SIGNAL	Copies parameters from one channel to the other.
ARWV	ARBWAVE	DATA	Changes arbitrary wave type.
SYNC	SYNC	SIGNAL	Sets or gets synchronization signal.
NBFM	NUMBER_FORMAT	SYSTEM	Sets or gets data format.
LAGG	LANGUAGE	SYSTEM	Sets or gets language. SCFG SYS_CFG SYSTEM Sets or gets the power-on system setting way.
BUZZ	BUZZER	SYSTEM	Sets or gets buzzer state.
SCSV	SCREEN_SAVE	SYSTEM	Sets or gets screen save state.

Short	Long Form	Subsystem	What Command/Query does
ROSC	ROSCILLATOR	SIGNAL	Sets or gets state of clock source.
FCNT	FREQCOUNTER	SIGNAL	Sets or gets frequency counter parameters.
INVT	INVERT	SIGNAL	Sets or gets polarity of current channel.
COUP	COUPLING	SIGNAL	Sets or gets coupling parameters.
VOLTPRT	VOLTPRT	SYSTEM	Sets or gets state of over-voltage protection.
STL	STORELIST	SIGNAL	Lists all stored waveforms.
WVDT	WVDT	SIGNAL	Sets and gets arbitrary wave data.
VKEY	VIRTUALKEY	SYSTEM	Sets the virtual keys.
SYST:COMM:LAN:IPAD	SYSTEM:COMMUNICATE:LAN:IPADDRESS	SYSTEM	The Command can set and get system IP address.
SYST:COMM:LAN:SMAS	SYSTEM:COMMUNICATE:LAN:SMASK	SYSTEM	The Command can set and get system subnet mask.
SYST:COMM:LAN:GAT	SYSTEM:COMMUNICATE:LAN:GATEWAY	SYSTEM	The Command can set and get system Gateway.
SRATE	SAMPLERATE	SIGNAL	Sets or gets sampling rate. You can only use it in TrueArb mode HARM HARMonic SIGNAL Sets or gets harmonic information.
CMBN	COMBINE	SIGNAL	Sets or gets wave combine information.

2.1 *IDN?

Description The *IDN? query causes the instrument to identify itself. The response comprises manufacturer, model, serial number, software version and firmware version.

Query Format *IDN?

Response Format *IDN, <device id>,<model>,<serial number>, <software version>, <hardware version>.

<device id>="BK" is used to identify instrument.
<model>= A model identifier less than 14 characters will contain the model number.
<serial number>:Each product has its own number, the serial number can labeled product uniqueness.
<software version>= A serial numbers about software version.
<hardware version>=The hardware level field, should contain information about all separately revisable subsystems. This information can be contained in single or multiple revision codes.

Example *IDN?

Returns:
*IDN BK, 4062B, 573J19100, 2.01.01.35R3B2
value2: Hardware version. value3:
Hardware subversion. value4:
FPGA version.
value5: CPLD version.

2.2 *OPC

Description The *OPC (Operation Complete) command sets the OPC bit (bit 0) in the standard Event Status Register (ESR). This command has no other effect on the operation of the device because the instrument starts parsing a command or query only after it has completely processed the previous command or query. The *OPC? query always responds with the ASCII character 1 because the device only responds to the query when the previous command has been entirely executed.

COMMAND SYNTAX *OPC

Query Syntax *OPC?

Response Format *OPC 1

2.3 *CLS

Description The *CLS command clears all the status data registers.

Command Syntax *CLS

Example The following command causes all the status data registers to be cleared: *CLS

2.4 *ESE

Description The *ESE command sets the Standard Event Status Enable register (ESE). This command allows one or more events in the ESR register to be reflected in the ESB summary message bit (bit 5) of the STB register. The *ESE? query reads the contents of the ESE register.

Command Syntax *ESE <value>
<value> = 0 to 255.

Query Format *ESE?

Query Response *ESE <value>

Example The following instruction allows the ESB bit to be set if a user request (URQ bit 6, i.e. decimal 64) and/or a device dependent error (DDE bit 3, i.e. decimal 8) occurs. Summing these values yields the ESE register mask 64+8=72.
*ESE?
Return:
*ESE 72

2.5 *ESR

Description The *ESR? query reads and clears the contents of the Event Status Register (ESR). The response represents the sum of the binary values of the register bits 0 to 7.

Query Format *ESR?

Query Response *ESR <value>
<value> = 0 to 255

Example The following instruction reads and clears the content of the ESR register
*ESR?
Return:
*ESR 0

Related Commands *CLS, *ESE

2.6 RST

Description The *RST command initiates a device reset. The *RST recalls the default setup.

Command Syntax *RST

Example This example resets the signal generator: *RST

2.7 SRE

Description The *SRE command sets the Service Request Enable register (SRE). This command allows the user to specify which summary message bit(s) in the STB register will generate a service request. A summary message bit is enabled by writing a '1' into the corresponding bit location. Conversely, writing a '0' into a given bit location prevents the associated event from generating a service request (SRQ). Clearing the SRE register disables SRQ interrupts.
The *SRE? query returns a value that, when converted to a binary number represents the bit settings of the SRE register. Note that bit 6 (MSS) cannot be set and it's returned value is always zero.

Command Syntax *SRE <value>
<value> = 0 to 255

Query Format *SRE?

Query Response *SRE <value>

Example The following instruction allows a SRQ to be generated as soon as the MAV summary bit (bit 4, i.e. decimal 16) or the INB summary bit (bit 0, i.e. decimal 1) in the STB register, or both are set. Summing these two values yields the SRE mask 16+1 = 17.
*SRE?
Return:
*SRE 17

2.8 *STB?

Description The *STB? query reads the contents of the 488.2 defined status register (STB), and the Master Summary Status (MSS). The response represents the values of bits 0 to 5 and 7 of the Status Byte register and the MSS summary message.
The response to a *STB? query is identical to the response of a serial poll except that the MSS summary message appears in bit 6 in place of the RQS message.

Query Syntax *STB?

Query Response *STB <value>
<value> = 0 to 255

Example The following reads the status byte register:
*STB?
Return:
*STB 0

Related Commands *CLS, *SRE

2.9 *TST?

Description The *TST? query performs an internal self-test and the response indicates whether the self-test has detected any errors. The self-test includes testing the hardware of all channels. Hardware

failures are identified by a unique binary code in the returned <status> number. A "0" response indicates that no failures occurred.

Query Format *TST?

Query Response *TST <status>
<status> = 0 self-test successful

Example The following causes a self-test to be performed:
TST?
Return(if no failure):
*TST 0

Related Commands *CAL

2.10 WAI

Description The *WAI (WAIT to continue) command, requires by the IEEE 488.2 standard, has no effect on the instrument, as the signal generator only starts processing a command when the previous command has been entirely executed.

Command Syntax *WAI

Related Commands *OPC

2.11 Comm_Header Command

Description This command is used to change the query command returned format. "SHORT" parameter returns short format. "LONG" parameter returns long format. "OFF" returns nothing.

Command Syntax Comm_HeaDeR
={SHORT,LONG,OFF}

Query Format Comm_HeaDeR?

Query Response chdr

Example Set query command format to long. CHDR LONG Read query command format.
CHDR?
Return:
COMM_HEADER LONG

2.12 Output Command

Description Enable or disable the output of the [Output] connector at the front panel corresponding to the channel. The query returns "ON" or "OFF" and "LOAD", "PLRT" parameters.

Command Syntax <channel>:OUTPut
<channel>={C1, C2}
={a parameter from the table below}
< load>={please see the note below.}

Parameters	Value	Description
ON	—	Turn on
OFF	—	Turn off
LOAD	<load>	value of load(defaultunite is ohm)
PLRT	<NOR,INVT>	value of polarity parameter

Query Format	<channel>:OUTPut?
Query Response	<channel>:OUTP <load>
Example	Turn on channel one.
	C1:OUTP ON
	Read channel one output state.
	C1:OUTP?
	Return:
	C1:OUTP ON, LOAD, HZ, PLRT, NOR
	Set the load to 50.
	C1:OUTP LOAD, 50
	Set the load to HZ.
	C1:OUTP LOAD, HZ
	Set the polarity normal.
	C1:OUTP PLRT, NOR
	Set the polarity inverted.
	C1:OUTP PLRT, INVT

2.13 Basic Wave Command

Description	Sets or gets basic wave parameters.
Command Syntax	<channel>:BaSic_WaVe <parameter>
	<channel>={C1, C2}
	<parameter>:={a parameter from the table below}

2.13.1 Paramters

> **Note:** if the command doesn't set basic wave type, WVPT parameter will be set to current wave type.

where:
<type>={SINE, SQUARE, RAMP, PULSE, NOISE, ARB ,DC}
<frequency>={Default unit is "Hz". Value depends on the model.}
<amplitude>={Default unit is "V". Value depends on the model.}
<offset>={Default unit is "V". Value depends on the model.}
<duty>={0% to 100%. Value depends on frequency.}
<symmetry> ={0% to 100%}
<phase>={0 to 360 if you set 400,it will set 40(400-360)}
< standard deviation >={Default unit is "V". Value depends on the model.}
<mean>={Default unit is "V". Value depends on the model.}
<width>={Max_width < (Max_duty * 0.01) * period and Min_width > (Min_duty * 0.01) * period.}
<rise>={Value depends on the model.}
<fall>={Value depends on the model.}
<delay>={Unit is S. Maximal is Pulse period, minimum value is 0.}
<bandwidth switch >={ON,OFF}
<bandwidth value>={value between 20MHz and 120MHz}

Parameters	Value	Description
WVTP	<type>	Type of wave
FRQ	<frequency>	Value of frequency. If wave type is Noise or DC, you can't set this parameter.
PERI	<period>	Value of period. If wave type is Noise or DC, you can't set this parameter.
AMP	<amplitude>	Value of amplitude. If wave type is Noise or DC, you can't set this parameter.
OFST	<offset>	Value of offset. If wave type is Noise or DC, you can't set this parameter.
SYM	<symmetry>	Value of symmetry. Only when wave type is Ramp, you can set this parameter.
DUTY	<duty>	Value of duty cycle. Only when wave type is Square and Pulse, you can set this parameter.
PHSE	<phase>	Value of phase. If wave type is Noise or Pulse or DC, you can't set this parameter.
STDEV	<standard deviation >	Value of Noise wave standard deviation. Only when wave type is Noise, you can set this parameter.
MEAN	<mean>	Value of Noise wave mean. Only when wave type is Noise, you can set this parameter.
IDTH	<width>	Value of width. Only when wave type is Pulse, you can set this parameter.
RISE	<rise>	Value of rise time. Only when wave type is Pulse, you can set this parameter.
FALL	<fall>	Value of fall time. Only when wave type is Pulse, you can set this parameter
DLY	<delay>	Value of delay. Only when wave type is Pulse, you can set this parameter.
HLEV	<high level>	Value of high level. If wave type is Noise or DC, you can't set this parameter.
LLEV	<low level>	Value of low level. If wave type is Noise or DC, you can't set this parameter.
BANDSTATE	<switch > <bandwidth>	State of noise bandwidth switch. Only when wave type is Noise, you can set this parameter.
BANDWIDTH	<bandwidth value>	Value of noise bandwidth. Only when wave type is noise, you can set this parameter.

Query Format   <channel>:BaSic_WaVe?
<channel>={C1, C2}

Query Response   <channel>:BSWV<type>,<frequency>,<amplitude>,<offset>, <duty>,<symmetry>, <phase>,<variance>,<mean>,<width>, <rise>, <fall>, <delay>.

Example   Change channel one wave type to ramp.
C1:BSWV WVTP, RAMP
Change frequency of channel one to 2000 Hz.
C1:BSWV FRQ, 2000
Set amplitude of channel one to 3Vpp.
C1:BSWV AMP, 3
Read channel basic wave parameters from device.
C1:BSWV?
Return:

C1:BSWV WVTP, SINE,FRQ,100HZ,PERI,0.01S,AMP,2V, OFST,0V,HLEV,1V,LLEV,-1V,PHSE,0
Set noise bandwidth value of channel one to 100MHz
C1:BSWV BANDWIDTH, 100000000

2.14 Modulate Wave Command

Description   Sets or gets modulation parameters.

Command   <channel>:MoDulateWaVe

Syntax   <channel>={C1, C2}
={a parameter from the table below}

2.14.1 ParamtersTable

Parameters	Value	Description
STATE	<state>	Turn on or off modulation. Note: if you want to set or read other parameters of modulation, you must set STATE to ON at first.
AM, SRC	<src>	AM signal source.
AM, MDSP	<mod wave shape>	AM modulation wave. Only when AM sign al source is set to INT, you can set the parameter.
AM, FRQ	<AM frequency>	AM frequency. Only when AM signal sour ce is set to INT, you can set the paramet er.
AM, DEPTH	<depth>	AM depth. Only when AM signal source is set to INT, you can set the parameter.
DSBAM, SRC	<src>	DSBAM signal source.
DSBAM, MDSP	<mod wave shape>	DSBAM modulation wave. Only when AM signal source is set to INT, you can set the parameter.
DSBAM, FRQ	<DSB-AM>< frequency>	DSBAM frequency. Only when AM signal source is set to INT, you can set the parameter.
FM, SRC	<src>	FM signal source.
FM, MDSP	<mod wave shape>	FM modulation wave. Only when FM signal source is set to INT, you can set the parameter.
FM, FRQ	<FM frequency>	FM frequency. Only when FM signal source is set to INT, you can set the parameter.
FM, DEVI	<FM frequency deviation >	FM frequency deviation. Only when FM signal source is set to INT. you can set the parameter.
PM, SRC,	<src>	PM signal source.

Parameters	Value	Description
PM, MDSP	<mod wave shape>	PM modulation wave. Only when PM signal source is set to INT, you can set the parameter.
PM, FRQ	<PM frequency>	PM frequency. Only when PM signal source is set to INT, you can set the parameter.
PWM, FRQ	<PWM frequency>	PWM frequency. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, DEVI	<PWM dev>	Duty cycle deviation. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, MDSP	<mod wave shape>	PWM modulation wave. Only when carrier wave is PULSE wave, you can set the parameter.
PWM, SRC	<src>	PWM signal source.
PM, DEVI	<PM phase offset>	PM phase deviation. Only when PM signal source is set to INT, you can set the parameter.
ASK, SRC	<src>	ASK signal source.
ASK, KFRQ	<ASK key frequency>	ASK key frequency. Only when ASK signal source is set to INT, you can set the parameter.
FSK, KFRQ	<FSK key frequency>	FSK key frequency. Only when FSK signal source is set to INT, you can set the parameter.
FSK, HFRQ	<FSK hop frequency>	FSK hop frequency.
FSK, SRC	<src>	FSK signal source.
PSK, KFRQ	<FSK key frequency>	PSK key frequency. Only when PSK signal source is set to INT, you can set the parameter.
PSK, SRC	<src>	PSK signal source.
CARR, WVTP	<wave type>	Carrier wave type.
CARR, FRQ	<frequency>	Value of carrier frequency.
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of carrier symmetry. Only ramp can set this parameter.
CARR, DUTY	<duty>	Value of duty cycle. Only square and pulse can set this parameter.
CARR, PHSE	<phase>	Value of carrier phase.
CARR, RISE	<rise>	Value of rise time. Only Pulse can set this parameter.
CARR, FALL	<fall>	Value of fall time. Only Pulse can set this parameter.
CARR,DLY	<DELAY>	Value of carrier delay.Only PULSE can set this parameter.

Note: If carrier wave is Noise you can't set to turn on modulation.

If you want to set AM, FM, PM, CARR and STATE the first parameter have to be one of them.
where: <state>={ON, OFF}
<src>={INT, EXT}
<mod wave shape>={SINE, SQUARE, TRIANGLE, UP RAMP, DNRAMP, NOISE, ARB}
<am frequency>={Default unit is "Hz". Value depends on the model.} <depth>={0% to 120%}
<fm frequency>={Default unit is "Hz". Value depends on the model.} <fm frequency deviation > ={0 to carrier frequency, Value depends on the difference between carrier frequency and bandwidth frequency.} <pm frequency> ={Default unit is "Hz", Value depends on the model.}
<pm phase deviation >={0 to 360.} <pwm frequency>={Default unit is "Hz", Value depends on the model.}

<pwm dev>={Default unit is "%",value depends on carrier duty cycle} <ask key frequency>={Default unit is "Hz", Value depends on the model.}

<fsk frequency>={Default unit is "Hz", Value depends on the version.} <fsk jump frequency>={the same with basic wave frequency}

<wave type>={SINE ,SQUARE, RAMP, ARB, PULSE}

<frequency> ={Default unit is "Hz", Value depends on the model.}

<amplitude> ={Default unit is "V", Value depends on the model.}

<offset> ={Default unit is "V", Value depends on the model.}

<duty>={0% to 100%.}

<symmetry>={0% to 100%}

<rise>={Value depends on the model.}

<fall>={Value depends on the model.}

<delay>={Default unit is "S".}

Note: There are some parameters Value depends on the model, You can read version datasheet to get specific parameters

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Query Format   <channel>:MoDulateWaVe?
<channel>={C1, C2}

RESPONSE FORMAT   <channel>:MDWV
={Return all parameter of the current modulation parameters.}

Example   Set channel one modulation type to AM.
C1:MDWV AM

Set modulation shape to AM, and set AM modulating wave type to sine wave.
C1:MDWV AM, MDSP, SINE

Read channel one modulation parameters of which STATE is ON.
C1:MDWV?

Return:
C1:MDWV STATE,ON,AM,MDSP,SINE,SRC,INT,FRQ,100HZ,
DEPTH,100,CARR,WVTP,RAMP,FRQ,1000HZ,AMP,4V,OFST,0V,PHSE, 0, SYM, 50 Read channel one modulate wave parameters of which STATE is OFF. C1:MDWV?
Return:

C1:MDWV STATE, OFF

Set channel one FM frequency to 1000Hz
C1:MDWV FM, FRQ, 1000

Set channel one carrier shape to SINE.
C1:MDWV CARR, WVTP, SINE

Set channel one carrier frequency to 1000 Hz.
C1:MDWV CARR, FRQ,1000

RELATED COMMANDS   ARWV, BTWV, SWWV, BSWV

2.15 Sweep Wave Command

Description   Sets or gets sweep parameters.

Command Syntax   <channel>:SWeepWaVe

<channel>={C1, C2}
={a parameter from the table below}

2.15.1 Paramters

Parameters	Value	Description
STATE	<state>	Turn on or off sweep. Note: if you want to set or read other parameters you must set STATE to ON at first.
TIME	<time>	Value of sweep time.
STOP	<stop frequency>	Value of stop frequency.
START	<start frequency>	Value of start frequency.
TRSR	<trigger src>	Trigger source.
TRMD	<trigger mode>	State of trigger output. If TRSR is EXT, the parameter is invalid.
SWMD	<sweep mode>	Sweep style.
DIR	<direction>	Sweep direction.
EDGE	<edge>	Value of edge. Only when TRSR is EXT, the parameter is valid.
MTRIG	<manual trigger>	Make a manual trigger. Only when TRSR is MAN, the parameter is valid.
CARR,WVTP	<wave type>	Carrier type.
CARR, FRQ	<frequency>	Value of carrier frequency.
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of carrier symmetry, Only Ramp can set this parameter.
CARR,DUTY	<duty>	Value of carrier duty cycle. Only Square can set this parameter.
CARR,Phase	<phase>	Value of carrier phase.

> **Note:** If carrier is Pulse or Noise you can't turn on sweep.
> If you want to set CARR and STATE, the first parameter has to be one of them.

where:
<state>={ON, OFF}
<time>={Default unit is "S". Value depends on the model.} <stop frequency> ={the same with basic wave frequency}
<start frequency> ={the same with basic wave frequency}
<trigger src>={EXT, INT, MAN}
<trigger mode>={ON, OFF}
<sweep mod>={LINE, LOG}
<direction>={UP, DOWN}
<edge>={RISE, FALL} <wave type>={SINE ,SQUARE, RAMP, ARB}
<frequency> ={Default unit is "Hz". Value depends on the model.}
<amplitude> ={Default unit is "V". Value depends on the model.}
<offset> ={Default unit is "V", Value depends on the model.}
<duty>={0% to 100%.}
<symmetry>={0% to 100%}

> **Note:** There are some parameters Value depends on the model, You can read version datasheet.

Query Format   <channel>:SWeepWaVe? <channel>={C1, C2}

Query Response   \<parameter\> =\{Return all parameters of the current sweep wave.\}

Example   Set channel one sweep time to 1 S.
C1:SWWV TIME, 1
Set channel one sweep stop frequency to 1000 Hz.
C1:SWWV STOP, 1000
Read channel one sweep parameters of which STATE is ON.
C2:SWWV?
Return:
C2:SWWV STATE, ON, TIME, 1S, STOP, 100HZ, START,
100HZ, TRSR, MAN,TRMD, OFF, SWMD, LINE, DIR, UP,
CARR, WVTP, SQUARE,
FRQ, 1000HZ, AMP, 4V, OFST, 0V, DUTY, 50, PHSE, 0
Read channel two sweep parameters of which STATE is OFF.
C2:SWWV?
Return:
C2:SWWV STATE, OFF

2.16 Burst Wave Command

Description   Sets or gets burst wave parameters.

Command Syntax   \<channel\>=\{C1, C2\} \<parameter\>=\{a parameter from the table below\}

Note: If you want to set CARR and STATE, the first parameter has to one of them

where: \<state\>=\{ON, OFF\}
\<period\>=\{Default unit is "S". Value depends on the model.\}
\<start phase\>=\{0 to 360\}
\<gate ncycle\>=\{GATE, NCYC\}
\<trigger source\>=\{EXT, INT, MAN\}
\<delay\>=\{Default unit is "S", Value depends on the model.\}
\<polarity\>=\{NEG, POS\}
\<trig mode \>=\{RISE, FALL, OFF\} \<edge\>=\{RISE, FALL\} \<circle time\> =\{Value depends
on the Model ("INF" means infinite).\}
\<wave type\>=\{SINE ,SQUARE, RAMP, PULSE, NOISE, ARB\}
\<frequency\> =\{Default unit is "HZ". Value depends on the model.\}
\<amplitude\>=\{Default unit is "V". Value depends on the model.\}
\<offset\>=\{Default unit is "V". Value depends on the model.\}
\<duty\>=\{0% to 100%.\}
\<symmetry\> =\{0% to 100%\}
\<phase\>=\{0 to 360\}
\< standard deviation \>=\{Default unit is "V". Value depends on the
model.\}
\<mean\>=\{Default unit is "V". Value depends on the model.\}
\<width\> =\{Max_width \< (Max_duty * 0.01) * period and
Min_width \> (Min_duty * 0.01) * period.\}
\<rise\>=\{Value depends on the model.\}
\<fall\>=\{Value depends on the model.\}
\<delay\>=\{Default unit is "S".\}

Note: There are some parameters Value depends on the model, You can read version
datasheet to get specific parameters.

2.16.1 Paramters

Parameters	Value	Description
STATE	<state>	Turn on or off burst. Note: If you want to set orread other parameters of burst, you must set state to ON at first. And when trigger source is EXT, you can't set it.
PRD	<period>	Value of burst period. When carrier is NOISE wave, you can't set it.
STPS	<start phase>	Start phase of carrier. When carrier is NOISE or PULSE wave, you can't set it.
GATE_NCYC	<gate Ncycle>	Set the burst mode to GATE or NCYC. When carrier is NOISE, you can't set it.
TRSR	<trigger source>	Set the trigger source.
DLAY	<delay>	Value of delay. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it.
PLRT	<polarity>	Value of polarity. When GATE is chosen you can set it. When carrier is NOISE, it is the only parameter.
TRMD	<trig mode>	Value of trigger mode. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it. When TRSR is set to EXT, you can't set it.
EDGE	<edge>	Value of edge. When carrier is NOISE wave, you can't set it. When NCYC is chosen and TRSR is set to EXT, you can set it.
TIME	<circle time>	Value of Ncycle number. When carrier is NOISE wave, you can't set it. When NCYC is chosen you can set it.
MTRIG	<manual trig>	Manual trigger. When TRSR is set to MAN, it can be set.
CARR,WVTP	<wave type>	Value of carrier type.
CARR, FRQ	<frequency>	Value of carrier frequency
CARR, AMP	<amplitude>	Value of carrier amplitude.
CARR, OFST	<offset>	Value of carrier offset.
CARR, SYM	<symmetry>	Value of symmetry. Only Ramp can set this parameter.
CARR,DUTY	<duty>	Value of duty cycle. Only Square or Pulse can set this parameter.
CARR, PHSE	<phase>	Value of carrier phase.
CARR, RISE	<rise>	Value of rise edge. Only when carrier is Pulse, the Value is valid.
CARR, FALL	<fall>	Value of fall edge. Only when carrier is Pulse, the Value is valid.
CARR,STDEV	<standard deviation >	Value of standard deviation. Only when carrier is Noise, the Value is valid.
CARR,MEAN	<mean>	Value of mean. Only when carrier wave is Noise, the Value is valid.
CARR,DLY	<delay>	Value of delay. Only whencarrier is Pulse, the parameter is valid

Query Format   <channel>:BursTWaVe?
<channel>={C1, C2}
=<period>......

Query Response

<channel>:BTWV <type>,<state>,<period>......

Example   Set channel one burst period to 1S.
C1:BTWV PRD, 1
Set channel one burst delay to 1s C1:BTWV DLAY, 1 Set channel one burst to infinite C1:BTWV TIME, INF
Read channel two burst parameters of which STATE is ON.
C2:BTWV?
Return:
C2:BTWV STATE,ON,PRD,0.01S,STPS,0,TRSR,INT,
TRMD,OFF,TIME,1,DLAY,2.4e-07S,GATE_NCYC,NCYC,
CARR,WVTP,SINE,FRQ,1000HZ,AMP,4V,OFST,0V,PHSE,0
Read channel two burst parameters of which STATE is OFF.
C2:BTWV?
Return:
C2:BTWV STATE, OFF

2.17 Parameter Copy Command

Description   Copies parameters from one channel to another.

Command Syntax   ParaCoPy <destination channel>, <src channel>
<destination channel>={C1, C2}
<src channel>={C1, C2}

Note: the parameters C1 and C2 must be set to the device together.

Example   Copy parameters from channel one to channel two.
PACP C2, C1

Related Commands   ARWV, BTWV, MDWV, SWWV, BSWV

2.18 Arbitrary Wave Command

Description   Sets and gets arbitrary wave type.

Command Syntax   <channel> ARWV(ArbWaVe) INDEX,<value1>, NAME,<value2>
<channel>={C1, C2}
<value1>: the table below shows what the index number mean.)
< value2>: see table below.

Query Format   <channel>:ARbWaVe?
<channel>={C1, C2}

Query Response   <channel>:ARWV <index>

Example   Set StairUp arbitrary wave output by index.
C1:ARWV INDEX, 2
Read system current wave.
ARWV?
Return:
ARWV INDEX,2,NAME,StairUp

Set Cardiac arbitrary wave output by name.
ARWV NAME, Cardiac

2.18.1 Notes:

Index	Name	Index	Name	Name	Index	Name	Index
0	Sine	12	Logfall	24	Gmonopuls	36	Triang
1	Noise	13	Logrise	25	Tripuls	37	Harris
2	StairUp	14	Sqrt	26	Cardiac	38	Bartlett
3	StairDn	15	Root3	27	Quake	39	Tan
4	Stairud	16	X^2	28	Chirp	40	Cot
5	Ppulse	17	X^3	29	Twotone	41	Sec
6	Npulse	18	Sinc	30	Snr	42	Csc
7	Trapezia	19	Gaussian	31	Hamming	43	Asin
8	Upramp	20	Dlorentz	32	Hanning	44	Acos
9	Dnramp	21	Haversine	33	Kaiser	45	Atan
10	Exp_fall	22	Lorentz	34	Blackman	46	Acot
11	Exp_rise	23	Gauspuls	35	Gausswin	47	Square

> **Note:** About the table: This table is just an example, the index may depend on the model, you can execute "STL?" command to get them accurately.

2.19 Sync Command

Description Sets synchronization signal.

Command Syntax <channel>:SYNC
<channel>={C1, C2}
={ON, OFF}

Query Format <channel>:SYNC?
<channel>={C1, C2}

Query Response <channel>:SYNC

Example Turn on sync function of channel one.
C1:SYNC ON

Read state of channel one sync.
C1:SYNC?
Return:
C1:SYNC OFF

2.20 Number Format Command

Description Sets or gets number format.

Command Syntax NBFM(NumBer_ForMat)
={a parameter from the table below.}

Parameters	Value	Description
PNT	<pnt>	Point format
SEPT	<sept>	Separator format

Where:
<pnt>={Dot, Comma}.
<sept> ={Space, Off, On}.

Query Format	NBFM (NumBer_ForMat)?
Query Response	NBFM <parameter>
Example	Set point format to DOT.
	NBFM PNT, DOT
	Set Separator format to ON.
	NBFM SEPT,ON
	Read number format.
	NBFM?
	Return:
	NBFM PNT, DOT, SEPT, ON

2.21 Language Command

Description	Sets or gets system language.
Command Syntax	LAGG(LAnGuaGe) <parameter> <parameter>={EN, CH, RU}
Query Format	LAGG (LAnGuaGe)?
Query Response	LAGG <parameter>
Example	Set language to English. LAGG EN Read language LAGG? Return: LAGG EN

2.22 Configuration Command

Description	Sets or gets the power-on system setting..
Command Syntax	SCFG(Sys_CFG)<parameter> <parameter>={DEFAULT, LAST}
Query Format	SCFG (Sys_CFG)?
Query Response	SCFG <parameter>
Example	Set the power-on system setting to LAST. SCFG LAST

2.23 Buzzer Command

Description	Turns on or off the buzzer.
Command Syntax	BUZZ(BUZZer) <parameter> <parameter>={ON, OFF}
Query Format	BUZZ (BUZZer)?
Query Response	BUZZ <parameter>
Example	Turn on the buzzer. BUZZ ON

2.24 Screen Save Command

Description	Turns off or sets screen save time (default unit is minutes).
Command Syntax	SCSV (SCreen_SaVe) <parameter> <parameter>={OFF, 1, 5, 15, 30, 60, 120, 300}
Query Format	SCSV (SCreen_SaVe)?
Query Response	SCreen_SaVe <parameter>
Example	Set screen save time to 5 minutes. SCSV 5 Read the current screen save time. SCreen_SaVe? Return: SCSV 5MIN

2.25 Clock Source Command

Description	Sets or gets the clock source.
Command Syntax	ROSC (ROSCillator) <parameter> <parameter>={INT, EXT}
Query Format	ROSC (ROSCillator)?
Query Response	ROSC <parameter>
Example	Set internal time base as the clock source. ROSC INT

2.26 Frequency Counter Command

Description	Sets or gets frequency counter parameters.
Command Syntax	<parameter>={a parameter from the table below}

Parameters	Value	Description
STATE	<state>	State of frequency counter.
FRQ	<frequency>	Value of frequency. Can't be set.
PW	<position width>	Value of positive width. Can't be set.
NW	<negative width>	Value of negative width. Can't be set.
DUTY	<duty>	Value of duty cycle. Can't be set.
FRQDEV	<freq deviation>	Value of freq deviation. Can't be set.
REFQ	<ref freq>	Value of reference freq.
TRG	<triglev>	Value of trigger level.
MODE	<mode>	Value of mode.
HFR	<HFR>	State of HFR.

where: < state >={ON, OFF}
<frequency>={Default unit is "Hz". Value range depends on the model.}
< mode >={AC, DC}
<HFR>={ON, OFF}

Query Format	FCNT (FreqCouNTer)?
Query Response	FCNT < state ><frequency><duty><ref freq><triglev> <position width><negative width> <freq deviation><mode><HFR>
Example	Turn frequency counter on: FCNT STATE,ON Set reference freq to 1000Hz: FCNT REFQ,1000

Query frequency counter information:
FCNT?
Return:
FCNT STATE,ON,FRQ,10000000HZ,DUTY,59.8568,REFQ,
1e+07HZ,TRG,0V,PW,5.98568e-08S,NW,4.01432e-08S,FR
QDEV,0ppm,MODE,AC,HFR,OFF

2.27 Invert Command

Description Sets or gets polarity of current channel.

Command Syntax <channel>:INVerT <parameter> <channel>={C1, C2} <parameter>={ON, OFF}

Query Format <channel>:INVerT?
<channel>={C1, C2}

Query Response <channel>:INVerT

Example <channel>:INVerT
Set C1 ON:
C1:INVT ON
Read the polarity of channel one.
C1:INVT? Return:
C1:INVT ON

2.28 Coupling Command

Description Sets or gets channel coupling parameters. You can only set coupling value when trace switch off.

Command Syntax COUP (COUPling)
={a parameter from the table below}

Value	Parameters	Description
TRACE	<trace>	Trace switch
STATE	<state>	State of channel coupling.
BSCH	<bsch>	Value of base channel.
FDEV	<frq_dev>	Value of f frequency deviation.
PDEV	<pha_dev>	Value of position phase deviation.
FCOUP	<fcoup>	Value of frequency coupling switch
FRAT	<frat>	Value of frequency coupling ratio
PCOUP	<pcoup>	Value of phase coupling switch
PRAT	<prat>	Value of phase coupling ratio
ACOUP	<acoup>	Value of amplitude coupling switch
ARAT	<arat>	Value of amplitude coupling ratio
ADEV	<adev>	Value of amplitude coupling deviation

where: <trace>={ON, OFF}
< state >={ON, OFF}
< bsch >={CH1, CH2}
< frq_dev >={Default unit is "Hz", value range depends on the model}
< pha_dev >={Default unit is "∘"value range depends on the model}
<fcoup>,<acoup>,<pcoup>={ON, OFF}
<frat>,<prat>,< arat >={a ratio value. value range depends on the model}
<adev>={a deviation value. value range depends on the model}

Query Format COUP?

Example Set amplitude coupling ratio
COUP ARAT,2
Query coupling information.
COUP?
Return:
COUP\sTRACE,OFF,FCOUP,ON,PCOUP,ON,ACOUP,ON,FDEV,5HZ,
PRAT,1,ARAT,2\n

2.29 Voltage Overload Command

Description Sets or gets state of over-voltage protection.

Command Syntax VOLTPRT<parameter> <parameter>={ON, OFF}

Query Syntax VOLTPRT?

Response Format VOLTPRT

2.30 Store List Command

Description

This command is used to read the stored wave data names if the store unit is empty; the command will return "EMPTY" string.

> **Note:** M50~ M59 is user defined memory. The name will return what you defined. if you do not define an arbitrary name, it will return"EMPTY"(It is depends on the model).

Query Format

STL (StoreList)? BUILDIN, USER

Example

Read all arbitrary data saved in the device.
STL?
Return:
STL M0, StairUp, M1, StairDn, M2, StairUD, M3, Trapezia, M4,ExpFall,
M5, ExpRise, M6, LogFall, M7, LogRise, M8, Sqrt, M9, X^2, M10, Sinc, M11
, Gaussian, M12, Dlorentz, M13, Haversine, M14, Lorentz, M15, Gauspuls, M16, Gmonopuls
, M17, Cardiac,M18, Quake, M19, TwoTone, M20, SNR, M21, Hamming, M22, Hanning, M23, Kaiser,
M24, Blackman, M25, GaussiWin, M26, Harris, M27, Bartlett, M28, Tan, M29, Cot, M30,
Sec, M31, Csc, M32, Asin, M33, Acos, M34, Atan, M35, ACot, M36, EMPTY, M37 .....
Read built-in wave data.

STL? BUILDIN

Return:

STL M0, Sine, M1, Noise, M10, ExpFal, M11, ExpRise, M12, LogFall, M13,
LogRise, M14, Sqrt, M15, Root3, M16, X^2, M17, X^3, M18, Sinc, M19,
Gussian, M2, StairUp, M20, Dlorentz, M21, Haversine, M22, Lorentz, M23, Gauspuls,
M24, Gmonopuls, M25, Tripuls, M26, Cardiac, M27, Quake,
M28, Chirp, M29, Twotone, M3, StairDn, M30, SNR, M31,
Hamming, M32, Hanning, M33, kaiser, M34, Blackman, M35,
Gausswin, M36, Triang, M37, Harris, M38, Bartlett, M39, Tan,
M4, StairUD, M40, Cot, M41, Sec, M42, Csc, M43, Asin, M44,

Acos, M45, Atan, M46, Acot, M47, Square, M5, Ppulse, M6,
Npulse, M7, Trapezia, M8, Upramp, M9, Dnramp

Read wave data defined by user.

STL? USER

Return:

STL

WVNM,sinec_8M,sinec_3000000,sinec_1664000,ramp_8M, sinec_2000000,sinec_50000,
square_8M,sinec_5000,wave1, square_1M

2.31 Arbitrary Wave Data Command

Description Sets and gets arbitrary wave data.

Command Syntax < channel>:WVDT <address>,
<channel>={C1, C2}
<address>={Mn}

Value	Value	Description
WVNM	<wave name>	Wave name.
TYPE	<type>	Wave type.
LENGTH	<length>	Wave length, 8b 8M)
FREQ	<frequency>	Wave frequency.
AMPL	<amplifier>	Wave amplifier.
OFST	<offset>	Wave offset.
PHASE	<phase>	Wave phase.
WAVEDATA	<wave data>	Wave data.

For all the arbitrary waveforms
WVDT? Mn

For user define wave
WVDT? USER,<wave name>
<wave name>={The name of user define wave}

Example Send wave1:
C1:WVDT WVNM,wave1,TYPE,5,LENGTH,16384B,FREQ,1000,
WAVEDATA, xxxxxxxx

Query user define wave (wave1) command.
WVDT? USER,wave1

Return:

WVDT\sPOS,\s/Local,\sWVNM,\swave1,\sLENGTH, \s1048576B,\sTYPE,\s6,
\sWAVEDATA,\00\00\00\00 \00\00\00\00\00\00 \00\00\00\00\00\00
\FE\ FF\FE\FF\FE\FF \FE\FF\FE\FF\FE\FF \FE\FF\FE\FF\FD\FF
\FD\FF\FD\FF\FD\FF \FD\FF\FD\FF\FD \FF\FD\FF\FC\FF\FC
\FF\FC\FF\FC\FF\FC \FF\FC\FF\FC\FF\FC \FF\FA\FF
\FA\FF\FA\FF\FA\FF \FA\FF\FA\FF\FA\FF \FA\FF\
F9\FF\F9\FF\F9\FF\F9 \FF\F9\FF\F9\FF\F9 \FF\F9\FF\F8\FF\F8 \FF\F8\
FF\F8\FF\F8\FF\F8\FF \F8\FF\F8\FF\F7\FF \F7\FF\F7\FF\F7\FF

\F7\FF\ F7\FF\F7\FF \F7\FF\F6\FF\F6\FF \F6\FF\F6\FF\F6\FF
\F6\FF\F6\FF\F6\ FF\F6\FF\F6\FF\F6\F F\F6\FF\F6\FF\F6\FF \F6\FF\F6
\FF\F5\FF\F5\FF\......

Note: The 4060b waveform generator is 16 bit meaning its range can be between -32,768 and 32,768. The data must sent and read in hexadecimal in little endian. Therefore, the least significant byte is put first.

Example: 22,500 in hex is 57E4, to send that point in little endian it would change to E457.

2.32 Virtual Key Command

Description The Command is used to send simulate a operation of pressing key on front panel.

Command Syntax <value>={a parameter from the table below.}
<state>=<0,1>("1" is effective to virtual value, and "0" is useless)

Example VKEY VALUE,15, STATE,1
VKEY VALUE,KB_SWEEP, STATE,1

Note:The following table states the corresponding key on front panel.

3

Paramter	Value	Paramter	Value
KB_FUNC1	28	KB_NUMBER_4	52
KB_FUNC2	23	KB_NUMBER_5	53
KB_FUNC3	18	KB_NUMBER_6	54
KB_FUNC4	13	KB_NUMBER_7	55
KB_FUNC5	8	KB_NUMBER_8	56
KB_FUNC6	3	KB_NUMBER_9	57
KB_SINE	34	KB_POINT	46
KB_SQUARE	29	KB_NEGATIVE	4
KB_ RAMP	24	KB_LEFT	44
KB_PULSE	19	KB_RIGHT	40
KB_NOISE	14	KB_UP	45
KB_ARB	9	KB_DOWN	39
KB_MOD	15	KB_OUTPUT1	153
KB_SWEEP	16	KB_OUTPUT2	152
KB_BURST	17	KB_KNOB_RIGHT	175
KB_WAVES	4	KB_KNOB_LEFT	177
KB_UTILITY	11	KB_KNOB_DOWN	176
KB_PARAMETER	5	KB_HELP	12
KB_STORE_RECALL	70	KB_CHANNEL	72
KB_NUMBER_0	48	KB_NUMBER_1	49
KB_NUMBER_2	50	KB_NUMBER_3	51

2.33 IP Command

Description The Command can set and get system IP address.

Command Syntax (SYSTem:COMMunicate:LAN:IPADdress) <parameter1>.<parameter2>.<parameter3>.
<parameter4> <parameter1>={a integer value between 1 and 223}

<parameter2>={a integer value between 0 and 255}
<parameter3>={a integer value between 0 and 255}
<parameter4>={a integer value between 0 and 255}

Query Format   SYST:COMM:LAN:IPAD (SYSTem:COMMunicate:LAN:IPADdress)?

Examples   Set IP address to 10.11.13.203 SYSTem:COMMunicate:LAN:IPADdress 10.11.13.203
Get IP address.
SYST:COMM:LAN:IPAD?
Return: "10.11.13.203"

2.34 Subnet Mask Command

Description   The Command can set and get system subnet mask.

Command Syntax   SYSTem:COMMunicate:LAN:SMASk <parameter1>.<parameter2>.<parameter3>.<parameter4>
<parameter1>={a integer value between 0 and 255}
<parameter2>={a integer value between 0 and 255}
<parameter3>={a integer value between 0 and 255}
<parameter4>={a integer value between 0 and 255}

Query Format   SYSTem:COMMunicate:LAN:SMASk?

Examples   Set subnet mask to 255.0.0.0 SYSTem:COMMunicate:LAN:SMASk 255.0.0.0
Get subnet mask
SYSTem:COMMunicate:LAN:SMASk?
Return: "255.0.0.0"

2.35 Gateway Command

Description   The Command can set and get system Gateway.

Command Syntax   SYSTem:COMMunicate:LAN:GATeway <parameter1>.
<parameter2>.<parameter3>.<parameter4>
<parameter1>=a integer value between 0 and 223
<parameter2>=a integer value between 0 and 255
<parameter3>=a integer value between 0 and 255
<parameter4>=a integer value between 0 and 255

Query Format   SYSTem:COMMunicate:LAN:GATeway?

Examples   Set Gateway to 10.11.13.5: SYSTem:COMMunicate:LAN:GATeway 10.11.13.5
Get gateway:
SYSTem:COMMunicate:LAN:GATeway?
Return:
"10.11.13.5"
Parameter/command

2.36 Sampling Rate Command

Description   Sets or gets sampling rate. You can only use it in TrueArb mode.

Command Syntax   <channel>:SampleRATE MODE <parameter1>, VALUE, <parameter2>
<channel> =<C1, C2>
<parameter1> =< DDS, TARB>

                                       <parameter2> ={a integer value between 1e-6 and 75000000, (default unit is Sa/s)}

Query Format   <channel>:SRATE?

Examples   Get the channel one sample rate value C1:SRATE?

Return:

C1:SRATE MODE, DDS
Set channel one to TureArb mode.
C1:SRATE MODE, TARB
Set channel one sample rate value to 1000000Sa/s.
C1:SRATE VALUE, 1000000

2.37 Harmonic Command

Description   Sets or gets harmonic information. The channel current basic wave must be sine.

Command Syntax   <channel>:HARMonic HARMSTATE,<value1>, HARMTY
PE, < value2>, HARMORDER,< value3>, <parameter>, <value4>,
HARMPHASE, < value5>
< value1>= <ON, OFF> < value2>= <EVEN, ODD, ALL>
< value3>={an integer value.}
=< HARMAMP, HARMDBC>
< value4>={an integer value.}
< value5>={an integer value.}

Query Format   <channel>:HARMonic?
<channel>={C1, C2}

Examples   Set the channel one harmonic switch on. C1:HARMHARMSTATE, ON
Get the channel one harmonic information. C1:HARM? Return: C1:HARM HARMSTATE, ON,HARM-
TYPE, EVEN,HARMORDER, 2, HARMAMP, 0V, HARMPHASE, 0

2.38 Waveform Combining Command

Description   Sets or gets waveform combining information.

Command Syntax   <channel>={C1, C2} <parameter>={ON, OFF}

Query Format   <channel>:CoMBiNe? <channel>={C1, C2}

Examples   Turn on the waveform combining of channel one.
C1:CMBN ON Query the waveform combining state of channel two.
C2:CMBN?
Return:
C2:CMBN OFF

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