

# ***VOLTCRAFT***

## **Dual-Channel Arbitrary Waveform Generator Programmer Manual**

- **FG-1302**
- **FG-1602**

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# 1. Introduction to the SCPI Language

## 1.1. Command Syntax

The command systems 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".

## 1.2. 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} indicates that ON or OFF can be selected.

b) Triangle Brackets < >

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

## 1.3. Programmed Parameter Type

The commands contain 8 kinds of parameters, different parameters have different setting methods.

(1) **arbitrary block**

A specified length of arbitrary data, for example,

#6377512xxxxx . . . where

6 indicates that the following 6 digits (377512) specify the length of the data in bytes;

xxxxx ... indicates the data or #0xxxxx...<LF><&EOI>

(2) **boolean**

Boolean numbers or values, for example,

ON or  $\neq$  0

OFF or 0

(3) **discrete**

A list of specific values, for example,

MIN, MAX

(4) **NR1** numeric

Integers, for example,  
0, 2, 30, -5

**(5) NR2 numeric**

Decimal numbers, for example,  
0.6, 3.1415926, -2.6

**(6) NR3 numeric**

Floating point numbers, for example,  
3.1415E-7, -8.2E3

**(7) NRf numeric**

Flexible decimal number that may be type NR1, NR2 or NR3  
See NR1, NR2, and NR3 examples

**(8) string**

Alphanumeric characters (must be within quotation marks)  
"Model, 123456"

### 1.4. 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,  
SOURce1:FREQuency:FIXed 500kHz also can be:  
SOUR1:FREQ:FIX 500kHz

## 2. Commands

### **COUNter:COUPing**

This command sets or queries the coupling mode of the counter to AC or DC.

#### **Syntax**

COUNter:COUPing [AC|DC]

COUNter:COUPing?

#### **Arguments**

AC means that AC is selected for the coupling mode of the counter.

DC means that DC is selected for the coupling mode of the counter.

#### **Returns**

AC|DC

#### **Example**

COUNter:COUPing DC

sets the coupling mode of the counter to DC.

### **COUNter:DUTYcycle? (Query Only)**

This query-only command returns the measurement results for duty cycle of the counter.

#### **Syntax**

COUNter:DUTYcycle?

#### **Arguments**

None

#### **Returns**

<dutycycle>::=<NR3>

#### **Examples**

:COUNter:DUTYcycle?

might returns 2.265700368E+01.

### **COUNTER:FREQ? (Query Only)**

This query-only command returns the measurement results for frequency of the counter.

#### **Syntax**

COUNTER:FREQ?

#### **Arguments**

None

#### **Returns**

<frequency>::=<NR3>

#### **Examples**

:COUNTER:FREQ?

might returns 1.000082563E+02.

### **COUNTER:HFR**

This command enables or disables the high-frequency reject of the counter. The query returns the state of high-frequency reject of the counter.

#### **Syntax**

COUNTER:HFR {ON|OFF|<NR1>}

COUNTER:HFR?

#### **Arguments**

ON or <NR1>≠0 enables the high-frequency reject of the counter.

OFF or <NR1>=0 disables the high-frequency reject of the counter.

#### **Returns**

<NR1>

#### **Examples**

COUNTER:HFR ON

enables the high-frequency reject of the counter.



## **COUNter:PERiod? (Query Only)**

This query-only command returns the measurement results for period of the counter.

### **Syntax**

COUNter:PERiod?

### **Arguments**

None

### **Returns**

<period>::=<NR3>

### **Examples**

:COUNter:PERiod?

might returns 8.545000251E-03.

## **COUNter:PULSewidth? (Query Only)**

This query-only command returns the measurement results for pulse width of the counter.

### **Syntax**

COUNter:PULSewidth?

### **Arguments**

None

### **Returns**

<pulsewidth>::=<NR3>

### **Examples**

:COUNter:PULSewidth?

might returns 366213017E-03.

## **COUNter:SENSitivity**

This command sets or queries the trigger sensitivity of the counter.

**Syntax**

COUNTER:SENSitivity [LOW|MIDDLE|HIGH]

COUNTER:SENSitivity?

**Arguments**

LOW means that Low is selected for the trigger sensitivity of the counter.

MIDDLE means that Middle is selected for the trigger sensitivity of the counter.

HIGH means that High is selected for the trigger sensitivity of the counter.

**Returns**

LOW|MIDDLE|HIGH

**Example**

COUNTER:SENSitivity LOW

sets the trigger sensitivity of the counter to Low.

**DISPLAY:BRIGhtness**

This command sets or queries the brightness of the LCD display.

**Syntax**

DISPlay:BRIGhtness {<brightness>|MINimum|MAXimum}

DISPlay:BRIGhtness?

**Arguments**

<brightness>::=<NR1>[<units>]

where:

<NR1> is a range of display brightness from 0 through 100. The larger the value, the higher the screen brightness.

<units>::=[PCT]

MINimum sets the display to the lowest brightness level.

MAXimum sets the display to the highest brightness level.

**Returns**

<NR1>

**Examples**

DISPLAY:BRIGhtNESS 90

sets the display brightness to 90%.

## **DISPlay:SAVer:DELaY**

This command sets or queries delay time for the screen saver function. The setting range is 1 minute to 999 minutes.

### **Syntax**

DISPlay:SAVer:DELaY {<minutes>|MINimum|MAXimum}

DISPlay:SAVer:DELaY? {MINimum|MAXimum}

### **Arguments**

<minutes>::=<NR1>[<units>]

where:

<NR1> is the delay time in minutes.

<units>::=MIN

### **Returns**

<minutes>

### **Examples**

DISPlay:SAVer:DELaY 30

sets the delay time for the screen saver function to 30 minutes.

## **DISPlay:SAVer:IMMEDIATE (No Query Form)**

This command sets the screen saver state to ON, regardless of the DISPlay:SAVer[:STATe] command setting.

The screen saver is enabled immediately (without waiting for the delay time).

### **Syntax**

DISPlay:SAVer:IMMEDIATE

### **Arguments**

None

### **Examples**

DISPlay:SAVer:IMMEDIATE

sets the screen saver state to ON.

## **DISPlay:SAVer[:STATe]**

This command sets or queries the screen saver setting of the LCD display. When enabled, the screen saver function starts automatically if no operations are applied to the instrument front panel for the delay time set in DISPlay:SAVer:DELAy.

### **Syntax**

DISPlay:SAVer[:STATe] {ON|OFF|<NR1>}  
DISPlay:SAVer[:STATe]?

### **Arguments**

ON or <NR1>≠0 enables the screen saver function.  
OFF or <NR1>=0 disables the screen saver function.

### **Returns**

<NR1>  
indicating the screen saver state.

### **Examples**

DISPLAY:SAVER:STATE OFF  
disables the screen saver function.

## **HCOPY:SDUMp:DATA? (Query Only)**

This query-only command returns a specified length of binary data which consist a BMP screen image.

### **Syntax**

HCOPY:SDUMp:DATA?

### **Arguments**

None

### **Returns**

<data>::=<arbitrary block>

### **Examples**

HCOPY:SDUMp:DATA?  
might return the following response:  
#6377512xxxxx . . . where  
6 indicates that the following 6 digits (377512) specify the length of the data in bytes;

xxxxx ... indicates the BMP image data.

### **HCOPY:SDUMp[:IMMEDIATE] (No Query Form)**

This command copies a screen image and saves the image file to a USB memory. The default file name is n.BMP, where n is a consecutive number from 0. The image files are saved in a folder named Model/IMAGE (Model is the instrument model) in the USB memory.

#### **Syntax**

HCOPY:SDUMp[:IMMEDIATE]

#### **Arguments**

None

#### **Examples**

HCOPY:SDUMP:IMMEDIATE

copies the screen image and may create a file 1.BMP in a USB memory.

### **\*IDN? (Query Only)**

This query-only command returns identification information on the instrument.

#### **Syntax**

\*IDN?

#### **Arguments**

None

#### **Returns**

<Manufacturer>,<Model>,<Serial Number>,<Firmware Level>

#### **Examples**

\*IDN?

might return the following response:

brand, model no., serial number, version number

## OUTPut[1|2]:IMPedance

This command sets the output load impedance for the specified channel. The specified value is used for amplitude, offset, and high/low level settings. You can set the impedance to any value from 1  $\Omega$  to 10 k $\Omega$  with a resolution of 1  $\Omega$ . The default value is 50  $\Omega$ . The query returns the current load impedance setting in ohms. If the load impedance is set to INFINITY, the query returns "9.9E+37".

### Syntax

```
OUTPut[1|2]:IMPedance {<ohms>|INFINITY|MINimum|MAXimum}  
OUTPut[1|2]:IMPedance? {MINimum|MAXimum}
```

### Arguments

<ohms>::=<NR3>[<units>]

where:

<units>::=OHM

INFINITY sets the load impedance to >10 k $\Omega$ .

MINimum sets the load impedance to 1  $\Omega$ .

MAXimum sets the load impedance to 10 k $\Omega$ .

### Returns

<ohms>::=<NR3>

### Examples

```
OUTPut1:IMPedance MAXimum  
sets the CH1 load impedance to 10 k $\Omega$ .
```

## OUTPut[1|2][:STATe]

This command sets or query the instrument output state for the specified channel.

### Syntax

```
OUTPut[1|2][:STATe] {ON|OFF|<NR1>}  
OUTPut[1|2][:STATe]?
```

### Arguments

ON or <NR1> $\neq$ 0 enables the instrument output.

OFF or <NR1>=0 disables the instrument output.

### Returns

<NR1>

### Examples

OUTPut1:STATe ON

sets the instrument CH1 output to ON.

### \*RST (No Query Form)

This command resets the instrument to the factory default settings.

### Syntax

\*RST

### Arguments

None

### Examples

\*RST

resets the instrument settings to the factory defaults.

### [SOURce[1|2]]:AM[:DEPTh]

This command sets or queries the modulation depth of AM modulation for the specified channel. Set the modulation depth from 0% to 100% with resolution of 1%.

### Syntax

[SOURce[1|2]]:AM[:DEPTh] {<depth>|MINimum|MAXimum}

[SOURce[1|2]]:AM[:DEPTh]? [MINimum|MAXimum]

### Arguments

<depth>::=<NR2>[<units>]

where:

<NR2> is the depth of modulating frequency.

<units>::=PCT

MINimum sets the modulation depth to minimum value. MAXimum sets the modulation depth to maximum value.

### Returns

<depth>

## Examples

SOURce1:AM:DEPth MAXimum

sets the depth of modulating signal on CH1 to the maximum value.

## [SOURce[1|2]]:AM:INTernal:FREQuency

This command sets or queries the internal modulation frequency of AM modulation for the specified channel. Use this command when the internal modulation source is selected.

Set the internal modulation frequency from 2 mHz to 100.00 kHz with resolution of 1 mHz.

### Syntax

[SOURce[1|2]]:AM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}

[SOURce[1|2]]:AM:INTernal:FREQuency? [MINimum|MAXimum]

### Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

## Examples

SOURce1:AM:INTernal:FREQuency 10kHz

sets the CH1 internal modulation frequency to 10 kHz.

## [SOURce[1|2]]:AM:SOURce

This command sets or queries the source of modulating signal of AM modulation for the specified channel.

### Syntax

[SOURce[1|2]]:AM:SOURce [INTernal|EXTernal]

[SOURce[1|2]]:AM:SOURce?

### Arguments

INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.



**Returns**

INT|EXT

**Examples**

SOURce1:AM:SOURce INTernal

sets the CH1 source of modulating signal to internal.

**[SOURce[1|2]]:AM:STATe**

This command enables or disables AM modulation for the specified channel. The query returns the state of AM modulation.

**Syntax**

[SOURce[1|2]]:AM:STATe {ON|OFF|<NR1>}

[SOURce[1|2]]:AM:STATe?

**Arguments**

If [SOURce[1|2]] are omitted, CH1 is specified automatically.

ON or <NR1>≠0 enables AM modulation.

OFF or <NR1>=0 disables AM modulation.

**Returns**

<NR1>

**Examples**

SOURce1:AM:STATe ON

enables the CH1 AM modulation.

**[SOURce[1|2]]:ASKey[:AMPLitude]**

This command sets or queries the modulation amplitude of ASK modulation for the specified channel. Set the modulation amplitude from 0 Vpp to the current amplitude of the carrier waveform. The amplitude resolution is 1 mVpp or four digits.

**Syntax**

[SOURce[1|2]]:ASKey[:AMPLitude] {<amplitude>|MINimum|MAXimum}

[SOURce[1|2]]:ASKey[:AMPLitude]? [MINimum|MAXimum]

**Arguments**

<amplitude>::=<NRf>[<units>]

where:

<NRf> is the modulation amplitude.

<units>::=[mVpp|Vpp]

MINimum sets the modulation amplitude to minimum value.

MAXimum sets the modulation amplitude to maximum value.

### Returns

<amplitude>

### Examples

SOURce1:ASKey:AMPLitude MAXimum

sets the amplitude of modulating signal on CH1 to the maximum value.

## [SOURce[1|2]]:ASKey:INTernal:RATE

This command sets or queries the internal modulation rate of ASK modulation for the specified channel. Use this command when the internal modulation source is selected.

### Syntax

[SOURce[1|2]]:ASKey:INTernal:RATE {<rate>|MINimum|MAXimum}

[SOURce[1|2]]:ASKey:INTernal:RATE? {MINimum|MAXimum}

### Arguments

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

### Returns

<rate>

### Examples

SOURce1:ASKey:INTernal:RATE 50Hz

sets the CH1 internal modulation rate to 50 Hz.

## [SOURce[1|2]]:ASKey:SOURce

This command sets or queries the source of modulation signal of ASK modulation for the specified channel.

**Syntax**

[SOURce[1|2]]:ASKey:SOURce [INTernal|EXTernal]  
[SOURce[1|2]]:ASKey:SOURce?

**Arguments**

INTernal means that the carrier waveform is modulated with an internal source.  
EXTernal means that the carrier waveform is modulated with an external source.

**Returns**

INT|EXT

**Examples**

SOURce1:ASKey:SOURce INTernal  
sets the CH1 source of modulating signal to internal.

**[SOURce[1|2]]:ASKey:STATe**

This command enables or disables ASK modulation. The query returns the state of ASK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

**Syntax**

[SOURce[1|2]]:ASKey:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:ASKey:STATe?

**Arguments**

ON or <NR1>≠0 enables ASK modulation.  
OFF or <NR1>=0 disables ASK modulation.

**Returns**

<NR1>

**Examples**

SOURce1:ASKey:STATe ON  
enables the CH1 ASK modulation.

**[SOURce[1|2]]:BPSKey:DATA**

This command sets or queries the data source of modulation signal of BPSK modulation for the specified channel.

**Syntax**

```
[SOURce[1|2]]:BPSKey:DATA [01|10|PN15|PN21]  
[SOURce[1|2]]:BPSKey:DATA?
```

**Arguments**

01 means that the carrier waveform is modulated with 01 pattern.

10 means that the carrier waveform is modulated with 10 pattern.

PN15 means that the carrier waveform is modulated with PN15 pattern.

PN21 means that the carrier waveform is modulated with PN21 pattern.

**Returns**

```
01|10|PN15|PN21
```

**Examples**

```
SOURce1:BPSKey:DATA 01
```

sets the CH1 source of BPSK modulating signal to 01 pattern.

**[SOURce[1|2]]:BPSKey:INTernal:RATE**

This command sets or queries the internal modulation rate of BPSK modulation for the specified channel.

**Syntax**

```
[SOURce[1|2]]:BPSKey:INTernal:RATE {<rate>|MINimum|MAXimum}  
[SOURce[1|2]]:BPSKey:INTernal:RATE? {MINimum|MAXimum}
```

**Arguments**

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

**Returns**

<rate>

**Examples**

```
SOURce1:BPSKey:INTernal:RATE 50Hz
```

sets the CH1 internal BPSK modulation rate to 50 Hz.

## **[SOURce[1|2]]:BPSKey:PHASe**

This command sets or queries the phase deviation of BPSK modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:BPSKey:PHASe {<phase>|MINimum|MAXimum}  
[SOURce[1|2]]:BPSKey:PHASe? [MINimum|MAXimum]
```

### **Arguments**

<phase>::=<NR3>[<units>]

where:

<NR3> is the phase deviation.

<units>::=[RAD|DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 PI to +1 PI, relative to phase value

DEG: 0 to +180, in 1 degree steps, relative to phase value

### **Returns**

<phase>

### **Examples**

```
SOURce1:BPSKey:PHASe MAXimum
```

sets the maximum value for the CH1 phase deviation of BPSK modulation.

## **[SOURce[1|2]]:BPSKey:STATe**

This command enables or disables BPSK modulation. The query returns the state of BPSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

### **Syntax**

```
[SOURce[1|2]]:BPSKey:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:BPSKey:STATe?
```

### **Arguments**

ON or <NR1>≠0 enables BPSK modulation.

OFF or <NR1>=0 disables BPSK modulation.

### **Returns**

<NR1>

### Examples

SOURce1:BPSKey:STATe ON  
enables the CH1 BPSK modulation.

## [SOURce[1|2]]:BURSt:GATE:POLarity

This command sets the generator to output a burst when the gated signal at the [Ext Trig/Burst/Fsk In] connector at the rear panel is high level or low level. This command is only available in gated Burst mode.

### Syntax

```
[SOURce[1|2]]:BURSt:GATE:POLarity{NORMal|INVerted}  
[SOURce[1|2]]:BURSt:GATE:POLarity?
```

### Arguments

NORMal sets the polarity to Normal.  
INVerted sets the polarity to Inverted.

### Returns

NORM|INV

### Examples

SOURce1:BURSt:GATE:POLarity INVerted  
sets the polarity to INVerted, means the instrument outputs a burst when the gated signal at the [Ext Trig/Burst/Fsk In] connector at the rear panel is low level.

## [SOURce[1|2]]:BURSt:INTernal:PERiod

This command sets or queries the Burst period for the specified channel.

### Syntax

```
[SOURce[1|2]]:BURSt:INTernal:PERiod {<period>|MINimum|MAXimum}  
[SOURce[1|2]]:BURSt:INTernal:PERiod?[MINimum|MAXimum]
```

### Arguments

<period>::=<NRf>[<units>]

where

<NRf> is the Burst period.

<units>::=[ns|us|ms|s]

**Returns**

<period>

**Examples**

SOURce1:BURSt:INTernal:PERiod 200ns  
sets the CH1 Burst period to 200 ns.

**[SOURce[1|2]]:BURSt:MODE**

This command sets or queries the burst mode for the specified channel.

**Syntax**

[SOURce[1|2]]:BURSt:MODE {TRIGgered|GATed}  
[SOURce[1|2]]:BURSt:MODE?

**Arguments**

TRIGgered means that triggered mode is selected for burst mode.  
GATed means that gated mode is selected for burst mode.

**Returns**

TRIG|GAT

**Examples**

SOURce1:BURSt:MODE TRIGgered  
selects triggered mode.

**[SOURce[1|2]]:BURSt:NCYCles**

This command sets or queries the number of cycles (burst count) to be output in burst mode for the specified channel. The query returns 9.9E+37 if the burst count is set to INFinity.

**Syntax**

[SOURce[1|2]]:BURSt:NCYCles {<cycles>|INFinity|MINimum|MAXimum}  
[SOURce[1|2]]:BURSt:NCYCles? {MINimum|MAXimum}

**Arguments**

<cycles>::=<NRf>  
where:

<NRf> is the burst count. The burst count ranges from 1 to 500,000.  
INFINITY sets the burst count to infinite count.  
MINimum sets the burst count to minimum count.  
MAXimum sets the burst count to maximum count.

### Returns

<cycles>

### Examples

SOURCE1:BURSt:NCYCles 2  
sets the CH1 burst count to 2.

## [SOURCE[1|2]]:BURSt:SOURce

This command sets or queries the trigger source in the burst mode for the specified channel. This command is available only in the Triggered burst mode.

### Syntax

[SOURCE[1|2]]:BURSt:SOURce [TIMER|MANual|EXternal]  
[SOURCE[1|2]]:BURSt:SOURce?

### Arguments

TIMER specifies an internal clock as the trigger source.  
MANual specifies a manual trigger input as the trigger source.  
EXternal specifies an external trigger input as the trigger source.

### Returns

TIM|MAN|EXT

### Examples

SOURCE1:BURSt:SOURce EXternal  
sets an external trigger input as the trigger source in the burst mode.

## [SOURCE[1|2]]:BURSt:STATe

This command enables or disables the burst mode for the specified channel. The query returns the state of burst mode.

### Syntax

[SOURCE[1|2]]:BURSt:STATe {ON|OFF|<NR1>}



[SOURce[1|2]]:BURSt:STATe?

### Arguments

ON or <NR1>≠0 enables the burst mode.  
OFF or <NR1>=0 disables the burst mode.

### Returns

<NR1>

### Examples

SOURce1:BURSt:STATe ON  
enables the burst mode for the CH1.

## [SOURce[1|2]]:FM[:DEVIation]

This command sets or queries the peak frequency deviation of FM modulation for the specified channel. The setting range of frequency deviation depends on the waveform selected as the carrier.

### Syntax

[SOURce[1|2]]:FM[:DEVIation] {<deviation>|MINimum|MAXimum}  
[SOURce[1|2]]:FM[:DEVIation]? [MINimum|MAXimum]

### Arguments

<deviation>::=<NRf>[<units>]

where:

<NRf> is the frequency deviation.

<units>::=[Hz|kHz|MHz]

### Returns

<deviation>

### Examples

SOURce1:FM:DEVIation 1.0MHz  
sets the CH1 frequency deviation to 1.0 MHz.

## [SOURce[1|2]]:FM:INTernal:FREQuency

This command sets or queries the internal modulation frequency of FM modulation for the

specified channel. Use this command when the internal modulation source is selected.

Set the internal modulation frequency from 2 mHz to 100.00 kHz with resolution of 1 mHz.

### Syntax

```
[SOURce[1|2]]:FM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FM:INTernal:FREQuency? [MINimum|MAXimum]
```

### Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

```
SOURce1:FM:INTernal:FREQuency 10kHz
```

sets the CH1 internal modulation frequency to 10 kHz.

## [SOURce[1|2]]:FM:SOURce

This command sets or queries the source of modulating signal of FM modulation for the specified channel.

### Syntax

```
[SOURce[1|2]]:FM:SOURce [INTernal|EXTernal]  
[SOURce[1|2]]:FM:SOURce?
```

### Arguments

INTernal means that the carrier waveform is modulated with the internal source.

EXTernal means that the carrier waveform is modulated with an external source.

### Returns

INT|EXT

### Examples

```
SOURce1:FM:SOURce INTernal
```

sets the CH1 source of modulating signal to internal.

## **[SOURce[1|2]]:FM:STATe**

This command enables or disables FM modulation. The query returns the state of FM modulation.

### **Syntax**

```
[SOURce[1|2]]:FM:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:FM:STATe?
```

### **Arguments**

ON or <NR1>≠0 enables FM modulation.

OFF or <NR1>=0 disables FM modulation.

### **Returns**

<NR1>

### **Examples**

```
SOURce1:FM:STATe ON  
enables the CH1 FM modulation.
```

## **[SOURce[1|2]]:FREQUency:CENTer**

This command sets or queries the center frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQUency:SPAN command. The setting range of center frequency depends on the waveform selected for sweep.

### **Syntax**

```
[SOURce[1|2]]:FREQUency:CENTer {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FREQUency:CENTer? {MINimum|MAXimum}
```

### **Arguments**

<frequency>::=<NRf>[<units>]

where:

<NRf> is the center frequency.

<units>::=[Hz|kHz|MHz]

### **Returns**

<frequency>

### **Examples**

```
SOURce1:FREQUency:CENTer 550kHz
```

sets the CH1 center frequency to 550 kHz.

## **[SOURce[1|2]]:FREQUency[:FIXed]**

This command sets or queries the frequency of output waveform for the specified channel. The setting range of output frequency depends on the type of output waveform. If you change the type of output waveform, it might change the output frequency because changing waveform types impacts on the setting range of output frequency. The resolution is 1  $\mu$ Hz or 12 digits.

### **Syntax**

```
[SOURce[1|2]]:FREQUency[:FIXed] {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FREQUency[:FIXed]? {MINimum|MAXimum}
```

### **Arguments**

<frequency>::=<NRf>[<units>]

where:

<NRf> is the output frequency.

<units>::=[Hz|kHz|MHz]

### **Returns**

<frequency>

### **Examples**

```
SOURce1:FREQUency:FIXed 500kHz  
sets the CH1 output frequency to 500 kHz.
```

## **[SOURce[1|2]]:FREQUency:SPAN**

This command sets or queries the span of frequency sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQUency:CENTer command. The setting range of frequency span depends on the waveform selected for sweep.

### **Syntax**

```
[SOURce[1|2]]:FREQUency:SPAN {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FREQUency:SPAN? {MINimum|MAXimum}
```

### **Arguments**

<frequency>::=<NRf>[<units>]

where:

<NRf> is the frequency span.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

SOURce1:FREQuency:SPAN 900 kHz

sets the CH1 frequency span to 900 kHz.

## [SOURce[1|2]]:FREQuency:START

This command sets or queries the start frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:STOP command. The setting range of start frequency depends on the waveform selected for sweep.

### Syntax

[SOURce[1|2]]:FREQuency:START {<frequency>|MINimum|MAXimum}

[SOURce[1|2]]:FREQuency:START? {MINimum|MAXimum}

### Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the start frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

SOURce1:FREQuency:START 10kHz

sets the sweep start frequency of CH1 to 10 kHz.

## [SOURce[1|2]]:FREQuency:STOP

This command sets or queries the stop frequency of sweep for the specified channel. This command is always used with the [SOURce[1|2]]:FREQuency:START command. The setting range of stop frequency depends on the waveform selected for sweep.

### Syntax

```
[SOURce[1|2]]:FREQuency:STOP {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FREQuency:STOP? {MINimum|MAXimum}
```

### Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the stop frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

```
SOURce1:FREQuency:STOP 100kHz  
sets the stop frequency of CH1 to 100 kHz.
```

## [SOURce[1|2]]:FSKey[:FREQuency]

This command sets or queries the hop frequency of FSK modulation for the specified channel.

### Syntax

```
[SOURce[1|2]]:FSKey[:FREQuency] {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:FSKey[:FREQuency]? {MINimum|MAXimum}
```

### Arguments

<frequency>::=<NRf>[<units>]

where:

<NRf> is the hop frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

```
SOURce1:FSKey:FREQuency 1.0MHz  
sets the hop frequency of CH1 FSK modulation to 1.0 MHz.
```

## **[SOURce[1|2]]:FSKey:INTernal:RATE**

This command sets or queries the internal modulation rate of FSK modulation for the specified channel. Use this command when the internal modulation source is selected.

### **Syntax**

```
[SOURce[1|2]]:FSKey:INTernal:RATE {<rate>|MINimum|MAXimum}  
[SOURce[1|2]]:FSKey:INTernal:RATE? {MINimum|MAXimum}
```

### **Arguments**

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

### **Returns**

<rate>

### **Examples**

```
SOURce1:FSKey:INTernal:RATE 50Hz  
sets the CH1 internal FSK modulation rate to 50 Hz.
```

## **[SOURce[1|2]]:FSKey:SOURce**

This command sets or queries the source of modulation signal of FSK modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:FSKey:SOURce [INTernal|EXTernal]  
[SOURce[1|2]]:FSKey:SOURce?
```

### **Arguments**

INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

### **Returns**

INT|EXT

### **Examples**

```
SOURce1:FSKey:SOURce INTernal  
sets the CH1 source of modulating signal to internal.
```

## **[SOURce[1|2]]:FSKey:STATe**

This command enables or disables FSK modulation. The query returns the state of FSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

### **Syntax**

```
[SOURce[1|2]]:FSKey:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:FSKey:STATe?
```

### **Arguments**

ON or <NR1>≠0 enables FSK modulation.  
OFF or <NR1>=0 disables FSK modulation.

### **Returns**

<NR1>

### **Examples**

```
SOURce1:FSKey:STATe ON  
enables the CH1 FSK modulation.
```

## **[SOURce[1|2]]:3FSKey[:FREQUENCY]**

This command sets or queries the hop frequency of 3FSK modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:3FSKey[:FREQUENCY] <n>,{<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:3FSKey[:FREQUENCY]? <n>,{MINimum|MAXimum}
```

### **Arguments**

<n>::=<NR1>

where:

<NR1> is the sequence number of hop frequency, which can be 1 or 2.

<frequency>::=<NRf>[<units>]

where:

<NRf> is the hop frequency.

<units>::=[Hz|kHz|MHz]



**Returns**

<frequency>

**Examples**

SOURce1:3FSKey:FREQuency 2,1.0MHz

sets the hop frequency 2 of CH1 3FSK modulation to 1.0 MHz.

**[SOURce[1|2]]:3FSKey:INTernal:RATE**

This command sets or queries the internal modulation rate of 3FSK modulation for the specified channel.

**Syntax**

[SOURce[1|2]]:3FSKey:INTernal:RATE {<rate>|MINimum|MAXimum}

[SOURce[1|2]]:3FSKey:INTernal:RATE? {MINimum|MAXimum}

**Arguments**

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

**Returns**

<rate>

**Examples**

SOURce1:3FSKey:INTernal:RATE 50Hz

sets the CH1 internal 3FSK modulation rate to 50 Hz.

**[SOURce[1|2]]:3FSKey:STATe**

This command enables or disables 3FSK modulation. The query returns the state of 3FSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

**Syntax**

[SOURce[1|2]]:3FSKey:STATe {ON|OFF|<NR1>}

[SOURce[1|2]]:3FSKey:STATe?

**Arguments**

ON or <NR1>≠0 enables 3FSK modulation.

OFF or <NR1>=0 disables 3FSK modulation.

### Returns

<NR1>

### Examples

SOURce1:3FSKey:STATe ON  
enables the CH1 3FSK modulation.

## [SOURce[1|2]]:4FSKey[:FREQUENCY]

This command sets or queries the hop frequency of 4FSK modulation for the specified channel.

### Syntax

[SOURce[1|2]]:4FSKey[:FREQUENCY] <n>,{<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:4FSKey[:FREQUENCY]? <n>,{MINimum|MAXimum}

### Arguments

<n>::=<NR1>

where:

<NR1> is the sequence number of hop frequency, which can be 1, 2, or 3.

<frequency>::=<NRf>[<units>]

where:

<NRf> is the hop frequency.

<units>::=[Hz|kHz|MHz]

### Returns

<frequency>

### Examples

SOURce1:4FSKey:FREQUENCY 2,1.0MHz  
sets the hop frequency 2 of CH1 4FSK modulation to 1.0 MHz.

## [SOURce[1|2]]:4FSKey:INTERNAL:RATE

This command sets or queries the internal modulation rate of 4FSK modulation for the specified channel.

### Syntax

[SOURce[1|2]]:4FSKey:INTernal:RATE {<rate>|MINimum|MAXimum}

[SOURce[1|2]]:4FSKey:INTernal:RATE? {MINimum|MAXimum}

### Arguments

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

### Returns

<rate>

### Examples

SOURce1:4FSKey:INTernal:RATE 50Hz

sets the CH1 internal 4FSK modulation rate to 50 Hz.

## [SOURce[1|2]]:4FSKey:STATe

This command enables or disables 4FSK modulation. The query returns the state of 4FSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

### Syntax

[SOURce[1|2]]:4FSKey:STATe {ON|OFF|<NR1>}

[SOURce[1|2]]:4FSKey:STATe?

### Arguments

ON or <NR1>≠0 enables 4FSK modulation.

OFF or <NR1>=0 disables 4FSK modulation.

### Returns

<NR1>

### Examples

SOURce1:4FSKey:STATe ON

enables the CH1 4FSK modulation.

## [SOURce[1|2]]:FUNCTION:RAMP:SYMMetry

This command sets or queries the symmetry of ramp waveform for the specified channel.

The setting range is 0.0% to 100.0%.

### Syntax

```
[SOURce[1|2]]:FUNction:RAMP:SYMMetry {<symmetry>|MINimum|MAXimum}  
[SOURce[1|2]]:FUNction:RAMP:SYMMetry?
```

### Arguments

<symmetry>::=<NR2>[<units>]

where:

<NR2> is the symmetry.

<units>::=PCT

### Returns

<symmetry>

### Examples

```
SOURce1:FUNction:RAMP:SYMMetry 80.5  
sets the symmetry of the CH1 ramp waveform to 80.5%.
```

## [SOURce[1|2]]:MOD:STATe

This command enables or disables the modulation function for the specified channel. The query returns the state of modulation function.

### Syntax

```
[SOURce[1|2]]:MOD:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:MOD:STATe?
```

### Arguments

ON or <NR1>≠0 enables the modulation function.

OFF or <NR1>=0 disables the modulation function.

### Returns

<NR1>

### Examples

```
SOURce1:MOD:STATe ON  
enables the modulation function for the CH1.
```

## **[SOURce[1|2]]:OSKey:INTernal:RATE**

This command sets or queries the internal modulation rate of OSK modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:OSKey:INTernal:RATE {<rate>|MINimum|MAXimum}  
[SOURce[1|2]]:OSKey:INTernal:RATE? {MINimum|MAXimum}
```

### **Arguments**

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

### **Returns**

<rate>

### **Examples**

```
SOURce1:OSKey:INTernal:RATE 50Hz
```

sets the CH1 internal OSK modulation rate to 50 Hz.

## **[SOURce[1|2]]:OSKey:STATe**

This command enables or disables OSK modulation. The query returns the state of OSK modulation. The carrier waveform can only be a sine wave.

### **Syntax**

```
[SOURce[1|2]]:OSKey:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:OSKey:STATe?
```

### **Arguments**

ON or <NR1>≠0 enables OSK modulation.

OFF or <NR1>=0 disables OSK modulation.

### **Returns**

<NR1>

### **Examples**

SOURce1:OSKey:STATe ON  
enables the CH1 OSK modulation.

## **[SOURce[1|2]]:OSKey:TIME**

This command sets or queries the oscillate period for the OSK modulation for the specified channel.

### **Syntax**

[SOURce[1|2]]:OSKey:TIME {<seconds>|MINimum|MAXimum}  
[SOURce[1|2]]:OSKey:TIME?

### **Arguments**

<seconds>::=<NRf>[<units>]

where:

<NRf> is the oscillate period in seconds.

<units>::=[ns|us|ms|s]

### **Returns**

<seconds>

### **Examples**

SOURce1:OSKey:TIME 100us  
sets the CH1 OSK oscillate period to 100 us.

## **[SOURce[1|2]]:PHASe[:ADJust]**

This command sets or queries the phase of output waveform for the specified channel. Set the value in radians or degrees. If no units are specified, the default is RAD. The query returns the value in RAD.

This command is supported when you select a waveform other than DC and Noise.

### **Syntax**

[SOURce[1|2]]:PHASe[:ADJust] {<phase>|MINimum|MAXimum}  
[SOURce[1|2]]:PHASe[:ADJust]? {MINimum|MAXimum}

### **Arguments**

<phase>::=<NR3>[<units>]

where:

<NR3> is the phase of output waveform.

<units>::=[RAD|DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 to +2 PI, relative to phase value

DEG: 0 to +360, relative to phase value

### Returns

<phase>

### Examples

SOURce1:PHASe:ADJusT MAXimum

sets the maximum value for the phase of CH1 output waveform.

## [SOURce[1|2]]:PM[:DEViation]

This command sets or queries the phase deviation of PM modulation for the specified channel.

### Syntax

[SOURce[1|2]]:PM[:DEViation] {<deviation>|MINimum|MAXimum}

[SOURce[1|2]]:PM[:DEViation]? [MINimum|MAXimum]

### Arguments

<deviation>::=<NR3>[<units>]

where:

<NR3> is the phase deviation.

<units>::=[RAD|DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 PI to +1 PI, relative to phase value

DEG: 0 to +180, in 1 degree steps, relative to phase value

### Returns

<deviation>

### Examples

SOURce1:PM:DEViation MAXimum

sets the maximum value for the CH1 phase deviation of PM modulation.

## **[SOURce[1|2]]:PM:INTernal:FREQuency**

This command sets or queries the internal modulation frequency of PM modulation for the specified channel. Use this command when the internal modulation source is selected. Set the internal modulation frequency from 2 mHz to 100.00 kHz with resolution of 1 mHz.

### **Syntax**

```
[SOURce[1|2]]:PM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:PM:INTernal:FREQuency? [MINimum|MAXimum]
```

### **Arguments**

<frequency>::=<NRf>[<units>]

where:

<NRf> is the modulation frequency.

<units>::=[Hz|kHz|MHz]

### **Returns**

<frequency>

### **Examples**

```
SOURce1:PM:INTernal:FREQuency 10kHz  
sets the CH1 internal modulation frequency to 10 kHz.
```

## **[SOURce[1|2]]:PM:SOURce**

This command sets or queries the source of modulation signal of PM modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:PM:SOURce [INTernal|EXTernal]  
[SOURce[1|2]]:PM:SOURce?
```

### **Arguments**

INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

### **Returns**

INT|EXT



### Examples

SOURce1:PM:SOURce INTernal  
sets the CH1 source of modulating signal to internal.

### [SOURce[1|2]]:PM:STATe

This command enables or disables PM modulation. The query returns the state of PM modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

### Syntax

[SOURce[1|2]]:PM:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:PM:STATe?

### Arguments

ON or <NR1>≠0 enables PM modulation.  
OFF or <NR1>=0 disables PM modulation.

### Returns

<NR1>

### Examples

SOURce1:PM:STATe ON  
enables the CH1 PM modulation.

### [SOURce[1|2]]:PSKey[:DEViation]

This command sets or queries the phase deviation of PSK modulation for the specified channel.

### Syntax

[SOURce[1|2]]:PSKey[:DEViation] {<deviation>|MINimum|MAXimum}  
[SOURce[1|2]]:PSKey[:DEViation]? [MINimum|MAXimum]

### Arguments

<deviation>::=<NR3>[<units>]

where:

<NR3> is the phase deviation.

<units>::=[RAD|DEG]

If <units> are omitted, RAD is specified automatically. The setting ranges are:

RAD: 0 PI to +1 PI, relative to phase value

DEG: 0 to +180, in 1 degree steps, relative to phase value

### Returns

<deviation>

### Examples

SOURce1:PSKey:DEVIation MAXimum

sets the maximum value for the CH1 phase deviation of PSK modulation.

## [SOURce[1|2]]:PSKey:INTernal:RATE

This command sets or queries the internal modulation rate of PSK modulation for the specified channel. Use this command when the internal modulation source is selected.

### Syntax

[SOURce[1|2]]:PSKey:INTernal:RATE {<rate>|MINimum|MAXimum}

[SOURce[1|2]]:PSKey:INTernal:RATE? {MINimum|MAXimum}

### Arguments

<rate>::=<NRf>[<units>]

where:

<NRf> is the modulation rate.

<units>::=[Hz|kHz|MHz]

### Returns

<rate>

### Examples

SOURce1:PSKey:INTernal:RATE 50Hz

sets the CH1 internal modulation rate to 50 Hz.

## [SOURce[1|2]]:PSKey:SOURce

This command sets or queries the source of modulation signal of PSK modulation for the specified channel.

### Syntax

[SOURce[1|2]]:PSKey:SOURce [INTernal|EXTernal]

[SOURce[1|2]]:PSKey:SOURce?

### Arguments

INTernal means that the carrier waveform is modulated with an internal source.

EXTernal means that the carrier waveform is modulated with an external source.

### Returns

INT|EXT

### Examples

SOURce1:PSKey:SOURce INTernal

sets the CH1 source of modulating signal to internal.

## [SOURce[1|2]]:PSKey:STATe

This command enables or disables PSK modulation. The query returns the state of PSK modulation. Select a sine, square, ramp, or arbitrary waveform as the carrier waveform.

### Syntax

[SOURce[1|2]]:PSKey:STATe {ON|OFF|<NR1>}

[SOURce[1|2]]:PSKey:STATe?

### Arguments

ON or <NR1>≠0 enables PSK modulation.

OFF or <NR1>=0 disables PSK modulation.

### Returns

<NR1>

### Examples

SOURce1:PSKey:STATe ON

enables the CH1 PSK modulation.

## [SOURce[1|2]]:PULSe:DCYCLE

This command sets or queries the duty cycle of the pulse waveform for the specified channel.

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 and pulse period.

**pulse duty cycle  $\geq 100\% \times \text{minimum pulse width} \div \text{pulse period}$**

**pulse duty cycle  $\leq 100\% \times (1 - 2 \times \text{minimum pulse width} \div \text{pulse period})$**

### Syntax

[SOURce[1|2]]:PULSe:DCYClE {<percent>|MINimum|MAXimum}  
[SOURce[1|2]]:PULSe:DCYClE? [MINimum|MAXimum]

### Arguments

<percent>::=<NR2>[<units>]

where:

<NR2> is the duty cycle.

<units>::=PCT

### Returns

<percent>

### Examples

SOURce1:PULSe:DCYClE 80.5

sets the duty cycle of the pulse waveform on CH1 to 80.5%.

## [SOURce[1|2]]:PULSe:TRANSition[:LEADing]

This command sets or queries the leading edge time of pulse waveform.

### Syntax

[SOURce[1|2]]:PULSe:TRANSition[:LEADing] {<seconds>|MINimum|MAXimum}  
[SOURce[1|2]]:PULSe:TRANSition[:LEADing]?[MINimum|MAXimum]

### Arguments

<seconds>::=<NRf>[<units>]

where

<NRf> is the leading edge time of pulse waveform.

<units>::=[ns|us|ms|s]

### Returns

<seconds>

### Examples

SOURce1:PULSe:TRANSition:LEADing 200ns

sets the CH 1 leading edge time to 200 ns.

## **[SOURce[1|2]]:PULSe:TRANSition:TRAIling**

This command sets or queries the trailing edge time of pulse waveform.

### **Syntax**

```
[SOURce[1|2]]:PULSe:TRANSition:TRAIling {<seconds>|MINimum|MAXimum}  
[SOURce[1|2]]:PULSe:TRANSition:TRAIling?[MINimum|MAXimum]
```

### **Arguments**

<seconds>::=<NRf>[<units>]

where

<NRf> is the trailing edge of pulse waveform.

<units>::=[ns|us|ms|s]

### **Returns**

<seconds>

### **Examples**

```
SOURce1:PULSe:TRANSition:TRAIling 200ns  
sets the trailing edge time to 200 ns.
```

## **[SOURce[1|2]]:PULSe:WIDTh**

This command sets or queries the pulse width for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:PULSe:WIDTh {<seconds>|MINimum|MAXimum}  
[SOURce[1|2]]:PULSe:WIDTh?[MINimum|MAXimum]
```

### **Arguments**

<seconds>::=<NRf>[<units>]

where

<NRf> is the pulse width.

<units>::=[ns|us|ms|s]

### **Returns**

<seconds>

### **Examples**

```
SOURce1:PULSe:WIDTh 200ns  
sets the CH 1 pulse width to 200 ns.
```

## **[SOURce[1|2]]:PWM:INTernal:FREQuency**

This command sets or queries the internal modulation frequency of PWM modulation for the specified channel. Use this command when the internal modulation source is selected. Set the internal modulation frequency from 2 mHz to 100.00 kHz with resolution of 1 mHz. Select the source of modulating signal by using the [SOURce[1|2]]:PWM:SOURce [INTernal|EXTernal] command.

### **Syntax**

```
[SOURce[1|2]]:PWM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}  
[SOURce[1|2]]:PWM:INTernal:FREQuency?
```

### **Arguments**

<frequency>::=<NRf>[<units>]  
where <NRf> is the modulation frequency.  
<units>::=[Hz|kHz|MHz]

### **Returns**

<frequency>

### **Examples**

```
SOURce1:PWM:INTernal:FREQuency 10kHz  
sets the CH1 internal modulation frequency of PWM modulation to 10 kHz.
```

## **[SOURce[1|2]]:PWM:SOURce**

This command sets or queries the source of modulating signal of PWM modulation for the specified channel.

### **Syntax**

```
[SOURce[1|2]]:PWM:SOURce [INTernal|EXTernal]  
[SOURce[1|2]]:PWM:SOURce?
```

### **Arguments**

INTernal means that the carrier waveform is modulated with the internal source.  
EXTernal means that the carrier waveform is modulated with an external source.

### **Returns**

INT|EXT

### Examples

SOURce1:PWM:SOURce INTernal  
sets the source of modulating signal on CH1 to internal.

## [SOURce[1|2]]:PWM:STATe

This command enables or disables PWM modulation. The query returns the state of PWM modulation. Select only pulse waveform as a carrier waveform for PWM.

### Syntax

[SOURce[1|2]]:PWM:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:PWM:STATe?

### Arguments

ON or <NR1>≠0 enables PWM modulation.  
OFF or <NR1>=0 disables PWM modulation.

### Returns

<NR1>

### Examples

SOURce1:PWM:STATe ON  
enables the CH1 PWM modulation.

## [SOURce[1|2]]:PWM[:DEVIation]:DCYCLE

This command sets or queries the PWM deviation in percent for the specified channel.

### Syntax

[SOURce[1|2]]:PWM[:DEVIation]:DCYCLE {<percent>|MINimum|MAXimum}  
[SOURce[1|2]]:PWM[:DEVIation]:DCYCLE?

### Arguments

<percent>::=<NR2>[<units>]

where:

<NR2> is the PWM deviation.

<units>::=PCT

### Returns

<percent>

### Examples

SOURce1:PWM:DEVIation:DCYCLE 5.0  
sets the CH1 PWM deviation to 5.0%.

## [SOURce[1|2]]:SWEep:SOURce

This command sets or queries the trigger source in the sweep mode for the specified channel.

### Syntax

[SOURce[1|2]]:SWEep:SOURce [TIMer|MANual|EXTernal]  
[SOURce[1|2]]:SWEep:SOURce?

### Arguments

TIMer specifies an internal clock as the trigger source.

MANual specifies a manual trigger input as the trigger source.

EXTernal specifies an external trigger input as the trigger source.

### Returns

TIM|MAN|EXT

### Examples

SOURce1:SWEep:SOURce EXTernal  
sets an external trigger input as the trigger source in the sweep mode.

## [SOURce[1|2]]:SWEep:SPACing

This command selects linear or logarithmic spacing for the sweep for the specified channel.

The query returns the type for the sweep spacing for the specified channel.

### Syntax

[SOURce[1|2]]:SWEep:SPACing {LINear|LOGarithmic}  
[SOURce[1|2]]:SWEep:SPACing?

### Arguments

LINear sets the sweep spacing to linear.



LOGarithmic sets the sweep spacing to logarithmic.

### Returns

LIN|LOG

### Examples

SOURce1:SWEEp:SPACing LINear  
sets the CH1 sweep spacing to linear.

## [SOURce[1|2]]:SWEEp:STATe

This command enables or disables the sweep mode for the specified channel. The query returns the state of sweep mode.

### Syntax

[SOURce[1|2]]:SWEEp:STATe {ON|OFF|<NR1>}  
[SOURce[1|2]]:SWEEp:STATe?

### Arguments

ON or <NR1>≠0 enables the sweep mode.  
OFF or <NR1>=0 disables the sweep mode.

### Returns

<NR1>

### Examples

SOURce1:SWEEp:STATe ON  
enables the sweep mode for the CH1.

## [SOURce[1|2]]:SWEEp:TIME

This command sets or queries the sweep time for the sweep for the specified channel. The sweep time does not include hold time and return time. The setting range is 1 ms to 500 s.

### Syntax

[SOURce[1|2]]:SWEEp:TIME {<seconds>|MINimum|MAXimum}  
[SOURce[1|2]]:SWEEp:TIME?

### Arguments

<seconds>::=<NRf>[<units>]

where:

<NRf> is the sweep time in seconds.

<units>::=[ns|us|ms|s]

### Returns

<seconds>

### Examples

SOURce1:SWEep:TIME 100ms

sets the CH1 sweep time to 100 ms.

## [SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet

This command sets or queries the offset level for the specified channel.

### Syntax

[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet {<voltage>|MINimum|MAXimum}

[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet? {MINimum|MAXimum}

### Arguments

<voltage>::=<NR3>[<units>]

where:

<NR3> is the offset voltage level.

<units>::=[mV|V]

### Returns

<voltage>

### Examples

SOURce1:VOLTage:LEVel:IMMediate:OFFSet 500mV

sets the CH1 offset level to 500 mV.

## [SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:AMPLitude

This command sets or queries the output amplitude for the specified channel. The amplitude resolution is 1 mVpp or four digits.

### Syntax

[SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:AMPLitude

{<amplitude>|MINimum|MAXimum}  
[SOURce[1|2]]:VOLTage[:LEVel][:IMMEDIATE][:AMPLitude]? {MINimum|MAXimum}

### Arguments

<amplitude>::=<NR3>[<units>]

where:

<NR3> is the output amplitude.

<units>::=[mVpp|Vpp]

### Returns

<amplitude>

### Examples

SOURce1:VOLTage:LEVel:IMMEDIATE:AMPLitude 1Vpp  
sets the CH1 output amplitude to 1 Vpp.

## SYSTem:BEEPer[:IMMEDIATE] (No Query Form)

This command causes the instrument to beep immediately. This command is only available when the beeper is enabled.

### Syntax

SYSTem:BEEPer[:IMMEDIATE]

### Arguments

None

### Examples

SYSTem:BEEPER  
causes a beep.

## SYSTem:BEEPer:STATe

The SYSTem:BEEPer:STATe command sets the beeper ON or OFF.

The SYSTem:BEEPer:STATe? command returns “0” (OFF) or “1” (ON).

When the beeper is set to ON, the instrument will beep when an error message or a warning message is displayed on the screen. The instrument does not beep when an error or warning caused by remote command execution.

**Syntax**

SYSTem:BEEPer:STATe {ON|OFF|<NR1>}  
SYSTem:BEEPer:STATe?

**Arguments**

ON or <NR1>≠0 enables the beeper.  
OFF or <NR1>=0 disables the beeper.

**Returns**

<NR1>

**Examples**

SYSTEM:BEEPER:STATE ON  
enables the beeper function.

**SYSTem:ERRor[:NEXT]? (Query Only)**

This query-only command returns the contents of the Error/Event queue.

**Syntax**

SYSTem:ERRor[:NEXT]?

**Arguments**

None

**Returns**

<Error/event number>::=<NR1>  
<Error/event description>::=<string>

**Examples**

SYSTEM:ERROR:NEXT?  
might return the following response:  
-201,"Invalid while in local"

If the instrument detects an error or an event occurs, the event number and event message will be returned.

**SYSTem:LANguage**

This command sets or queries the language that the instrument uses to display

information on the screen.

Different languages may support different types of languages.

### **Syntax**

SYSTem:LANguage

{SCHinese|TCHinese|ENGLish|PORTuguese|GERMan|POLish|KORean|JAPAnese}

SYSTem:LANguage?

### **Arguments**

SCHinese|TCHinese|ENGLish|PORTuguese|GERMan|POLish|KORean|JAPAnese

specifies which language will be used to display instrument information on the screen.

### **Returns**

SCH|TCH|ENGL|PORT|GERM|POL|KOR|JAPA

### **Examples**

SYSTEM:LANGUAGE ENGLish

specifies that the instrument displays information in English.

## **SYSTem:VERSion? (Query Only)**

This query-only command returns the software version of the instrument.

### **Syntax**

SYSTem:VERSion?

### **Arguments**

None

### **Returns**

<Software Version>::=Vx.x.x

where:

x – indicates the version number.

### **Examples**

SYSTEM:VERSION?

might return V1.2.4.

## TRACe|DATA[:DATA]

This command transfers the waveform data from the external controller to the edit memory in the instrument. The query returns the binary block data.

### Syntax

```
TRACe|DATA[:DATA] EMEMory,<binary_block_data>  
TRACe|DATA[:DATA]? EMEMory
```

### Arguments

<binary\_block\_data>

where <binary\_block\_data> is the waveform data in binary format.

### Returns

<binary\_block\_data>

### Examples

```
DATA:DATA EMEMory,#42000<DAB><DAB>...<DAB>
```

transmits a waveform to the edit memory in the instrument. The block data element #21000 indicates that 2 is the number of digits in 1000 (byte count) and the 1000 bytes of binary data are to be transmitted.

## 3. Command Errors

The following table shows the error messages generated by improper command syntax. Check that the command is properly formed and that it follows the rules in the Syntax and Commands.

### Command messages

Code	Message
0 (indicates no error)	
-101	Invalid character
-102	Syntax error
-108	Parameter not allowed
-201	Invalid while in local

### Error/Event Queue

The event queue is an FIFO queue, which stores events as they occur in the instrument. The event queue can store up to 64 events.

The oldest error code and text are retrieved by using the following command:

```
SYSTem:ERRor[:NEXT]?
```

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