WAVE FACTORY

MULTIFUNCTION GENERATOR

WF1973/WF1974

Instruction Manual
(Remote Control)

NF Corporation

DA00016811-001

MULTIFUNCTION GENERATOR

WF1973/WF1974

Instruction Manual
(Remote Control)

Introduction

This manual explains the WF1973/WF1974 GPIB and USB interfaces. For operations from the panel, refer to the WF1973/WF1974 Instruction Manual.
The GPIB and USB interfaces of the WF1973/WF1974 feature a large array of functions, which allow control of almost all front panel operations. Moreover, the setting values can be read from outside the equipment.

● **The chapter organization of the WF1973/WF1974 Instruction Manual (Remote Control) is as follows.**

1. **PREPARATIONS BEFORE USE**
   Describes the interface settings and GPIB address settings.
2. **COMMAND EXPLANATION**
   Outlines the commands, lists the commands, and describes the individual commands.
3. **STATUS SYSTEM**
   Describes status reporting, including the status byte and standard event status register.
4. **ERROR MESSAGES**
   Describes the error numbers and the error contents.
5. **SPECIFICATIONS**
   Describes the specifications of the external control interfaces.
6. **COMMAND TREE**
   Commands are shown in the tree structure.

Contents

1. PREPARATIONS BEFORE USE

1.1 Outline of WF1973/WF1974 GPIB/USB Interface

Almost all the functions of the WF1973/WF1974 can be remotely set via the GPIB or USB interface. Moreover, by allowing measurement data and setting statuses to be transferred outside the equipment, an automatic measuring system can be configured easily.

1.2 USB Preparations

The WF1973/WF1974 can be controlled by USB Test and Measurement Class (hereafter, USB-TMC). Almost all panel operations can be controlled, and internal statuses, such as setting values and errors, can be read out.

Install a USB-TMC class driver on the controlling computer, and connect it using a commercially available USB cable. The installation file for this driver can be downloaded from the website of National Instruments Corporation. The driver installation is described below.

1. Either search the VISA Run-time Engine page on the website of National Instruments Corporation, or select “VISA driver downloads” from the following URL:http://www.ni.com/support/visa/
2. Download VISA Run-time Engine from the VISA Run-time Engine page. User registration is required at this time. Download Ver. 3.3 or a later version of VISA Run-time Engine.
3. The downloaded file is self-extracting. Extract and install the file.
4. Once the file has installed successfully, the USB-TMC class driver is installed.

For details, refer to the website of National Instruments Corporation.

1.3 GPIB Preparations

Install a GPIB controller board (card) in the controlling computer and connect it with a commercially available GPIB cable. For details, refer to the user's manual of the GPIB controller board (card) that is used.

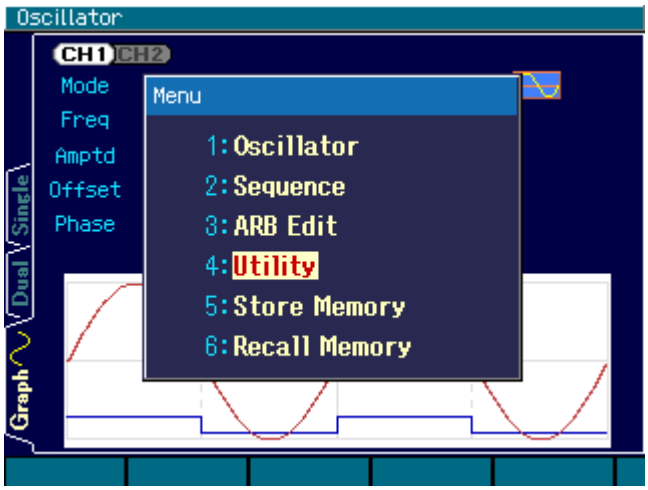
1.4 Selecting the Interface

Either GPIB or USB can be used as the interface to be used. The WF1973/WF1974 cannot be controlled from the interface that is not selected.

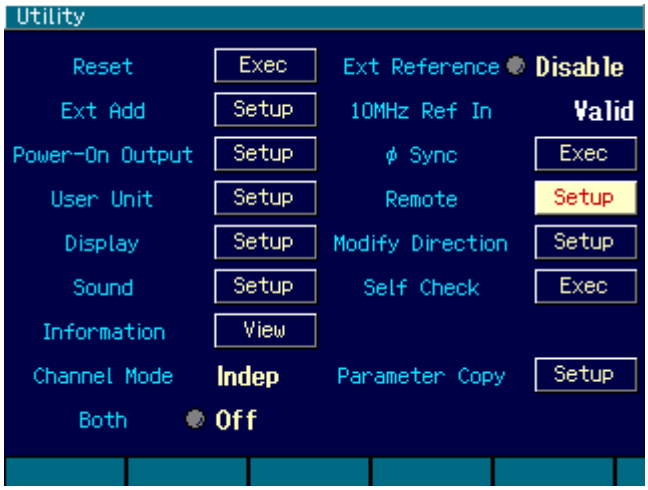
The selected interface is retained even after the power is switched off.

The USB interface is selected at shipping.

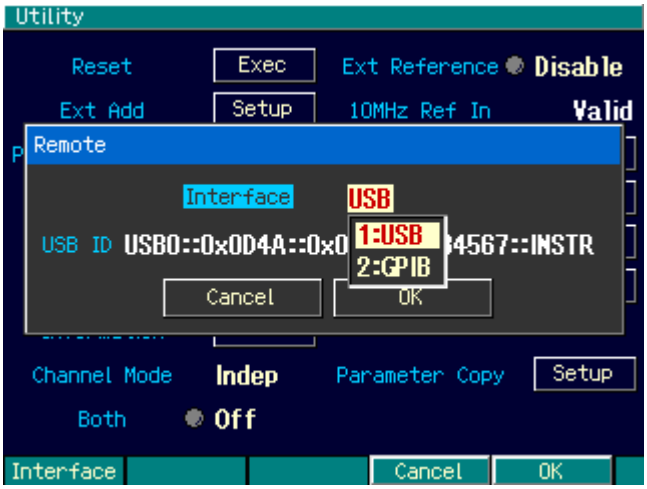
<1> From [MENU], select “4:Utility” and then press the [ENTER] key.



<2> Select “Remote” and then press the [ENTER] key.



<3> Select “Interface” and then press the [ENTER] key to display the screen for selecting the interface.



⚠ **CAUTION** When the computer recognizes the WF1973/WF1974, the computer may operate erratically when the interface is switched from USB to GPIB or the USB cable is disconnected.

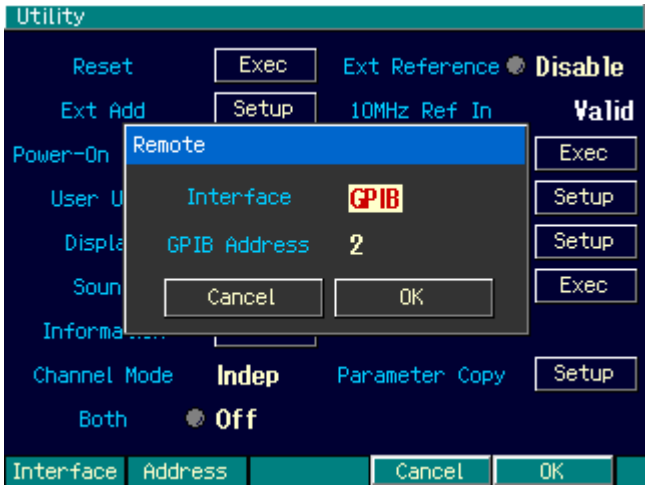
1.5 GPIB Address Setting

The GPIB address can be set.

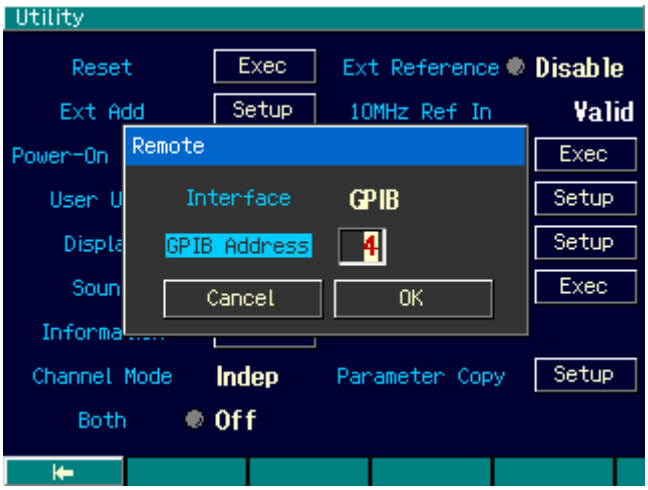
Set the GPIB address to a different value than the addresses of other devices connected with a GPIB cable. The set value is backed up when the power is switched off.

“2” is set at shipping.

<1> Set “Interface” to [GPIB] by performing steps <1> to <3> in “1.4 Selecting the Interface”.



<2> Select “GPIB Address” and then press the [ENTER] key to display the screen for setting the GPIB address.



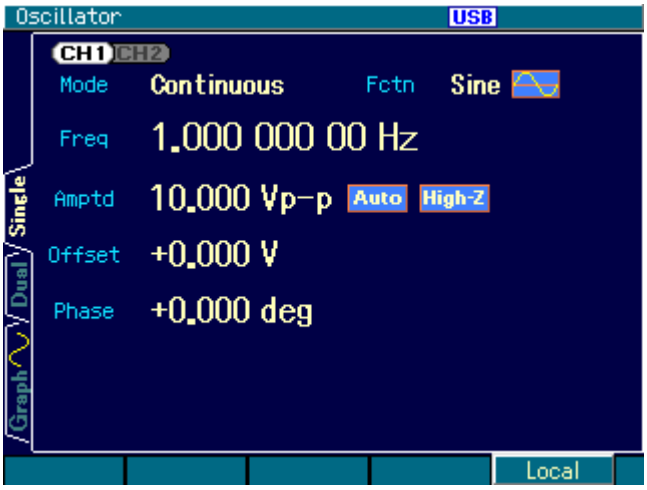
1.6 USB ID

If multiple WF1973/WF1974 units are connected within a system with USB, the following numbers are used to allow unit recognition by the application.

- Vendor number: 3402(0x0D4A)
- Product number: 13(0x0D)/WF1973, 14(0x0E)/WF1974
- Serial number: Product’s manufacturing number (serial number)

1.7 Releasing Remote Status

In the remote control remote status, the “USB” or “GPIB” icon is lit on the LCD, and “LOCAL” is displayed on the [F5] software key. When the [F5] key is pressed in this status, the remote status is released, and panel operation becomes possible. However, when “LOCAL” is not displayed (local lockout status), panel operation is disabled. To enable panel operation, specify local control from the remote control controller.



1.8 Cautions

- USB and GPIB connectors are located on the rear panel.
- USB and GPIB are interfaces designed based on the assumption of use in a relatively favorable environment. Use of these interfaces in unfavorable locations such as locations with power supply fluctuations and noisy locations should be avoided whenever possible.
- Connect/disconnect the GPIB connector only after powering off all the units connected on the bus.
- During GPIB use, power on all the units connected on the bus.
- The total cable length should be 2 m x (number of units) or 20 m, whichever is shortest.
- The length of each cable must be 4 m max.
- Set GPIB addresses after careful checking. If the same address is set within the same sequence, the equipment may be damaged.

2. EXPLANATION OF COMMANDS

2.1 Outline of Commands

The commands of the WF1973/WF1974 comply with IEEE488.2 and SCPI (version 1999.0). SCPI defines a communication method using between controllers and measuring devices. For general information regarding SCPI, refer to the following document:

Standard Commands for Programmable Instruments (SCPI) Version 1999.0, available at http://www.scpiconsortium.org/.

2.1.1 Notation

For convenience, the following notation system is used in this document.

< >:	< > indicates something other than the item itself. In the case of parameters and response data, the abbreviation of the type is enclosed in < >.
[ ]:	Options, which can be omitted, are indicated between [ ].
{abc | xyz}:	Means that either "abc" or "xyz" can be used.
[abc | xyz]:	Indicates that either "abc" or "xyz" can be used, but that both are options, which may be omitted.
Uppercase, lowercase:	Keywords in both uppercase and lowercase are the long form, while keywords in uppercase only are the short form.

2.1.2 Commands

The program messages of the WF1973/WF1974 are configured of common commands and subsystem commands.

The format of each type of command, the subsystem command tree, etc., are described below.

2.1.2.1 Common commands

Common commands are commands that are used to control comprehensive functions of the equipment.

Figure 2.1 shows the common command syntax.

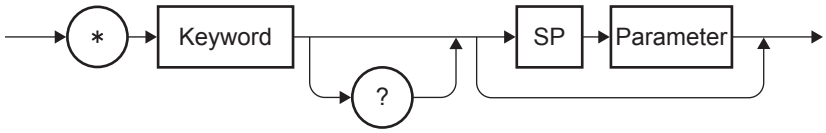


Figure 2.1. Common Command Syntax

The keyword in Figure 2.1 consists of 3 alphabetic characters. Here, SP is a space character (ASCII code 32).

2.1.2.2 Subsystem commands

Subsystem commands are commands that are used to execute specific functions of the equipment. Each such command consists of a root keyword, one or more lower-level keywords, a parameter, and a suffix.

A sample command and query are shown below.

:OUTPut:STATe ON
:OUTPut:STATe?

OUTPut is the root-level keyword, linking a second level keyword, and ON is a parameter.

2.1.2.2.1 Command tree of subsystem command

(A) Command tree structure

In SCPI, a hierarchical structure resembling a file system is used for subsystem commands.

This command structure is called a command tree.

Figure 2.2 shows an example of a command tree for subsystem commands.

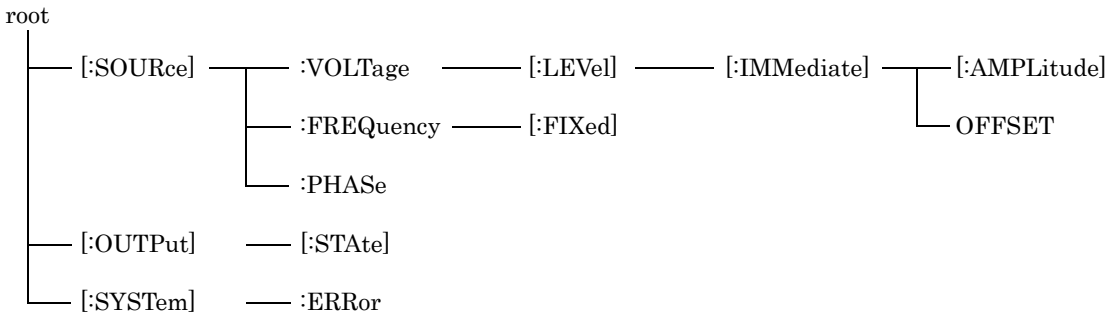


Figure 2.2. Example of Command Tree for Subsystem Commands

In the command tree in Figure 2.2, the keywords nearest the top ([:SOURce], [:OUTPut], and [:SYSTem]) are root level keywords, and to reach the keywords on the lower levels, a specific path must be traveled. For example, the access path to [:OFFSet] is [:SOURce]-[VOLTage]-[LEVel]-[IMMediate]-[OFFSet].

(B) Current path transition

The current path is the first level that is searched by the parser among the various levels of the command tree when the user sends the next command. The parser determines the current path according to the following rules.

(1) At power-on and reset

The current path is set to root.

(2) Message terminator

Upon reception of a message terminator, the current path is set to root.

(3) Colon (command separator)

When a colon is placed between two keywords, the colon moves the current path one level down in the command tree.

(4) Colon (root specifier)
When a colon is placed at the beginning of a command, the current path is set to root.
(5) Semicolon
Semicolons have no influence on the current path.
(6) Space
Spaces have no influence on the current path.
(7) Comma
Commas have no influence on the current path.
(8) IEEE488.2 common commands
Common commands have no influence on the current path.

Through appropriate use of semicolons, multiple commands can be sent efficiently.
For example, the following string

:SOURce:VOLTage:LEVel:IMMediate:AMPLitude 1.0; OFFSet 1.0

achieves the transmission of the following two commands:

:SOURce:VOLTage:LEVel:IMMediate:AMPLitude 1.0
:SOURce:VOLTage:LEVel:IMMediate:OFFSet 1.0

When an optional keyword is omitted, caution about the current path movement is required.
For example, in the case of

:VOLTage 1.0

the current path is [:SOURce]. Therefore, if

:SOURce:VOLTage:LEVel:IMMediate:AMPLitude 1.0
:SOURce:FREQuency:FIXed 1000.0

are transmitted as one program message, as follows,

:SOURce:VOLTage:LEVel:IMMediate:AMPLitude 1.0; FREQuency:FIXed 1000.0,

this results in an error.
However,

:SOURce:VOLTage 1.0; FREQuency:FIXed 1000.0

does not result in an error.

2.1.2.2.2 Subsystem command syntax

Figure 2.3 shows the syntax of subsystem commands.

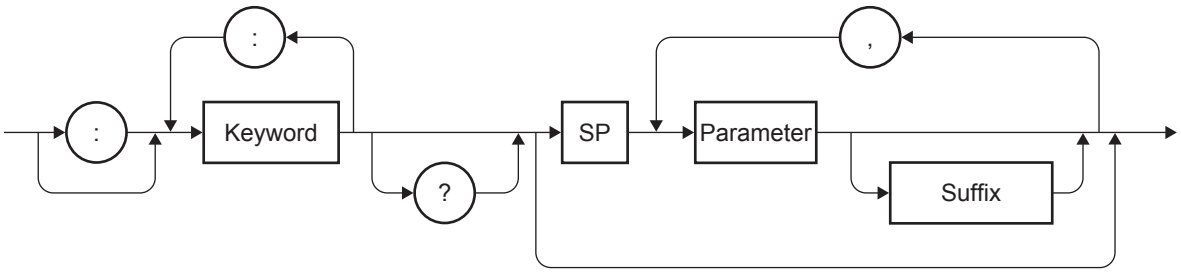


Figure 2.3. Subsystem Command Syntax

(A) Keyword

The keyword in Figure 2.3 is a string of up to 12 characters, starts with an alphabetic character, and is comprised of uppercase and lowercase alphabetic characters, underscore (_), and numeric characters.

The majority of the keywords listed in "2.2 Command List" consist of a mix of uppercase and lowercase characters. Here, uppercase characters are used for the short form, and a mix of uppercase and lowercase characters is used for the long form of keywords. For convenience, keywords use uppercase and lowercase characters, but in the case of actual commands, no distinction is made between uppercase and lowercase. Examples for the "OUTPut" keyword are listed in Table 2.1.

Table 2.1. Keywords Accepted and Not Accepted by Equipment (for "OUTPut")

Keyword	Description
OUTPUT	Can be use as long form.
OUTP	Can be used as short form.
OuTpUt	Not case sensitive. Can be used as long form.
oUtP	Not case sensitive. Can be used as short form.
OUTPU	Cannot be used because it corresponds to neither long form nor short form.
OUT	Cannot be used because it corresponds to neither long form nor short form.

(B) Keyword separator

The colons (:) in Figure 2.3 are interpreted as keyword separators. These keyword separators serve to separate an upper-level keyword from a lower-level keyword in the command tree, as shown in Figure 2.2.

The colon (:) at the beginning of the subsystem command is interpreted as a root specifier. This root specifier sets the current path to root.

(C) Keyword omission

The keywords enclosed in square brackets ([ ]) in the commands listed in "2.2 Command List" can be omitted.

If omitted, the equipment analyzes that command as if that option keyword had been received.

For example, in the case of

:OUTPut[:STATe]

either of the following two commands can be used.

:OUTPut:STATe
:OUTPut

(D) Channel specification

In the case of a two-channel unit, the channel can be specified for the majority of the commands by using an omissible numeric keyword suffix.

For example, in the case of

:OUTPut[1|2]:STATe

Channel 1 and Channel 2 commands are as follows:

:OUTPut[1]:STATe
:OUTPut2:STATe

If no channel number is specified, [1] is considered to have been omitted, and the command is interpreted as a command for Channel 1. For example, when the output of Channel 1 is controlled to “On", either of the following commands can be used:

:OUTPut1:STATe ON
:OUTPut:STATe ON

(E) Parameters

The parameter types are as follows.

(1) Numeric parameter (<REAL>, <INT>)

The numeric parameter syntax is shown in Figure 2.4.

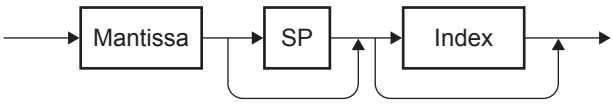


Figure 2.4. Numeric Parameter (<REAL>, <INT>) Syntax

The syntaxes of the mantissa and index of Figure 2.4 are shown in Figures 2.5 and 2.6.

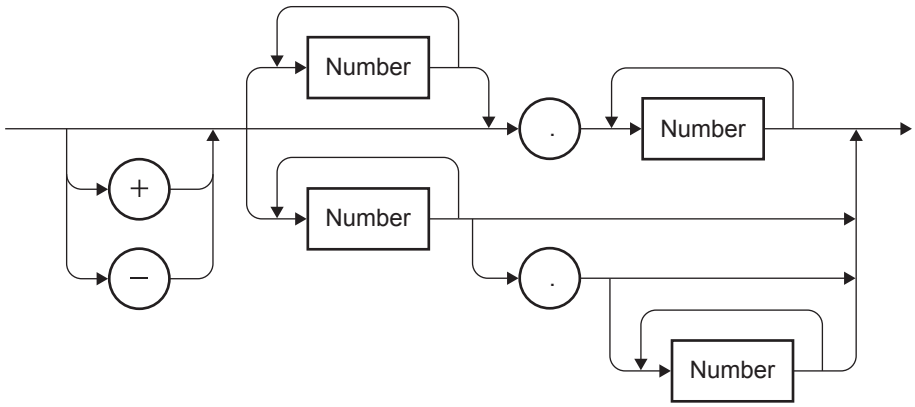


Figure 2.5. Mantissa Syntax

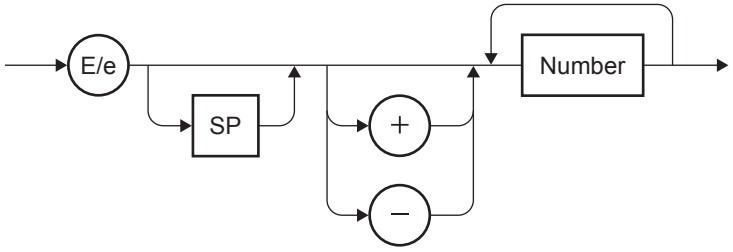


Figure 2.6. Index Syntax

(2) Discrete parameter (<DISC>)

The discrete parameter syntax is shown in Figure 2.7.

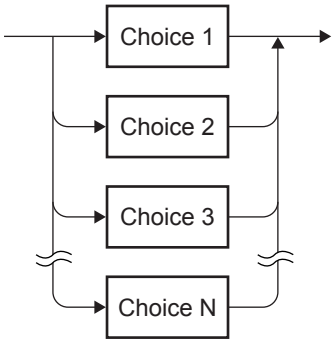


Figure 2.7. Discrete Parameter (<DISC>) Syntax

(3) Truth value parameter (<BOL>)

The truth value parameter syntax is shown in Figure 2.8.

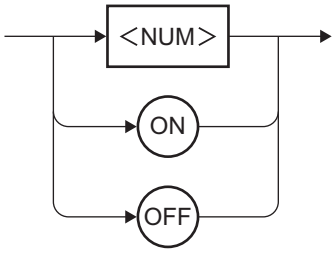


Figure 2.8. Truth Value Parameter (<BOL>) Syntax

The truth value parameter is interpreted as true for values other than 0, and as false for "0".

If a value that includes a fractional part is specified, this value is interpreted as the whole number obtained by rounding off the fractional part. Therefore, for example, "0.4" is false, and "0.5" is true.

(4) Character string parameter (<STR>)

The character string parameter syntax is shown in Figure 2.9.

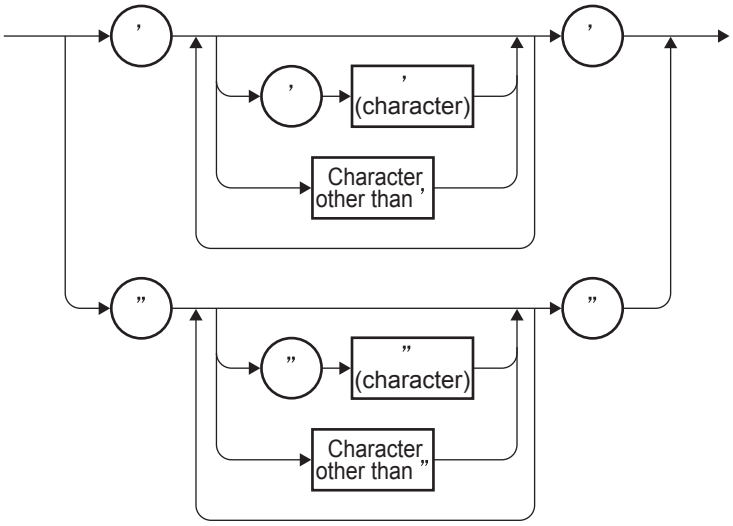


Figure 2.9. Character String Parameter (<STR>) Syntax

(5) Block parameter (<BLK>)

The block parameter syntax is shown in Figure 2.10.

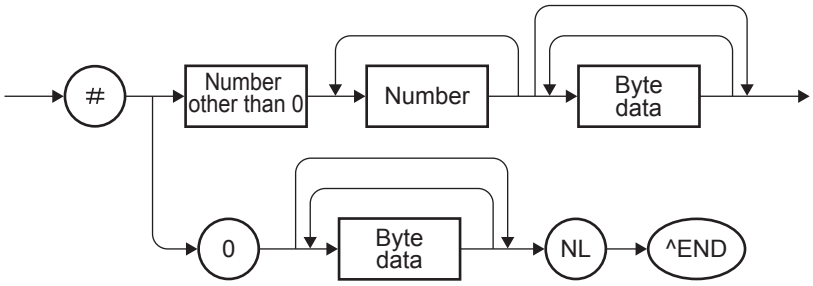


Figure 2.10. Block Parameter (<BLK>) Syntax

NL is a line feed (ASCII code 10), and ^END is an EOI asserted at the last byte.

(F) Parameter separator

The parameter separator is used for commands that have two or more parameters, and serves as a separator between parameters.

(G) Query parameter

The query parameter is specified after "?" of the query, and can be used for most queries for commands with numeric parameters. For example, when "MINimum" or "MAXimum" is specified, the settable minimum value or settable maximum value, respectively, can be queried.

(H) Suffix

The suffix syntax is shown in Figure 2.11.

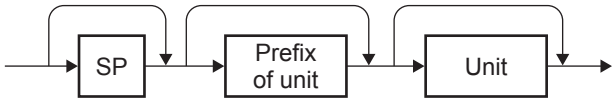


Figure 2.11. Suffix Syntax

In the WF1973/WF1974, the prefix of the unit and the unit attached to a parameter are valid only for that command, and have no influence on other commands.

:SOURce1:VOLTage:AMPLitude:UNIT VRMS	Sets amplitude unit to Vrms
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0	Sets amplitude to 2.0 Vrms
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0VPP	Sets amplitude to 2.0 Vp-p

2.1.2.2.3 Program message syntax

Two or more common commands and subsystem commands can be combined and transmitted from the controller to the equipment as one program message.

The program message syntax is shown in Figure 2.12.

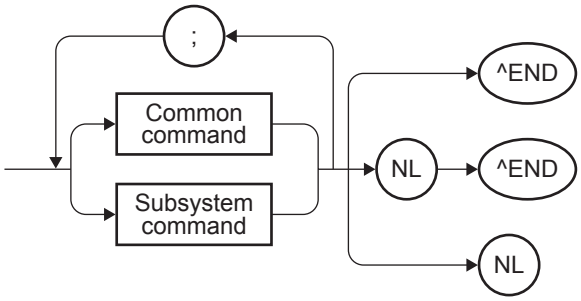


Figure 2.12. Program Message Syntax

Commands are separated by a semicolon (;).

2.1.2.2.4 Response message syntax

A response message is send data from the equipment in response to a query.

(A) Response message syntax

The response message syntax is shown in Figure 2.13.

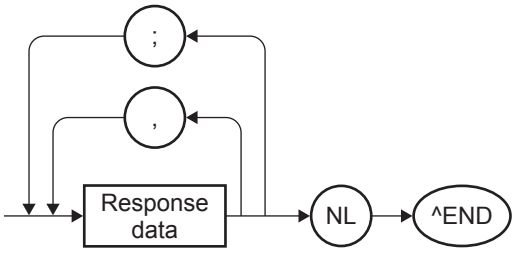


Figure 2.13. Response Message Syntax

Commas (,) and semicolons (;) are used as separators in response messages. When multiple values are returned with one command, the data are separated with commas (,). On the other hand, when there are several queries for one program message, the data for each query are separated with semicolons (;).

(B) Response message data

The response message data types are as follows.

(1) Real number response data (<REAL>)

The real number response data syntax is shown in Figure 2.14.

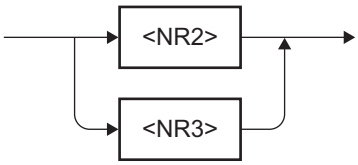


Figure 2.14. Real Number Response Data (<REAL>) Syntax

The NR2 real number response data syntax is shown in Figure 2.15.

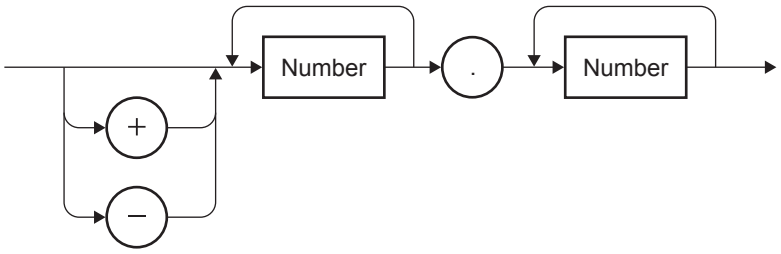


Figure 2.15. NR2 Real Number Response Data (<NR2>) Syntax

The NR3 real number response data syntax is shown in Figure 2.16.

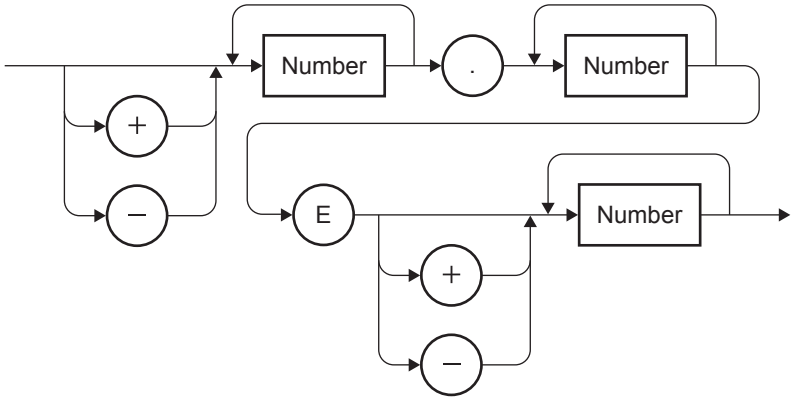


Figure 2.16. NR3 Real Number Response Data (<NR3>) Syntax

(2) Integer response data (<INT>)

The integer response data syntax is shown in Figure 2.17.

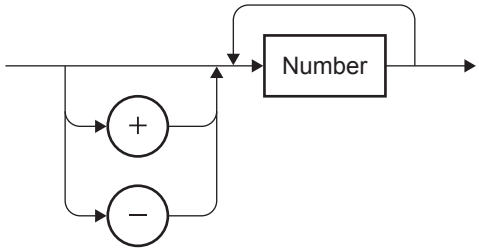


Figure 2.17. Integer Response Data (<INT>) Syntax

(3) Discrete response data (<DISC>)

The discrete response data syntax is shown in Figure 2.18.

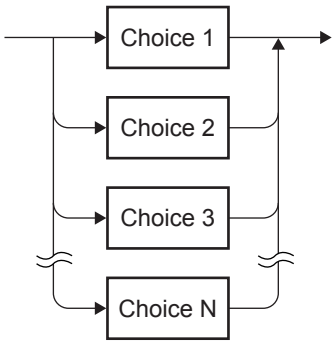


Figure 2.18. Discrete Response Data (<DISC>) Syntax

(4) Numeric truth value response data (<NBOL>)

The numeric truth value response data syntax is shown in Figure 2.19.

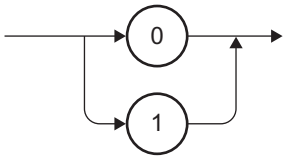


Figure 2.19. Numeric Truth Value Response Data (<NBOL>) Syntax

(5) Character string response data (<STR>)

The character string response data syntax is shown in Figure 2.20.

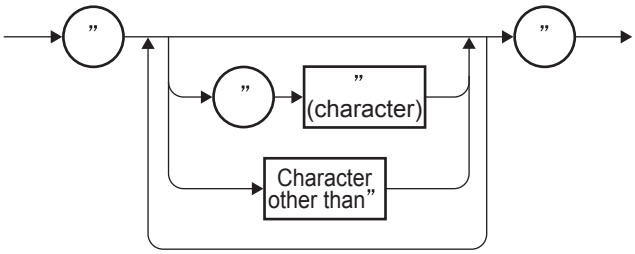


Figure 2.20. Character String Response Data (<STR>) Syntax

(6) Determined length block response data (<DBLK>

The determined length block response data syntax is shown in Figure 2.21.

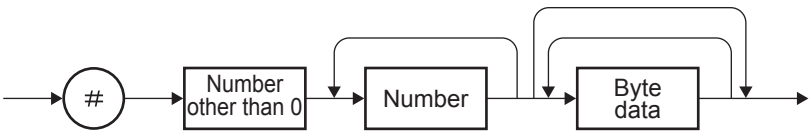


Figure 2.21. Determined Length Block Response Data (<DBLK>) Syntax

(7) Indeterminate length block response data (<IBLK>)

The indeterminate length block response data syntax is shown in Figure 2.22.

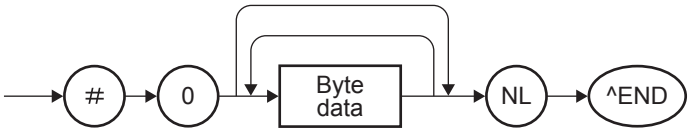


Figure 2.22. Indeterminate Length Block Response Data (<IBLK>) Syntax

2.2 Command List

Table 2.2 lists the commands of the WF1973/WF1974.
The meanings of the symbols used in Table 2.2 are as follows. The lowercase part of each keyword is omissible.

・Square brackets ([ ]) indicate omissible keywords (implicit keywords).
・Vertical bars (|) indicate that one of several keywords can be selected.

Table 2.2. Command List

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
WF1974				
Same value setting to 2 channels	:INSTrument:COUPle	P.28	20/10	20/15
Channel mode	:CHANnel:MODE	P.27	345/10	345/10
Frequency difference	:CHANnel:DELTa	P.27	250/10	250/15
Frequency ratio	:CHANnel:RATio	P.28	490/10	485/10
Output				
Output on/off selection	:OUTPut[1|2][:STATe]	P.32	15/10	15/15
Output status selection at power-on	:OUTPut[1|2]:PON	P.31	220/10	335/10
Autorange selection	[:SOURce[1|2]]:VOLTage:RANGe:AUTO	P.119	70/10	70/15
Phase synchronization	[:SOURce[1|2]]:PHASe:INITiate	P.85	45/–	45/–
External addition input	[:SOURce[1|2]]:COMBine:FEED	P.46	65/10	65/10
Load impedance	:OUTPut[1|2]:LOAD	P.29	260/10	260/10
Trigger				
Sweep				
Trigger source selection	:TRIGger[1|2]:SWEep:SOURce	P.134	15/10	15/15
Internal trigger cycle	:TRIGger[1|2]:SWEep:TIMer	P.135	10/10	15/15
External trigger signal polarity selection	:TRIGger[1|2]:SWEep:SLOPe	P.134	10/10	10/10
Burst				
Trigger source selection	:TRIGger[1|2]:BURSt:SOURce	P.132	10/10	10/15
Internal trigger cycle	:TRIGger[1|2]:BURSt:TIMer	P.133	10/10	15/15
External trigger signal polarity selection	:TRIGger[1|2]:BURSt:SLOPe	P.132	10/10	10/10
Manual trigger equivalent function	*TRG	P.138	10/–	10/–
Manual trigger equivalent function	:TRIGger[1|2][:SEQuence][:IMMediate]	P.134	15/–	15/–
Control	:TRIGger[1|2]:SELected:EXECute	P.133	30/–	30/–
Basic parameter				
Frequency	[:SOURce[1|2]]:FREQuency[:CW|:FIXed]	P.49	45/10	45/15
Unit selection	[:SOURce[1|2]]:FREQuency:UNIT	P.52	10/10	10/15
User unit	[:SOURce[1|2]]:FREQuency:USER	P.53	15/15	15/15
Amplitude	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	P.108	95/10	95/15

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Unit selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:UNIT	P.111	10/10	10/15
User unit	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:USER	P.112	15/15	20/15
DC offset	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet	P.114	95/15	95/10
Unit selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT	P.117	10/10	10/15
User unit	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:USER	P.118	15/15	20/15
Phase	[:SOURce[1|2]]:PHASe[:ADJust]	P.84	20/15	20/15
Unit selection	[:SOURce[1|2]]:PHASe:UNIT	P.88	10/10	10/15
User unit	[:SOURce[1|2]]:PHASe:USER	P.88	15/15	15/15
Square wave: Duty	[:SOURce[1|2]]:FUNCtion:SQUare:DCYCle	P.73	20/15	20/15
Pulse: Duty	[:SOURce[1|2]]:PULSe:DCYCle	P.93	65/15	45/20
Square wave/pulse: duty unit				
Unit selection	[:SOURce[1|2]]:PULSe:DCYCle:UNIT	P.97	10/15	10/15
User unit	[:SOURce[1|2]]:PULSe:DCYCle:USER	P.97	15/20	15/15
Pulse: Pulse width	[:SOURce[1|2]]:PULSe:WIDTh	P.101	65/10	45/20
Square wave/pulse: Rising time	[:SOURce[1|2]]:PULSe:TRANsition[:LEADing]	P.100	35/10	30/15
Square wave/pulse: Falling time	[:SOURce[1|2]]:PULSe:TRANsition:TRAiling	P.100	25/10	25/15
Ramp wave: Symmetry	[:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry	P.70	30/10	30/15
Period	[:SOURce[1|2]]:PULSe:PERiod	P.98	95/15	75/20
Unit selection	[:SOURce[1|2]]:PULSe:PERiod:UNIT	P.98	10/10	10/10
User unit	[:SOURce[1|2]]:PULSe:PERiod:USER	P.99	15/15	20/15
High level	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH	P.112	70/15	70/15
Unit selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT	P.113	10/10	10/15
Low level	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW	P.113	145/15	145/20
Unit selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT	P.114	10/10	10/15
Waveform				
Waveform selection	[:SOURce[1|2]]:FUNCtion[:SHAPe]	P.71	300/10	300/15
Waveform polarity selection	:OUTPut[1|2]:POLarity	P.29	100/10	100/15
Amplitude range selection	:OUTPut[1|2]:SCALe	P.31	100/10	100/15
Square wave extension on/off selection	[:SOURce[1|2]]:FUNCtion:SQUare:EXTend	P.74	15/10	20/15
Parameter variable waveform				
Unbalanced sine wave: First-half amplitude	[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude[1]	P.78	65/10	65/15
Unbalanced sine wave: Second-half amplitude	[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2	P.79	60/15	60/15
Clipped sine wave: Clip rate	[:SOURce[1|2]]:FUNCtion:CSINe:CLIP	P.60	25/15	30/15
CF controlled sine wave: Crest factor	[:SOURce[1|2]]:FUNCtion:CFCSine:CFACtor	P.56	30/10	30/15

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Conduction angle controlled sine wave: Conduction angle	[:SOURce[1|2]]:FUNCtion:ACSine:ANGle	P.55	25/10	30/15
Staircase sine wave: Number of steps	[:SOURce[1|2]]:FUNCtion:SSINe:STEPs	P.74	90/10	90/15
Multi-cycle sine wave: Number of cycles	[:SOURce[1|2]]:FUNCtion:MCSine:CYCLes	P.65	35/15	35/15
Multi-cycle sine wave: Start phase	[:SOURce[1|2]]:FUNCtion:MCSine:PHASe	P.66	35/15	35/15
On-phase controlled sine wave: Complete-on phase	[:SOURce[1|2]]:FUNCtion:ONPSine:ONPHase	P.67	25/15	30/15
On-phase controlled sine wave: On-slope time	[:SOURce[1|2]]:FUNCtion:ONPSine:STIMe	P.68	25/15	30/15
Off-phase controlled sine wave: Off-phase	[:SOURce[1|2]]:FUNCtion:OFPSine:OFPHase	P.66	25/15	25/15
Off-phase controlled sine wave: Off-slope time	[:SOURce[1|2]]:FUNCtion:OFPSine:STIMe	P.67	20/10	20/15
Chattering-on sine wave: On-phase	[:SOURce[1|2]]:FUNCtion:CONSine:ONPHase	P.59	25/15	25/15
Chattering-on sine wave: Number of chattering	[:SOURce[1|2]]:FUNCtion:CONSine:NCHattering	P.58	25/10	25/15
Chattering-on sine wave: On-state time	[:SOURce[1|2]]:FUNCtion:CONSine:TON	P.60	25/10	30/15
Chattering-on sine wave: Off-state time	[:SOURce[1|2]]:FUNCtion:CONSine:TOFF	P.59	25/10	30/15
Chattering-off sine wave: Off-phase	[:SOURce[1|2]]:FUNCtion:COFSine:OFPHase	P.57	25/15	25/15
Chattering-off sine wave: Number of chattering	[:SOURce[1|2]]:FUNCtion:COFSine:NCHattering	P.56	20/10	20/15
Chattering-off sine wave: On-state time	[:SOURce[1|2]]:FUNCtion:COFSine:TON	P.58	20/10	20/15
Chattering-off sine wave: Off-state time	[:SOURce[1|2]]:FUNCtion:COFSine:TOFF	P.57	20/10	20/15
Gaussian pulse: Standard deviation	[:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa	P.62	30/10	30/15
Lorentz pulse: Half value of width	[:SOURce[1|2]]:FUNCtion:LORentz:HWIDth	P.65	30/10	30/15
Haversine: Width	[:SOURce[1|2]]:FUNCtion:HAVersine:WIDTh	P.63	85/10	85/15
Half-sine pulse: Width	[:SOURce[1|2]]:FUNCtion:HSPulse:WIDTh	P.64	80/15	80/15
Trapezoid pulse: Slope width	[:SOURce[1|2]]:FUNCtion:TPULse:RFALl	P.77	20/15	20/15
Trapezoid pulse: Upper base width	[:SOURce[1|2]]:FUNCtion:TPULse:UBASe	P.77	25/10	20/15
Sinx(x)/x: Number of zero crossings	[:SOURce[1|2]]:FUNCtion:SINC:ZCRossing	P.72	40/10	40/15
Exponential rise: Time constant	[:SOURce[1|2]]:FUNCtion:ERISe:TCONstant	P.62	30/15	30/15
Exponential fall: Time constant	[:SOURce[1|2]]:FUNCtion:EFALl:TCONstant	P.61	15/15	15/15
Second order LPF step response: Natural frequency	[:SOURce[1|2]]:FUNCtion:SOLStep:NFRequency	P.72	35/10	35/15
Second order LPF step response: Q	[:SOURce[1|2]]:FUNCtion:SOLStep:Q	P.73	30/10	30/15
Damped oscillation: Oscillation frequency	[:SOURce[1|2]]:FUNCtion:DOSCillation :OFRequency	P.61	40/15	40/15
Damped oscillation: Damping time constant	[:SOURce[1|2]]:FUNCtion:DOSCillation :DTConstant	P.60	30/15	30/15
Oscillation surge: Oscillation frequency	[:SOURce[1|2]]:FUNCtion:OSURge:OFRequency	P.68	170/15	170/15
Oscillation surge: Damping time constant	[:SOURce[1|2]]:FUNCtion:OSURge:DTConstant	P.68	170/15	170/15
Oscillation surge: Trailing time constant	[:SOURce[1|2]]:FUNCtion:OSURge:TTConstant	P.69	170/15	170/15
Pulse surge: Rising time	[:SOURce[1|2]]:FUNCtion:PSURge:TR	P.70	30/10	30/15

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Pulse surge: Duration time	[:SOURce[1|2]]:FUNCtion:PSURge:TD	P.69	30/15	30/15
Trapezoid wave with offset: Leading delay	[:SOURce[1|2]]:FUNCtion:TOFFset:DELay	P.75	20/15	20/15
Trapezoid wave with offset: Rising-slope width	[:SOURce[1|2]]:FUNCtion:TOFFset:RISe	P.76	20/10	20/15
Trapezoid wave with offset: Upper base width	[:SOURce[1|2]]:FUNCtion:TOFFset:UBASe	P.76	20/10	20/15
Trapezoid wave with offset: Falling-slope width	[:SOURce[1|2]]:FUNCtion:TOFFset:FALL	P.75	20/15	20/15
Trapezoid wave with offset: Offset	[:SOURce[1|2]]:FUNCtion:TOFFset:OFFSet	P.75	20/10	20/15
Half-sine edge pulse: Leading-edge time	[:SOURce[1|2]]:FUNCtion:HSEPulse:LE	P.64	25/10	25/15
Half-sine edge pulse: Trailing-edge time	[:SOURce[1|2]]:FUNCtion:HSEPulse:TE	P.64	25/10	25/15
Half-sine edge pulse: Duty	[:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle	P.63	20/10	20/15
Bottom referenced ramp wave: Symmetry	[:SOURce[1|2]]:FUNCtion:BRRAMp:SYMMetry	P.56	20/10	20/15
Arbitrary waveform				
Arbitrary waveform selection	[:SOURce[1|2]]:FUNCtion:USER	P.78	25/10	25/15
Arbitrary wave data I/O	:TRACe|DATA[:DATA]	P.128		
	Array format (4 KWord)		450/50	820/150
	Array format (512 KWord)		28000/7000	41000/22000
	Control point format (10 points)		250/20	370/25
	Control point format (10000 points)		2200/150	3100/1200
Store	:TRACe|DATA:STORe	P.132	540/–	660/–
Recall	:TRACe|DATA:RECall	P.130	50/–	50/–
Copy	:TRACe|DATA:COPY	P.126	380/–	540/–
Arbitrary memory delete	:TRACe|DATA:DELete	P.129	600/–	620/–
Arbitrary wave memory information acquisition	:TRACe|DATA:INFormation?	P.130	–/35	–/20
Continuous oscillation				
Continuous oscillation selection	[:SOURce[1|2]]:CONTinuous[:IMMediate]	P.46	90/–	90/–
Continuous oscillation query	[:SOURce[1|2]]:CONTinuous:STATe?	P.46	–/10	–/15
Modulation				
FSK				
Selection	[:SOURce[1|2]]:FSKey:STATe	P.55	100/10	100/15
Hop frequency	[:SOURce[1|2]]:FSKey[:FREQuency]	P.53	10/15	10/15
Modulation source selection	[:SOURce[1|2]]:FSKey:SOURce	P.54	10/10	15/15
Modulation frequency	[:SOURce[1|2]]:FSKey:INTernal:FREQuency	P.54	20/15	20/15
Sync output selection	:OUTPut[1|2]:SYNC:FSKey:TYPE	P.34	10/10	10/10
PSK				
Selection	[:SOURce[1|2]]:PSKey:STATe	P.93	100/10	100/15
Deviation	[:SOURce[1|2]]:PSKey[:DEViation]	P.91	10/10	10/15
Modulation source selection	[:SOURce[1|2]]:PSKey:SOURce	P.92	20/10	20/15

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Modulation frequency	[:SOURce[1|2]]:PSKey:INTernal:FREQuency	P.92	20/10	20/15
Sync output selection	:OUTPut[1|2]:SYNC:PSKey:TYPE	P.35	10/10	10/15
FM				
Selection	[:SOURce[1|2]]:FM:STATe	P.48	100/10	100/10
Peak deviation	[:SOURce[1|2]]:FM[:DEViation]	P.46	25/15	10/15
Modulation source selection	[:SOURce[1|2]]:FM:SOURce	P.48	15/10	15/10
Modulation frequency	[:SOURce[1|2]]:FM:INTernal:FREQuency	P.47	15/10	20/15
Modulation waveform selection	[:SOURce[1|2]]:FM:INTernal:FUNCtion[:SHAPe]	P.47	10/10	10/15
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:FM:INTernal:FUNCtion:USER	P.48	25/10	35/15
Sync output selection	:OUTPut[1|2]:SYNC:FM:TYPE	P.34	10/10	10/15
PM				
Selection	[:SOURce[1|2]]:PM:STATe	P.91	100/10	100/15
Peak deviation	[:SOURce[1|2]]:PM[:DEViation]	P.89	20/10	20/15
Modulation source selection	[:SOURce[1|2]]:PM:SOURce	P.91	10/10	20/10
Modulation frequency	[:SOURce[1|2]]:PM:INTernal:FREQuency	P.89	15/10	20/15
Modulation waveform selection	[:SOURce[1|2]]:PM:INTernal:FUNCtion[:SHAPe]	P.90	10/10	10/15
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:PM:INTernal:FUNCtion:USER	P.90	25/10	35/15
Sync output selection:	:OUTPut[1|2]:SYNC:PM:TYPE	P.35	10/10	15/15
AM				
Selection	[:SOURce[1|2]]:AM:STATe	P.39	100/10	100/10
Modulation depth	[:SOURce[1|2]]:AM[:DEPTh]	P.37	10/10	15/15
Modulation source selection	[:SOURce[1|2]]:AM:SOURce	P.38	10/10	15/15
Modulation frequency	[:SOURce[1|2]]:AM:INTernal:FREQuency	P.37	20/10	20/15
Modulation waveform selection	[:SOURce[1|2]]:AM:INTernal:FUNCtion[:SHAPe]	P.37	10/10	10/10
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:AM:INTernal:FUNCtion:USER	P.38	25/10	25/15
Sync output selection	:OUTPut[1|2]:SYNC:AM:TYPE	P.33	10/10	10/10
AM (DSB-SC)				
Selection	[:SOURce[1|2]]:AMSC:STATe	P.41	100/10	100/10
Modulation depth	[:SOURce[1|2]]:AMSC[:DEPTh]	P.39	10/10	10/15
Modulation source selection	[:SOURce[1|2]]:AMSC:SOURce	P.41	10/10	15/10
Modulation frequency	[:SOURce[1|2]]:AMSC:INTernal:FREQuency	P.39	20/10	20/15
Modulation waveform selection	[:SOURce[1|2]]:AMSC:INTernal:FUNCtion [:SHAPe]	P.40	10/10	10/10
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:AMSC:INTernal:FUNCtion:USER	P.40	25/10	30/15
Sync output selection	:OUTPut[1|2]:SYNC:AMSC:TYPE	P.33	10/10	10/10
DC offset modulation				
Selection	[:SOURce[1|2]]:OFSM:STATe	P.84	100/10	100/20
Peak deviation	[:SOURce[1|2]]:OFSM[:DEViation]	P.82	65/15	65/15
Modulation source selection	[:SOURce[1|2]]:OFSM:SOURce	P.84	10/10	15/10

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Modulation frequency	[:SOURce[1|2]]:OFSM:INTernal:FREQuency	P.82	15/15	15/15
Modulation waveform selection	[:SOURce[1|2]]:OFSM:INTernal:FUNCtion [:SHAPe]	P.83	10/10	10/10
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:OFSM:INTernal:FUNCtion:USER	P.83	25/10	25/15
Sync output selection:	:OUTPut[1|2]:SYNC:OFSM:TYPE	P.35	10/10	10/10
PWM				
Selection	[:SOURce[1|2]]:PWM:STATe	P.103	120/10	120/10
Peak deviation	[:SOURce[1|2]]:PWM[:DEViation]:DCYCle	P.101	25/15	25/15
Modulation source selection	[:SOURce[1|2]]:PWM:SOURce	P.103	10/10	15/10
Modulation frequency	[:SOURce[1|2]]:PWM:INTernal:FREQuency	P.102	15/15	15/15
Modulation waveform selection	[:SOURce[1|2]]:PWM:INTernal:FUNCtion [:SHAPe]	P.102	10/10	10/15
Arbitrary waveform in modulation waveform selection	[:SOURce[1|2]]:PWM:INTernal:FUNCtion:USER	P.103	25/10	25/15
Sync output selection	:OUTPut[1|2]:SYNC:PWM:TYPE	P.36	10/10	10/10
Sweep				
Sweep mode selection	[:SOURce[1|2]]:SWEep:MODE	P.105	15/10	15/15
Sweep slope selection	[:SOURce[1|2]]:SWEep:SPACing	P.107	10/10	10/15
Sweep direction selection	[:SOURce[1|2]]:SWEep:INTernal:FUNCtion	P.105	10/10	10/15
Sweep time	[:SOURce[1|2]]:SWEep:TIME	P.107	15/10	10/15
Stop level	[:SOURce[1|2]]:SWEep:SLEVel	P.106	10/10	10/15
Stop level selection	[:SOURce[1|2]]:SWEep:SLEVel:STATe	P.107	10/10	10/15
Oscillation stop unit	[:SOURce[1|2]]:SWEep:OSTop	P.106	10/10	10/15
Multiconnector control on/off selection	[:SOURce[1|2]]:SWEep:MCONnector:STATe	P.105	10/10	10/15
Sync output selection	:OUTPut[1|2]:SYNC:SWEep:TYPE	P.36	10/10	10/15
Frequency sweep				
Selection	[:SOURce[1|2]]:FREQuency:MODE	P.50	180/10	180/15
Start value	[:SOURce[1|2]]:FREQuency:STARt	P.51	20/15	20/15
Stop value	[:SOURce[1|2]]:FREQuency:STOP	P.51	20/15	20/15
Center value	[:SOURce[1|2]]:FREQuency:CENTer	P.49	20/15	20/15
Span value	[:SOURce[1|2]]:FREQuency:SPAN	P.50	20/15	20/15
Marker value	[:SOURce[1|2]]:MARKer:FREQuency	P.79	15/15	15/15
Swap	[:SOURce[1|2]]:FREQuency:SWAP	P.52	25/–	15/–
Start state/stop state	[:SOURce[1|2]]:FREQuency:STATe	P.51	10/–	15/–
Phase sweep				
Selection	[:SOURce[1|2]]:PHASe:MODE	P.85	190/10	190/15
Start value	[:SOURce[1|2]]:PHASe:STARt	P.86	20/15	20/15
Stop value	[:SOURce[1|2]]:PHASe:STOP	P.87	20/15	20/15
Center value	[:SOURce[1|2]]:PHASe:CENTer	P.85	20/15	20/15
Span value	[:SOURce[1|2]]:PHASe:SPAN	P.86	20/15	20/15
Marker value	[:SOURce[1|2]]:MARKer:PHASe	P.80	15/15	15/15
Swap	[:SOURce[1|2]]:PHASe:SWAP	P.87	15/–	20/–

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Start state/stop state	[:SOURce[1|2]]:PHASe:STATe	P.87	10/–	15/–
Amplitude sweep				
Selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE	P.109	230/15	230/20
Start value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt	P.110	20/15	20/20
Stop value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STOP	P.110	20/15	20/20
Center value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CENTer	P.108	20/15	25/20
Span value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN	P.109	20/15	20/20
Marker value	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]	P.81	20/15	20/20
Swap	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SWAP	P.111	20/–	20/–
Start state/stop state	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STATe	P.110	15/–	15/–
DC offset sweep				
Selection	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE	P.115	230/15	230/20
Start value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt	P.116	20/20	20/20
Stop value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP	P.117	20/15	20/20
Center value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer	P.115	20/15	20/20
Span value	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN	P.116	20/15	20/20
Marker value	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet	P.81	15/20	15/20
Swap	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP	P.117	20/–	20/–
Start state/stop state	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe	P.117	15/–	15/–
Duty sweep			/	/
Selection	[:SOURce[1|2]]:PULSe:DCYCle:MODE	P.94	250/15	250/15
Start value	[:SOURce[1|2]]:PULSe:DCYCle:STARt	P.95	20/15	20/15
Stop value	[:SOURce[1|2]]:PULSe:DCYCle:STOP	P.96	20/15	20/15
Center value	[:SOURce[1|2]]:PULSe:DCYCle:CENTer	P.93	20/15	20/15
Span value	[:SOURce[1|2]]:PULSe:DCYCle:SPAN	P.94	20/15	20/15
Marker value	[:SOURce[1|2]]:MARKer:PULSe:DCYCle	P.80	20/15	20/15
Swap	[:SOURce[1|2]]:PULSe:DCYCle:SWAP	P.97	20/–	20/–
Start state/stop state	[:SOURce[1|2]]:PULSe:DCYCle:STATe	P.96	10/–	10/–
Burst				
Burst selection	[:SOURce[1|2]]:BURSt:STATe	P.44	100/10	100/10

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
Burst mode selection	[:SOURce[1|2]]:BURSt:MODE	P.43	10/10	10/10
Auto burst: Mark wave number	[:SOURce[1|2]]:BURSt:AUTO:NCYCles	P.42	10/10	10/15
Auto burst: Space wave number	[:SOURce[1|2]]:BURSt:AUTO:SPACe	P.42	10/10	10/10
Trigger burst: Mark wave number	[:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles	P.45	10/10	10/15
Trigger burst: Trigger delay time	[:SOURce[1|2]]:BURSt[:TRIGger]:TDELay	P.45	10/10	15/15
Stop level	[:SOURce[1|2]]:BURSt:SLEVel	P.43	10/10	10/15
Stop level selection	[:SOURce[1|2]]:BURSt:SLEVel:STATe	P.44	10/10	10/10
Gate: Oscillation stop unit	[:SOURce[1|2]]:BURSt:GATE:OSTop	P.42	10/10	10/15
Triggered gate: Oscillation stop unit	[:SOURce[1|2]]:BURSt:TGATe:OSTop	P.44	10/10	10/10
Sync output selection	:OUTPut[1|2]:SYNC:BURSt:TYPE	P.34	10/10	10/10
Sequence				
Sequence selection	[:SOURce[1|2]]:SEQuence:STATe	P.104	20/10	20/15
Store	:TRACe|DATA:SEQuence:STORe	P.131	1600/–	1800/–
Recall	:TRACe|DATA:SEQuence:RECall	P.131	90/–	90/–
Sequence data I/O	:TRACe|DATA:SEQuence	P.130	2000/160	3000/285
Sequence data compilation	:TRIGger[1|2]:COMPile[:IMMediate]	P.133	2000/–	2000/–
Current step number acquisition	[:SOURce[1|2]]:SEQuence:CSTep?	P.104	–/10	–/10
Sequence data initialization	:TRACe|DATA:SEQuence:CLEar	P.131	2000/–	2000/–
Setting memory				
Clear	:MEMory:STATe:DELete	P.28	700/–	700/–
Store	*SAV	P.137	900/–	900/–
Recall	*RCL	P.137	250/–	250/–
Status				
Status register and related queue clear	*CLS	P.135	105/–	100/–
Status reporting related preset	:STATus:PRESet	P.123	10/–	10/–
Power-on status register clear flag	*PSC	P.137	10/10	10/10
Status byte register	*STB?	P.138	–/10	–/10
Service request enable register	*SRE	P.137	10/10	10/10
Standard event status register	*ESR?	P.136	–/10	–/10
Standard event enable register	*ESE	P.136	10/10	10/10
Operation status register group				
Condition register	:STATus:OPERation:CONDition?	P.121	–/10	–/10
Transition filter register (negative)	:STATus:OPERation:NTRansition	P.122	10/10	10/10
Transition filter register (positive)	:STATus:OPERation:PTRansition	P.123	10/10	10/10
Event register	:STATus:OPERation[:EVENt]?	P.122	–/10	–/10
Event enable register	:STATus:OPERation:ENABle	P.122	10/10	10/10
CH1 operation status register group				
Condition register	:STATus:OPERation:CH1:CONDition?	P.119	–/10	–/10
Transition filter register (negative)	:STATus:OPERation:CH1:NTRansition	P.120	10/10	10/10
Transition filter register (positive)	:STATus:OPERation:CH1:PTRansition	P.120	10/10	10/15
Event register	:STATus:OPERation:CH1[:EVENt]?	P.119	–/10	–/10
Event enable register	:STATus:OPERation:CH1:ENABle	P.119	10/10	10/10

Function	Command	Refer-ence	Processing Time [ms] Setting/Query	
			USB	GPIB
CH2 operation status register group				
Condition register	:STATus:OPERation:CH2:CONDition?	P.120	–/10	–/15
Transition filter register (negative)	:STATus:OPERation:CH2:NTRansition	P.121	10/10	10/10
Transition filter register (positive)	:STATus:OPERation:CH2:PTRansition	P.121	10/10	10/10
Event register	:STATus:OPERation:CH2[:EVENt]?	P.121	–/10	–/15
Event enable register	:STATus:OPERation:CH2:ENABle	P.120	10/10	10/15
Questionable data status register group				
Condition register	:STATus:QUEStionable:CONDition?	P.123	–/10	–/10
Transition filter register (negative)	:STATus:QUEStionable:NTRansition	P.124	10/10	10/15
Transition filter register (positive)	:STATus:QUEStionable:PTRansition	P.124	10/10	10/10
Event register	:STATus:QUEStionable[:EVENt]?	P.124	–/10	–/10
Event enable register	:STATus:QUEStionable:ENABle	P.124	10/10	10/10
Warning event register group				
Event register	:STATus:WARNing[:EVENt]?	P.126	–/10	–/10
Event enable register	:STATus:WARNing:ENABle	P.126	10/10	10/10
CH1 warning event register group				
Event register	:STATus:WARNing:CH1[:EVENt]?	P.125	–/10	–/10
Event enable register	:STATus:WARNing:CH1:ENABle	P.125	10/10	10/15
CH2 warning event register group				
Event register	:STATus:WARNing:CH2[:EVENt]?	P.125	–/10	–/10
Event enable register	:STATus:WARNing:CH2:ENABle	P.125	10/10	10/10
Other				
External reference frequency input	[:SOURce[1|2]]:ROSCillator:SOURce	P.104	15/10	15/15
Setting initialization (status registers, etc. not cleared)	*RST	P.137	330/–	330/–
Setting of operation completion event bit	*OPC	P.136	10/–	10/–
Setting of output key at operation completion to 1	*OPC?	P.137	–/10	–/10
Self-check result query	*TST?	P.138	–/10	–/10
Error query	:SYSTem:ERRor?	P.126	–/10	–/15
ID read	*IDN?	P.136	–/10	–/15
Command, query execution obstruction	*WAI	P.138	10/–	10/–

“Processing time” shown in table 2.2 indicates the typical time for command processing of this device.

Transfer speed of data depends on the speed of the controller (PC) and the processing time of this device is affected by the internal status.

The actual processing time and the one shown here may differ due to transmitting parameter values and relevant setting values.

The processing time for a query is the time from the transmission of a query command to the reception of a response message.

2.3 Description of Individual Commands

Each command is described in detail below.

■ :CHANnel:DELTa

□ :CHANnel:DELTa?

Description:

Sets/queries frequency difference when frequency difference is constant.

Setting parameters:

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Frequency difference:(CH2 frequency-CH1 frequency), resolution: 0.01 μHz

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ

MINimum → Minimum value setting

MAXimum → Maximum value setting

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:CHANnel:DELTa 1 KHZ

Sets frequency difference to 1 kHz

Remark:

* This command can be used only for 2-channel equipment.

■ :CHANnel:MODE

□ :CHANnel:MODE?

Description:

Selects/queries channel mode

Setting parameters:

INDependent|PHASe|TONE|RATio|DIFFerential

INDependent → Independent

PHASe → 2-phase

TONE → Constant frequency difference.

RATio → Constant frequency ratio

DIFFerential → Differential output

Query parameters:

None

Response waveform:

IND|PHAS|TONE|RAT|DIFF

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:CHANnel:MODE INDependent

Sets the channel mode to independent

Remark:

* This command can be used only for 2-channel device.

■ :CHANnel:RATio

□ :CHANnel:RATio?

Description:

Sets/queries frequency ratio when frequency ratio is constant.

Setting parameters:

<value1>|MINimum|MAXimum,<value2>|MINimum|MAXimum

<value1> ::= <INT>

<INT> → CH1 frequency ratio:1 to 9,999,999

<value2> ::= <INT>

<INT> → CH2 frequency ratio:1 to 9,999,999

MINimum → 1

MAXimum → 9,999,999

Query parameters:

None

Response waveform:

<NR1>,<NR1>

Setting example:

:CHANnel:RATio 2,3

Sets frequency ratio to 2:3

Remark:

* This command can be used only for 2-channel device.

■ :INSTrument:COUPle

□ :INSTrument:COUPle?

Description:

Selects/queries same value setting to 2 channels

Setting parameters:

ALL|NONE

ALL → Simultaneous setting on

NONE → Simultaneous setting off

Query parameters:

None

Response waveform:

ALL|NONE

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:INSTrument:COUPle ALL

Use of same value setting to 2 channels

Remark:

* This command can be used only for 2-channel device.

■ :MEMory:STATe:DELete

Description:

Clears setting memory clear

Setting parameters:

<memory>|MINimum|MAXimum

<memory> ::= <INT>

<INT> → Memory number: 1 to 10

MINimum → 1

MAXimum → 10

■ :OUTPut[1|2]:LOAD

□ :OUTPut[1|2]:LOAD?

Description:

Sets/queries load impedance.

Setting parameters:

<load>|MINimum|MAXimum|INFinity

<load> ::= <INT>[<eunits>][<units>]

<INT> → Load impedance: 1 Ω to 10 kΩ, resolution: 1 Ω

<eunits> ::= K

<units> ::= OHM

MINimum → 1 Ω

MAXimum → 10 kΩ

INFinity → High-Z

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR1>

Setting example:

:OUTPut1:LOAD 500 HM

Sets CH1 load impedance to 50 Ω.

■ :OUTPut[1|2]:POLarity

□ :OUTPut[1|2]:POLarity?

Description:

Selects/queries waveform polarity.

Setting parameters:

<shape>,<polarity>

<shape> →

SINusoid|SQUare|PULSe|RAMP

|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine

|ONPSine|OFPSine|CONSine|COFSine

|GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC

|ERISe|EFALl|SOLStep|DOSCillation

|OSURge|PSURge

|TOFFset|HSEPulse|BRRamp

|USER

SINusoid → Sine wave

```
  SQUare       → Square wave
  PUISe        → Pulse wave
  RAMP         → Ramp wave
  USINe        → Unbalanced sine wave
  CSINe        → Clipped sine wave
  CFCSine      → CF controlled sine wave
  ACSine       → Conduction angle controlled sine wave
  SSINe        → Staircase sine wave
  MCSine       → Multi-cycle sine wave
  ONPSine      → On-phase controlled sine wave
  OFPSine      → Off-phase controlled sine wave
  CONSine      → Chattering-on sine wave
  COFSine      → Chattering-off sine wave
  GAUSsian     → Gaussian pulse
  LORentz      → Lorentz pulse
  HAVersine    → Haversine
  HSPulse      → Half-sine pulse
  TPULse       → Trapezoid pulse
  SINC         → Sin(x)/x
  ERISe        → Exponential rise
  EFALI        → Exponential fall
  SOLStep      → Second order LPF step response
  DOSCillation → Damped oscillation
  OSURge       → Oscillation surge
  PSURge       → Pulse surge
  TOFFset      → Trapezoid with offset
  HSEPulse     → Half-sine edge pulse
  BRRamp       → Bottom referenced ramp wave
  USER         → Arbitrary waveform
<polarity> → NORMal|INVerted
  NORMal → Normal
  INVerted → Inverted
Query parameters:
<shape> ::= {
  SINusoid|SQUare|PULSe|RAMP
    |USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
    |ONPSine|OFPSine|CONSine|COFSine
    |GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC
    |ERISe|EFALl|SOLStep|DOSCillation
    |OSURge|PSURge
    |TOFFset|HSEPulse|BRRamp
    |USER
  }
  * For the meaning of each parameter, refer to the setting parameters.
Response waveform:
  NORM|INV
  * For the meaning of the response data, refer to the setting parameters.
```

Setting example:
:OUTPut1:POLarity SINusoid, NORMal
Sets CH1 sine wave polarity to normal.

■ :OUTPut[1|2]:PON
□ :OUTPut[1|2]:PON?
Description:
Selects/queries output on/off during power-on manipulation
Setting parameters:
ON|OFF|LAST
ON → Output on
OFF → Output off
LAST → Setting at previous output off manipulation
Query parameters:
None
Response waveform:
ON|OFF|LAST
* For the meaning of the response data, refer to the setting parameters
Setting example:
:OUTPut1:PON ON
Sets CH1 output during power-on manipulation to on

■ :OUTPut[1|2]:SCALe
□ :OUTPut[1|2]:SCALe?
Description:
Selects/queries waveform amplitude range.
Setting parameters:
<shape>,<scale>
<shape> ::= {
SINusoid|SQUare|PULSe|RAMP
|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFAL1|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|BRRamp
|USER
}
SINusoid → Sine wave
SQUare → Square wave
PULSe → Pulse wave
RAMP → Ramp wave
USINe → Unbalanced sine wave
CSINe → Clipped sine wave
CFCSine → CF controlled sine wave
ACSine → Conduction angle controlled sine wave
SSINe → Staircase sine wave

MCSine → Multi-cycle sine wave
ONPSine → On-phase controlled sine wave
OFPSine → Off-phase controlled sine wave
CONSine → Chattering-on sine wave
COFSine → Chattering-off sine wave
GAUSsian → Gaussian pulse
LORentz → Lorentz pulse
HAVersine → Haversine
HSPulse → Half-sine pulse
TPULse → Trapezoid pulse
SINC → Sin(x)/x
ERISe → Exponential rise
EFALl → Exponential fall
SOLStep → Second order LPF step response
DOSCillation → Damped oscillation
OSURge → Oscillation surge
PSURge → Pulse surge
TOFFset → Trapezoid with offset
IISEPulse → Half-sine edge pulse
BRRamp → Bottom referenced ramp wave
USER → Arbitrary waveform

<scale> ::= {MFS|FS|PFS}
MFS → -FS/0
FS → ±FS
PFS → 0/+FS

Query parameters:
<shape> ::= {
SINusoid|SQUare|PULSe|RAMP
|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFALl|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|BRRamp
|USER
}
* For the meaning of each parameter, refer to the setting parameters

Response waveform:
MFS|FS|PFS
* For the meaning of the response data, refer to the setting parameters

Setting example:
:OUTPut1:SCALe SINusoid, FS
Sets CH1 sine wave amplitude range to ±FS

■ :OUTPut[1|2][:STATe]
□ :OUTPut[1|2][:STATe]?

Description:

Selects/queries output on/off.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Output off, 1/ON: Output on

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:OUTPut1:STATe ON

Sets CH1 output to on.

■ :OUTPut[1|2]:SYNC:AM:TYPE

□ :OUTPut[1|2]:SYNC:AM:TYPE?

Description:

Selects/queries sync output during AM.

Setting parameters:

SYNC|MSYNc|MFCTn

SYNC → Waveform sync

MSYNc → Internal modulation sync

MFCTn → Internal modulation signal

Query parameters:

None

Response waveform:

SYNC|MSYN|MFCT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:OUTPut1:SYNC:AM:TYPE SYNC

Sets sync output of CH1 during AM to waveform sync.

■ :OUTPut[1|2]:SYNC:AMSC:TYPE

□ :OUTPut[1|2]:SYNC:AMSC:TYPE?

Description:

Sets/queries sync output during AM (DSB-SC).

Setting parameters:

SYNC|MSYNc|MFCTn

SYNC → Waveform sync

MSYNc → Internal modulation sync

MFCTn → Internal modulation signal

Query parameters:

None

Response waveform:

SYNC|MSYN|MFCT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:OUTPut1:SYNC:AMSC:TYPE SYNC

Sets sync output of CH1 during AM (DSB-SC) to waveform sync.

■ :OUTPut[1|2]:SYNC:BURSt:TYPE
□ :OUTPut[1|2]:SYNC:BURSt:TYPE?

Description:
Selects/queries burst sync output.

Setting parameters:
SYNC|BSYNc
SYNC → Reference phase sync
BSYNc → Burst sync

Query parameters:
None

Response waveform:
SYNC|BSYN
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:OUTPut1:SYNC:BURSt:TYPE SYNC
Sets CH1 burst sync output to reference phase sync.

■ :OUTPut[1|2]:SYNC:FM:TYPE
□ :OUTPut[1|2]:SYNC:FM:TYPE?

Description:
Selects/queries sync output during FM.

Setting parameters:
SYNC|MSYNc|MFCTn
SYNC → Waveform sync
MSYNc → Internal modulation sync
MFCTn → Internal modulation signal

Query parameters:
None

Response waveform:
SYNC|MSYN|MFCT
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:OUTPut1:SYNC:FM:TYPE SYNC
Sets sync output of CH1 during FM to waveform sync.

■ :OUTPut[1|2]:SYNC:FSKey:TYPE
□ :OUTPut[1|2]:SYNC:FSKey:TYPE?

Description:
Selects/queries sync output during FSK.

Setting parameters:
SYNC|MSYNc
SYNC → Waveform sync
MSYN → Internal modulation sync

Query parameters:
None

Response waveform:
SYNC|MSYNc

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:OUTPut1:SYNC:FSKey:TYPE SYNC

Sets sync output of CH1 during FSK to waveform sync.

■ :OUTPut[1|2]:SYNC:OFSM:TYPE

□ :OUTPut[1|2]:SYNC:OFSM:TYPE?

Description:

Selects/queries sync output during DC offset modulation.

Setting parameters:

SYNC|MSYNc|MFCTn

SYNC → Waveform sync

MSYNc → Internal modulation sync

MFCTn → Internal modulation signal

Query parameters:

None

Response waveform:

SYNC|MSYN|MFCT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:OUTPut1:SYNC:OFSM:TYPE SYNC

Sets sync output of CH1 during DC offset modulation to sync output.

■ :OUTPut[1|2]:SYNC:PM:TYPE

□ :OUTPut[1|2]:SYNC:PM:TYPE?

Description:

Selects/queries sync output during PM.

Setting parameters:

SYNC|MSYNc|MFCTn

SYNC → Waveform sync

MSYNc → Internal modulation sync

MFCTn → Internal modulation signal

Query parameters:

None

Response waveform:

SYNC|MSYN|MFCT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:OUTPut1:SYNC:PM:TYPE SYNC

Sets sync output of CH1 during PM to waveform sync.

■ :OUTPut[1|2]:SYNC:PSKey:TYPE

□ :OUTPut[1|2]:SYNC:PSKey:TYPE?

Description:

Selects/queries sync output during PSK.

Setting parameters:

SYNC|MSYNc

SYNC → Waveform sync
MSYN → Internal modulation sync

Query parameters:
None

Response waveform:
SYNC|MSYNc
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:OUTPut1:SYNC:PSKey:TYPE SYNC
Sets sync output of CH1 during PSK to waveform sync.

■ :OUTPut[1|2]:SYNC:PWM:TYPE
□ :OUTPut[1|2]:SYNC:PWM:TYPE?

Description:
Selects/queries sync output during PWM.

Setting parameters:
SYNC|MSYNc|MFCTn
SYNC → Waveform sync
MSYNc → Internal modulation sync
MFCTn → Internal modulation signal

Query parameters:
None

Response waveform:
SYNC|MSYN|MFCT
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:OUTPut1:SYNC:PWM:TYPE SYNC
Sets sync output of CH1 during PWM to waveform sync.

■ :OUTPut[1|2]:SYNC:SWEep:TYPE
□ :OUTPut[1|2]:SYNC:SWEep:TYPE?

Description:
Selects/queries sweep sync output.

Setting parameters:
SYNC|SSYNc|XDRive|MARKer
SYNC → Reference phase sync
SSYNc → Sweep sync
XDRive → Sweep x drive
MARKer → Marker

Query parameters:
None

Response waveform:
SYNC|SSYN|XDR|MARK
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:OUTPut1:SYNC:SWEep:TYPE SYNC
Sets CH1 sweep sync output to reference phase sync.

■ [:SOURce[1|2]]:AM[:DEPTh]

□ [:SOURce[1|2]]:AM[:DEPTh]?

Description:

Sets/queries AM modulation depth.

Setting parameters:

<depth>|MINimum|MAXimum

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

<REAL> → Modulation depth: 0.0% to 100.0%, resolution: 0.1%

<units> ::= PCT

MINimum → 0.0%

MAXimum → 100.0%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:AM:DEPTh 30PCT

Sets AM modulation depth of CH1 to 30%.

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

□ [:SOURce[1|2]]:AM:INTernal:FREQuency?

Description:

Sets/queries AM internal modulation frequency

Setting parameters:

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz,
resolution: 5 digits or 0.1 mHz

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ

MINimum → 0.1 mHz

MAXimum → 100 kHz

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:AM:INTernal:FREQuency 1kHz

Sets AM internal modulation frequency of CH1 to 1 kHz.

■ [:SOURce[1|2]]:AM:INTernal:FUNCtion[:SHAPe]

□ [:SOURce[1|2]]:AM:INTernal:FUNCtion[:SHAPe]?

Description:

Selects/queries AM internal modulation waveform.

Setting parameters:

SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER

SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangular wave
PRAMp → Rising ramp wave
NRAMp → Falling ramp wave
NOISe → Noise
USER → Arbitrary wave

Query parameters:

None

Response waveform:

SIN|SQU|TRI|PRAM|NRAM|NOIS|USER

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:AM:INTernal:FUNCtion:SHAPe SINusoid

Sets AM internal modulation waveform of CH1 to sine wave.

■ [:SOURce[1|2]]:AM:INTernal:FUNCtion:USER

□ [:SOURce[1|2]]:AM:INTernal:FUNCtion:USER?

Description:

Selects/queries arbitrary waveform of AM internal modulation waveform

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:SOURce1:AM:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of AM internal modulation waveform of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:AM:SOURce

□ [:SOURce[1|2]]:AM:SOURce?

Description:

Select/queries AM modulation source.

Setting parameters:

INTernal|EXTernal

INTernal → Internal
EXTernal → External

Query parameters:

None

Response waveform:
INT|EXT
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:AM:SOURce INTernal
Sets AM modulation source of CH1 to internal.

■ [:SOURce[1|2]]:AM:STATe
□ [:SOURce[1|2]]:AM:STATe?
Description:
Switches oscillation mode between continuous oscillation and AM.
Queries whether the oscillation mode is AM or not.
Setting parameters:
<state> ::= <BOL>
BOL → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to AM
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:AM:STATe ON
Switches oscillation mode of CH1 to AM.

■ [:SOURce[1|2]]:AMSC[:DEPTh]
□ [:SOURce[1|2]]:AMSC[:DEPTh]?
Description:
Sets/queries AM (DSB-SC) modulation depth.
Setting parameters:
<depth>|MINimum|MAXimum
<depth> ::= <REAL>[<units>]
<REAL> → Modulation depth: 0.0% to 100.0%, resolution: 0.1%
<units> ::= PCT
MINimum → 0.0%
MAXimum → 100.0%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:AMSC:DEPTh 30PCT
Sets AM (DSB-SC) modulation depth of CH1 to 30%.

■ [:SOURce[1|2]]:AMSC:INTernal:FREQuency
□ [:SOURce[1|2]]:AMSC:INTernal:FREQuency?

Description:
Sets/queries AM (DSB-SC) internal modulation frequency.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz,
resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 100 kHz
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:AMSC:INTernal:FREQuency 1kHz
Sets internal modulation frequency of AM (DSB-SC) of CH1 to 1 kHz.

■ [:SOURce[1|2]]:AMSC:INTernal:FUNCtion[:SHAPe]
□ [:SOURce[1|2]]:AMSC:INTernal:FUNCtion[:SHAPe]?
Description:
Selects/queries AM (DSB-SC) internal modulation waveform.
Setting parameters:
SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER
SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangular wave
PRAMp → Rising ramp wave
NRAMp → Falling ramp wave
NOISe → Noise
USER → Arbitrary wave
Query parameters:
None
Response waveform:
SIN|SQU|TRI|PRAM|NRAM|NOIS|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:AMSC:INTernal:FUNCtion:SHAPe SINusoid
Sets internal modulation waveform of AM (DSB-SC) of CH1 to sine wave.

■ [:SOURce[1|2]]:AMSC:INTernal:FUNCtion:USER
□ [:SOURce[1|2]]:AMSC:INTernal:FUNCtion:USER?
Description:
Selects/queries arbitrary waveform of AM (DSB-SC) internal modulation waveform

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:SOURce1:AMSC:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of AM (DSB-SC) internal modulation waveform of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:AMSC:SOURce

□ [:SOURce[1|2]]:AMSC:SOURce?

Description:

Selects/queries AM (DSB-SC) modulation source.

Setting parameters:

INTernal|EXTernal

INTernal → Internal modulation source

EXTernal → External modulation source

Query parameters:

None

Response waveform:

INT|EXT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:AMSC:SOURce INTernal

Sets modulation source of AM (DSB-SC) of CH1 to internal modulation source.

■ [:SOURce[1|2]]:AMSC:STATe

□ [:SOURce[1|2]]:AMSC:STATe?

Description:

Switches oscillation mode between continuous oscillation and AM (DSB-SC).

Queries whether the oscillation mode is AM (DSB-SC) or not.

Setting parameters:

<state> ::= <BOL>

BOL → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to AM (DSB-SC)

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:SOURce1:AMSC:STATe ON

Switches oscillation mode of CH1 to AM (DSB-SC).

■ [:SOURce[1|2]]:BURSt:AUTO:NCYCles

□ [:SOURce[1|2]]:BURSt:AUTO:NCYCles?

Description:

Sets/queries mark wave number during auto burst

Setting parameters:

<mark>|MINimum|MAXimum

<mark> ::= <REAL>

<REAL> → Mark wave number: 0.5 waves to 999,999.5 waves, resolution: 0.5 waves

MINimum → 0.5 waves

MAXimum → 999,999.5 waves

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:BURSt:AUTO:NCYCles 10

Sets CH1 mark wave number during auto burst to 10 waves

■ [:SOURce[1|2]]:BURSt:AUTO:SPACe

□ [:SOURce[1|2]]:BURSt:AUTO:SPACe?

Description:

Sets/queries space wave number during auto burst

Setting parameters:

<mark>|MINimum|MAXimum

<mark> ::= <REAL>

<REAL> → Space wave number: 0.5 waves to 999,999.5 waves, resolution: 0.5 waves

MINimum → 0.5 waves

MAXimum → 999,999.5 waves

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:BURSt:AUTO:SPACe 10

Sets CH1 space wave number during auto burst to 10 waves

■ [:SOURce[1|2]]:BURSt:GATE:OSTop

□ [:SOURce[1|2]]:BURSt:GATE:OSTop?

Description:

Selects/queries oscillation stop unit during gate

Setting parameters:

HALF|CYCLe

HALF → half cycle

CYCLe → 1 cycle

Query parameters:

None

Response waveform:

HALF|CYCL

* For the meaning of the response data, refer to the setting parameters

Setting example:

:SOURce1:BURSt:GATE:OSTop HALF

Sets CH1 oscillation stop unit during gate to half cycle

■ [:SOURce[1|2]]:BURSt:MODE

□ [:SOURce[1|2]]:BURSt:MODE?

Description:

Selects/queries burst mode.

Setting parameters:

AUTO|TRIGger|GATE|TGATe

AUTO → Auto burst

TRIGger → Trigger burst

GATE → Gate

TGATe → Triggered gate

Query parameters:

None

Response waveform:

AUTO|TRIG|GATE|TGAT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:BURSt:MODE AUTO

Sets CH1 burst mode to auto burst

■ [:SOURce[1|2]]:BURSt:SLEVel

□ [:SOURce[1|2]]:BURSt:SLEVel?

Description:

Sets/queries step level value setting during burst.

Setting parameters:

<level>|MAXimum|MINimum

<level> ::= <REAL>[<units>]

<REAL> → Stop level value: -100.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → -100.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:BURSt:SLEVel 20PCT
Sets stop level value during CH1 burst to 20%.

■ [:SOURce[1|2]]:BURSt:SLEVel:STATe
□ [:SOURce[1|2]]:BURSt:SLEVel:STATe?
Description:
Selects/queries stop level during burst oscillation.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Invalid, 1/ON: Valid
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:BURSt:SLEVel:STATe ON
Enables stop level of CH1 during burst oscillation.

■ [:SOURce[1|2]]:BURSt:STATe
□ [:SOURce[1|2]]:BURSt:STATe?
Description:
Switches oscillation mode between continuous oscillation and burst.
Queries whether the oscillation mode is burst or not.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Continuous, 1/ON: Burst
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:BURSt:STATe ON
Switches oscillation mode of CH1 to burst.

■ [:SOURce[1|2]]:BURSt:TGATe:OSTop
□ [:SOURce[1|2]]:BURSt:TGATe:OSTop?
Description:
Selects/queries oscillation stop unit during triggered gate.
Setting parameters:
HALF|CYCLe
HALF → half cycle
CYCLe → 1 cycle
Query parameters:
None
Response waveform:
HALF|CYCL
* For the meaning of the response data, refer to the setting parameters

Setting example:

:SOURce1:BURSt:TGATe:OSTop HALF

Sets CH1 oscillation stop unit during triggered gate to half cycle

■ [:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles

□ [:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles?

Description:

Sets/queries mark wave number during trigger burst

Setting parameters:

<mark>|MINimum|MAXimum

<mark> ::= <REAL>

<REAL> → Mark wave number: 0.5 waves to 999,999.5 waves, resolution: 0.5 waves

MINimum → 0.5 waves

MAXimum → 999,999.5 waves

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:BURSt:TRIGger:NCYCles 10

Sets CH1 mark wave number during trigger burst to 10 waves

■ [:SOURce[1|2]]:BURSt[:TRIGger]:TDELay

□ [:SOURce[1|2]]:BURSt[:TRIGger]:TDELay?

Description:

Sets/queries trigger delay time during trigger burst

Setting parameters:

<delay>|MINimum|MAXimum

<delay> ::= <REAL>[<eunits>][<units>]

<REAL> → Trigger delay time: 0.0 μs to 100 s, resolution: 5 digits or 0.1 μs

<eunits> ::= MA|K|M|U|N

<units> :: S

MINimum → 0.0 μs

MAXimum → 100 s

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:BURSt:TRIGger:TDELay 10 MS

Sets CH1 trigger delay time during trigger burst to 10 ms.

■ [:SOURce[1|2]]:COMBine:FEED
□ [:SOURce[1|2]]:COMBine:FEED?

Description:
Selects/queries external addition

Setting parameters:
OFF|X2|X10
OFF → Prohibit external addition
X2 → Add external input x 2
X10 → Add external input x 10

Query parameters:
None

Response waveform:
OFF|X2|X10

Setting example:
:SOURce1:COMBine:FEED X2
Adds [external input x 2] to CH1 output.

■ [:SOURce[1|2]]:CONTinuous[:IMMediate]

Description:
Setting of oscillation mode to continuous oscillation.

Setting parameters:
None

Setting example:
:SOURce1:CONTinuous:IMMediate
Sets oscillation mode of CH1 to continuous oscillation.

□ [:SOURce[1|2]]:CONTinuous:STATe?

Description:
Queries whether oscillation mode is continuous oscillation or not.

Query parameters:
None

Response waveform:
<NBOL>

■ [:SOURce[1|2]]:FM[:DEViation]
□ [:SOURce[1|2]]:FM[:DEViation]?

Description:
Sets/queries FM peak deviation.

Setting parameters:
<deviation>|MINimum|MAXimum
<deviation> ::= <REAL>[<eunits>][<units>]
<REAL> → Peak deviation: 0.00 μHz to 15 MHz, resolution: 8 digits or 0.01 μHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → Maximum value setting
MAXimum → Minimum value setting

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FM:DEViation 1KHZ
Sets peak deviation of FM of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FM:INTernal:FREQuency
□ [:SOURce[1|2]]:FM:INTernal:FREQuency?
Description:
Sets/queries FM internal modulation frequency.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz,
resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 100 kHz
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FM:INTernal:FREQuency 1kHz
Sets internal modulation frequency of FM of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FM:INTernal:FUNCtion[:SHAPe]
□ [:SOURce[1|2]]:FM:INTernal:FUNCtion[:SHAPe]?
Description:
Selects/queries FM internal modulation waveform.
Setting parameters:
SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER
SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangular wave
PRAMp → Rising ramp wave
NRAMp → Falling ramp wave
NOISe → Noise
USER → Arbitrary waveform
Query parameters:

None

Response waveform:

SIN|SQU|TRI|PRAM|NRAM|NOIS|USER

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid

Sets internal modulation waveform of FM of CH1 to sine wave.

■ [:SOURce[1|2]]:FM:INTernal:FUNCtion:USER

□ [:SOURce[1|2]]:FM:INTernal:FUNCtion:USER?

Description:

Selects/queries FM internal modulation arbitrary waveform

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:SOURce1:FM:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of FM internal modulation waveform of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:FM:SOURce

□ [:SOURce[1|2]]:FM:SOURce?

Description:

Selects/queries FM modulation source.

Setting parameters:

INTernal|EXTernal

INTernal → Internal

EXTernal → External

Query parameters:

None

Response waveform:

INT|EXT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:FM:SOURce INTernal

Sets modulation source of FM of CH1 to internal.

■ [:SOURce[1|2]]:FM:STATe

□ [:SOURce[1|2]]:FM:STATe?

Description:

Switches oscillation mode between continuous oscillation and FM.

Queries whether the oscillation mode is FM or not.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to modulation (FM)

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:SOURce1:FM:STATe ON

Switches oscillation mode of CH1 to modulation (FM).

■ [:SOURce[1|2]]:FREQuency:CENTer

□ [:SOURce[1|2]]:FREQuency:CENTer?

Description:

Sets/queries center value of frequency sweep.

Setting parameters:

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Center value: 0.01 μHz to 30 MHz, resolution: 0.01 μHz

* The setting range differs according to the waveform and the oscillation mode.

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ

MINimum → Minimum value setting

MAXimum → Maximum value setting

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FREQuency:CENTer 1KHZ

Sets the center value of frequency sweep of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FREQuency[:CW|:FIXed]

□ [:SOURce[1|2]]:FREQuency[:CW|:FIXed]?

Description:

Sets/queries oscillator frequency

Setting parameters:

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Frequency: 0.01 μHz to 30 MHz, resolution: 0.01 μHz

* The setting range differs according to the waveform and the oscillation mode.

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ|USER

MINimum → Maximum value setting
MAXimum → Minimum value setting
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FREQuency:CW 1 MHZ
Sets the frequency of CH1 to 1 MHz.
Remark:
* Sequence frequency setting/query is not possible with this command.

■ [:SOURce[1|2]]:FREQuency:MODE
□ [:SOURce[1|2]]:FREQuency:MODE?
Description:
Switches oscillation mode between continuous oscillation and frequency sweep.
Queries whether the oscillation mode is frequency sweep or not.
Setting parameters:
CW|FIXed|SWEep
CW → Continuous oscillation
FIXed → Continuous oscillation
SWEep → Frequency sweep
Query parameters:
None
Response waveform:
CW|FIX|SWE
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:FREQuency:MODE SWEep
Sets oscillation mode of CH1 to frequency sweep.

■ [:SOURce[1|2]]:FREQuency:SPAN
□ [:SOURce[1|2]]:FREQuency:SPAN?
Description:
Sets/queries span value of frequency sweep.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Span value: 0.00000000 Hz to 29999999.99999999 Hz, resolution: 0.01 μHz
* The setting range differs according to the waveform and the oscillation mode.
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → Minimum value setting
MAXimum → Maximum value setting

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FREQuency:SPAN 1KHZ
Sets the span value of frequency sweep of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FREQuency:STARt
□ [:SOURce[1|2]]:FREQuency:STARt?
Description:
Sets/queries start value of frequency sweep.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Start value: 0.01 μHz to 30 MHz, resolution: 0.01 μHz
* The setting range differs according to the waveform and the oscillation mode.
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → Minimum value setting
MAXimum → Maximum value setting
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FREQuency:STARt 1KHZ
Sets the start value of CH1 frequency sweep to 1 kHz.

■ [:SOURce[1|2]]:FREQuency:STATe
Description:
Switches frequency sweep state
Setting parameters:
STARt|STOP
STARt → Switches output to start value
STOP → Switches output to stop value
Setting example:
:SOURce1:FREQuency:STATe STARt
Switches state of CH1 frequency sweep to start value.

■ [:SOURce[1|2]]:FREQuency:STOP
□ [:SOURce[1|2]]:FREQuency:STOP?

Description:
Sets/queries stop value of frequency sweep.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Stop value: 0.01 μHz to 30 MHz, resolution: 0.01 μHz
* The setting range differs according to the waveform and the oscillation mode.
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → Minimum value setting
MAXimum → Maximum value setting
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FREQuency:STOP 1KHZ
Sets the stop value of CH1 frequency sweep to 1 kHz.

■ [:SOURce[1|2]]:FREQuency:SWAP
Description:
Swaps start value and stop value of frequency sweep.
Setting parameters:
None
Setting example:
:SOURce1:FREQuency:SWAP
Swaps start value and stop value of CH1 frequency sweep.

■ [:SOURce[1|2]]:FREQuency:UNIT
□ [:SOURce[1|2]]:FREQuency:UNIT?
Description:
Selects/queries frequency unit.
Setting parameters:
HZ|USER
HZ → Hz
USER → User unit
Query parameters:
None
Response waveform:
HZ|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:FREQuency:UNIT HZ
Sets frequency unit of CH1 to Hz.

■ [:SOURce[1|2]]:FREQuency:USER

□ [:SOURce[1|2]]:FREQuency:USER?

Description:

Sets/queries user unit of frequency.

Setting parameters:

[<name>],[<form>],[<m>],[<n>]

<name> ::= <STR>

<STR> → User unit name (up to 4 characters)

* Omissible (If omitted, will not be changed)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Logarithmic

* Omissible (If omitted, will not be changed)

<m> ::= <REAL>|MINimum|MAXimum

<REAL> → m (scale)

MINimum → Minimum value setting

MAXimum → Maximum value setting

* Omissible (If omitted, will not be changed)

<n> ::= <REAL>|MINimum|MAXimum

<REAL> → n (offset)

MINimum → Minimum value setting

MAXimum → Maximum value setting

* Omissible (If omitted, will not be changed)

Query parameters:

None

Response waveform:

<name>,<form>,<m>,<n>

<name> ::= <STR>

<form> ::= LIN|LOG

<m> ::= <NR3>

<n> ::= <NR2>

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:FREQuency:USER "kHz",LINear,1000,0

Sets the user unit for frequency of CH1 to kHz

■ [:SOURce[1|2]]:FSKey[:FREQuency]

□ [:SOURce[1|2]]:FSKey[:FREQuency]?

Description:

Sets/queries FSK hop frequency

Setting parameters:

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Hop frequency

* The setting range corresponds to the settable frequency range of each carrier waveform.

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ
MINimum → Minimum value setting
MAXimum → Maximum value setting

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:FSKey:FREQuency 1kHz
Sets hop frequency of FSK of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FSKey:INTernal:FREQuency
□ [:SOURce[1|2]]:FSKey:INTernal:FREQuency?

Description:
Sets/queries FSK internal modulation frequency.

Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 1 MHz, resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 1 MHz

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:FSKey:INTernal:FREQuency 1kHz
Sets internal modulation frequency of FSK of CH1 to 1 kHz.

■ [:SOURce[1|2]]:FSKey:SOURce
□ [:SOURce[1|2]]:FSKey:SOURce?

Description:
Selects/queries FSK modulation source

Setting parameters:
INTernal|EXTernal|CH1
INTernal → Internal
EXTernal → External
CH1 → External of CH1 (Only selectable for CH2)

Query parameters:
None

Response waveform:

INT|EXT|CH1

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:FSKey:SOURce INTernal

Sets modulation source of FSK of CH1 to internal.

■ [:SOURce[1|2]]:FSKey:STATe

□ [:SOURce[1|2]]:FSKey:STATe?

Description:

Switches oscillation mode between continuous oscillation and FSK.

Queries whether the oscillation mode is FSK or not.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to modulation (FSK)

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:SOURce1:FSKey:STATe ON

Switches oscillation mode of CH1 to FSK.

■ [:SOURce[1|2]]:FUNCtion:ACSine:ANGLe

□ [:SOURce[1|2]]:FUNCtion:ACSine:ANGLe?

Description:

Sets/queries conduction angle setting for conduction angle controlled sine wave

Setting parameters:

<angle>|MINimum|MAXimum

<angle> ::= <REAL>[<units>]

<REAL> → Conduction angle: -180.0° to 180.0°, resolution: 0.01°

<units> ::= DEG

MINimum → -180.00°

MAXimum → 180.00°

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:ACSine:ANGLe 30DEG

Sets conduction angle of conduction angle controlled sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:BRRamp:SYMMetry

□ [:SOURce[1|2]]:FUNCtion:BRRamp:SYMMetry?

Description:

Sets/queries bottom referenced ramp wave symmetry.

Setting parameters:

<symmetry>|MINimum|MAXimum

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

<REAL> → Symmetry: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:BRRamp:SYMMetry 30PCT

Sets symmetry of bottom referenced ramp wave of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:CFCSine:CFACtor

□ [:SOURce[1|2]]:FUNCtion:CFCSine:CFACtor?

Description:

Sets/queries crest factor of CF controlled sine wave.

Setting parameters:

<cf>|MINimum|MAXimum

<cf> ::= <REAL>

<REAL> → Crest factor: 1.41 to 10.00, resolution: 0.01

MINimum → 1.41

MAXimum → 10.00

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:CFCSine:CFACTor 5.00

Sets crest factor of CF controlled sine wave of CH1 to 5.00.

■ [:SOURce[1|2]]:FUNCtion:COFSine:NCHattering

□ [:SOURce[1|2]]:FUNCtion:COFSine:NCHattering?

Description:

Sets/queries number of chatterings of chattering-off sine wave.

Setting parameters:

<chattering>|MINimum|MAXimum

<chattering> ::= <INT>
<REAL> → Number of chatterings: 0 to 3
MINimum → 0
MAXimum → 3
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR1>
Setting example:
:SOURce1:FUNCtion:COFSine:NCHattering 2
Sets number of chatterings of chattering-off sine wave of CH1 to 2.

■ [:SOURce[1|2]]:FUNCtion:COFSine:OFPHase
□ [:SOURce[1|2]]:FUNCtion:COFSine:OFPHase?
Description:
Sets/queries off-phase of chattering-off sine wave.
Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Off-phase: 0.00° to 360.00°, resolution: 0.01°
<units> ::= DEG
MINimum → 0.00
MAXimum → 360.00
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:COFSine:OFPHase 30DEG
Sets off-phase of chattering-off sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:COFsine:TOFF
□ [:SOURce[1|2]]:FUNCtion:COFsine:TOFF?
Description:
Sets/queries off time of chattering-off sine wave.
Setting parameters:
<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → Off time: 0.00% to 20.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 20.00%

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:COFSine:TOFF 20PCT
Sets off time of chattering-off sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:COFsine:TON
□ [:SOURce[1|2]]:FUNCtion:COFsine:TON?
Description:
Sets/queries on-time of chattering-off sine wave.
Setting parameters:
<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → On-time: 0.00% to 20.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 20.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:COFSine:TON 20PCT
Sets on-time of chattering-off sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:CONSine:NCHattering
□ [:SOURce[1|2]]:FUNCtion:CONSine:NCHattering?
Description:
Sets/queries number of chatterings of chattering-on sine wave.
Setting parameters:
<chattering>|MINimum|MAXimum
<chattering> ::= <INT>
<REAL> → Number of chatterings: 0 to 3
MINimum → 0
MAXimum → 3
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR1>

Setting example:

:SOURce1:FUNCtion:CONSine:NCHattering 2

Sets number of chatterings of chattering-on sine wave of CH1 to 2.

■ [:SOURce[1|2]]:FUNCtion:CONSine:ONPHase

□ [:SOURce[1|2]]:FUNCtion:CONSine:ONPHase?

Description:

Sets/queries on-phase of chattering-on sine wave

Setting parameters:

<phase>|MINimum|MAXimum

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

<REAL> → On-phase: 0.00° to 360.00°, resolution: 0.01°

<units> ::= DEG

MINimum → 0.00°

MAXimum → 360.00°

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:CONSine:OFPHase 30DEG

Sets on-phase of chattering-on sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:CONSine:TOFF

□ [:SOURce[1|2]]:FUNCtion:CONSine:TOFF?

Description:

Sets/queries off time of chattering-on sine wave.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<units>]

<REAL> → Off time: 0.00% to 20.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 20.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:CONSine:TOFF 20PCT

Sets off time of chattering-on sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:CONSine:TON

□ [:SOURce[1|2]]:FUNCtion:CONSine:TON?

Description:

Sets/queries on-time of chattering-on sine wave.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<units>]

<REAL> → On-time: 0.00% to 20.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 20.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:CONSine:TON 20PCT

Sets on-time of chattering-on sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:CSINe:CLIP

□ [:SOURce[1|2]]:FUNCtion:CSINe:CLIP?

Description:

Sets/queries clip rate of clipped sine wave.

Setting parameters:

<clip>|MINImum|MAXimum

<clip> ::= <REAL>[<units>]

<REAL> → Clip rate: 0.00% to 99.99%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 99.99%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:CSINe:CLIP 20PCT

Sets clip rate of clipped sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:DOSCillation:DTConstant

□ [:SOURce[1|2]]:FUNCtion:DOSCillation:DTConstant?

Description:

Sets/queries damping time constant of damped oscillation.

Setting parameters:

<tc>|MINimum|MAXimum
<tc> ::= <REAL>[<units>]
<REAL> → Damping time constant: -100.00% to 100.00%, resolution: 0.01%
<units> → PCT
MINimum → -100.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:DOSCillation:DTConstant 30PCT
Sets damping time constant of damped oscillation of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:DOSCillation:OFRequency
□ [:SOURce[1|2]]:FUNCtion:DOSCillation:OFRequency?
Description:
Sets/queries oscillation frequency of damped oscillation.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>
<REAL> → Oscillation oscillation: 0.01 to 50.00, resolution: 0.01
MINimum → 0.01
MAXimum → 50.00
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:DOSCillation:OFRequency 10
Sets oscillation frequency of damped oscillation of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:EFALl:TCONstant
□ [:SOURce[1|2]]:FUNCtion:EFALl:TCONstant?
Description:
Sets/queries time constant of exponential fall.
Setting parameters:
<tc>|MINimum|MAXimum
<tc> ::= <REAL>[<units>]
<REAL> → Time constant: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:EFALl:TCONstant 20PCT
Sets time constant of exponential fall of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:ERISe:TCONstant
□ [:SOURce[1|2]]:FUNCtion:ERISe:TCONstant?
Description:
Sets/queries time constant of exponential rise.
Setting parameters:
<tc>|MINimum|MAXimum
<tc> ::= <REAL>[<units>]
<REAL> → Time constant: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:ERISe:TCONstant 20
Sets time constant of exponential rise of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa
□ [:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa?
Description:
Sets/queries standard deviation of Gaussian pulse.
Setting parameters:
<sigma>|MINimum|MAXimum
<sigma> ::= <REAL>[<units>]
<REAL> → Standard deviation: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:

<NR3>
Setting example:
:SOURce1:FUNCtion:GAUSsian:SIGMa 20PCT
Sets standard deviation of Gaussian pulse of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:HAVersine:WIDTh
□ [:SOURce[1|2]]:FUNCtion:HAVersine:WIDTh?
Description:
Sets/queries haversine width.
Setting parameters:
<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Width: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:HAVersine:WIDTh 20PCT
Sets haversine width of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle
□ [:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle?
Description:
Sets/queries duty of half-sine edge pulse.
Setting parameters:
<duty>|MINimum|MAXimum
<duty> ::= <REAL>[<units>]
<REAL> → Duty: 0.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:HSEPulse:DCYCle 30PCT
Sets duty of half-sine edge pulse of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:HSEPulse:LE

□ [:SOURce[1|2]]:FUNCtion:HSEPulse:LE?

Description:

Sets/queries leading-edge time of half-sine edge pulse.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<units>]

<REAL> → Leading-edge time: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:HSEPulse:LE 30PCT

Sets leading-edge time of half-sine edge pulse of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:HSEPulse:TE

□ [:SOURce[1|2]]:FUNCtion:HSEPulse:TE?

Description:

Sets/queries trailing-edge time of half-sine edge pulse.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<units>]

<REAL> → Trailing-edge time: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:HSEPulse:TE 30PCT

Sets trailing-edge time of half-sine edge pulse of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:HSPulse:WIDTh

□ [:SOURce[1|2]]:FUNCtion:HSPulse:WIDTh?

Description:

Sets/queries half-sine pulse width.

Setting parameters:

<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Width: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:HSPulse:WIDTh 20PCT
Sets half-sine pulse width of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:LORentz:HWIDth
□ [:SOURce[1|2]]:FUNCtion:LORentz:HWIDth?
Description:
Sets/queries half value of width of Lorentz pulse.
Setting parameters:
<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Half value of width: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:LORentz:HWIDth 20PCT
Sets half value of width of Lorentz pulse of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:MCSine:CYCLes
□ [:SOURce[1|2]]:FUNCtion:MCSine:CYCLes?
Description:
Sets/queries number of cycles of multi-cycle sine wave.
Setting parameters:
<cycles>|MINimum|MAXimum
<cycles> ::= <REAL>
<REAL> → Number of cycles: 0.01 to 50.00, resolution: 0.01
MINimum → 0.01
MAXimum → 50.00

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:MCSine:CYCLes 0.2
Sets the number of cycles of multi-cycle sine wave of CH1 to 0.2.

■ [:SOURce[1|2]]:FUNCtion:MCSine:PHASe
□ [:SOURce[1|2]]:FUNCtion:MCSine:PHASe?
Description:
Sets/queries start phase of multi-cycle sine wave.
Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Start phase: -360.00° to 360.00°, resolution: 0.01°
<units> ::= DEG
MINimum → -360.00°
MAXimum → 360.00°
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:MCSine:PHASe 30DEG
Sets start phase of multi-cycle sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:OFPSine:OFPHase
□ [:SOURce[1|2]]:FUNCtion:OFPSine:OFPHase?
Description:
Sets/queries off-phase of off-phase controlled sine wave.
Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Off-phase: 0.00° to 360.00°, resolution: 0.01°
<units> ::= DEG
MINimum → 0.00°
MAXimum → 360.00°
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:OFPSine:OFPHase 30DEG
Sets off-phase of off-phase controlled sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:OFPSine:STIMe
□ [:SOURce[1|2]]:FUNCtion:OFPSine:STIMe?
Description:
Sets/queries off-slope time of off-phase controlled sine wave.
Setting parameters:
<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → Off-slope time: 0.00% to 50.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 50.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:OFPSine:STIMe 20PCT
Sets off-slope time of off-phase controlled sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:ONPSine:ONPHase
□ [:SOURce[1|2]]:FUNCtion:ONPSine:ONPHase?
Description:
Sets/queries complete-on phase of on-phase controlled sine wave.
Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → On-phase: 0.00° to 360.00°, resolution: 0.01°
<units> ::= DEG
MINimum → 0.00°
MAXimum → 360.00°
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:ONPSine:ONPHase 30DEG

Sets complete-on phase of on-phase controlled sine wave of CH1 to 30°.

■ [:SOURce[1|2]]:FUNCtion:ONPSine:STIMe

□ [:SOURce[1|2]]:FUNCtion:ONPSine:STIMe?

Description:

Sets/queries on-slope time of on-phase controlled sine wave.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<units>]

<REAL> → On-slope time: 0.00% to 50.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 50.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:ONPSine:STIMe 20PCT

Sets on-slope time of on-phase controlled sine wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:OSURge:DTConstant

□ [:SOURce[1|2]]:FUNCtion:OSURge:DTConstant?

Description:

Sets/queries damping time constant of oscillation surge.

Setting parameters:

<tc>|MINimum|MAXimum

<tc> ::= <REAL>[<units>]

<REAL> → Damping time constant: 0.01% to 100.00%, resolution: 0.01%

<units> → PCT

MINimum → 0.01%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:OSURge:DTConstant 30PCT

Sets damping time constant of oscillation surge of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:OSURge:OFRequency

□ [:SOURce[1|2]]:FUNCtion:OSURge:OFRequency?

Description:
Sets/queries oscillation frequency of oscillation surge.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>
<REAL> → Oscillation frequency: 0.01 to 50.00, resolution: 0.01
MINimum → 0.01
MAXimum → 50.00
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:OSURge:OFRequency 10
Sets oscillation frequency of oscillation surge of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:OSURge:TTConstant
□ [:SOURce[1|2]]:FUNCtion:OSURge:TTConstant?
Description:
Sets/queries trailing time constant of oscillation surge.
Setting parameters:
<tc>|MINimum|MAXimum
<tc> ::= <REAL>[<units>]
<REAL> → Trailing time constant: 0.01% to 100.00%, resolution: 0.01%
<units> → PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:OSURge:TTConstant 30PCT
Sets trailing time constant of oscillation surge of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:PSURge:TD
□ [:SOURce[1|2]]:FUNCtion:PSURge:TD?
Description:
Sets/queries duration time of pulse surge.
Setting parameters:
<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → Duration time: 0.01% to 100.00%, resolution: 0.01%

<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:PSURge:TD 30PCT
Sets duration time of pulse surge of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:PSURge:TR
□ [:SOURce[1|2]]:FUNCtion:PSURge:TR?
Description:
Sets/queries rising time of pulse surge.
Setting parameters:
<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → Rising time: 0.01% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:PSURge:TR 30PCT
Sets rising time of pulse surge of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry
□ [:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry?
Description:
Sets/queries symmetry of ramp wave.
Setting parameters:
<symmetry>|MINimum|MAXimum
<symmetry> ::= <REAL>[<units>]
<REAL> → Symmetry: 0.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]

MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:FUNCtion:RAMP:SYMMetry 20PCT
Sets symmetry of ramp wave of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion[:SHAPe]

□ [:SOURce[1|2]]:FUNCtion[:SHAPe]?

Description:
Sets/queries waveform

Setting parameters:
DC|NOISe|SINusoid|SQUare|PULSe|RAMP
|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFALl|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|BRRamp
|USER

DC	→ DC
NOISe	→ Noise
SINusoid	→ Sine wave
SQUare	→ Square wave
PULSe	→ Pulse wave
RAMP	→ Ramp wave
USINe	→ Unbalanced sine wave
CSINe	→ Clipped sine wave
CFCSine	→ CF controlled sine wave
ACSine	→ Conduction angle controlled sine wave
SSINe	→ Staircase sine wave
MCSine	→ Multi-cycle sine wave
ONPSine	→ On-phase controlled sine wave
OFPSine	→ Off-phase controlled sine wave
CONSine	→ Chattering-on sine wave
COFSine	→ Chattering-off sine wave
GAUSsian	→ Gaussian pulse
LORentz	→ Lorentz pulse
HAVersine	→ Haversine
HSPulse	→ Half-sine pulse
TPULse	→ Trapezoid pulse
SINC	→ Sin(x)/x
ERISe	→ Exponential rise
EFALl	→ Exponential fall
SOLStep	→ Second order LPF step response
DOSCillation	→ Damped oscillation

OSURge → Oscillation surge
PSURge → Pulse surge
TOFFset → Trapezoid with offset
HSEPulse → Half-sine edge pulse
BRRamp → Bottom referenced ramp wave
USER → Arbitrary waveform

Query parameters:
None

Response waveform:
DC|NOIS|SIN|SQU|PULS|RAMP
|USIN|CSIN|CFCS|ACS|SSIN|MCS
|ONPS|OFPS|CONS|COFS
|GAUS|LOR|HAV|HSP|TPUL|SINC
|ERIS|EFAL|SOLS|DOSC
|OSUR|PSUR
|TOFF|HSEP|BRR
|USER
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:FUNCtion:SHAPe RAMP
Sets waveform of CH1 to ramp wave.

■ [:SOURce[1|2]]:FUNCtion:SINC:ZCRossing
□ [:SOURce[1|2]]:FUNCtion:SINC:ZCRossing?

Description:
Sets/queries number of zero crossing of Sin(x)/x.

Setting parameters:
<number>|MINimum|MAXimum
<number> ::= <INT>
<INT> → Number of zero crossing: 1 to 50
MINimum → 1
MAXimum → 50

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR1>

Setting example:
:SOURce1:FUNCtion:SINC:ZCRossing 10
Sets number of zero crossings of Sin(x)/x of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:SOLStep:NFRequency
□ [:SOURce[1|2]]:FUNCtion:SOLStep:NFRequency?

Description:
Sets/queries natural frequency of LPF of second order LPF step response.

Setting parameters:

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>
<REAL> → Natural frequency of LPF: 1.00 to 50.00, resolution: 0.01
MINimum → 1.00
MAXimum → 50.00
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:SOLStep:NFRequency 10
Sets natural frequency of LP of second order LPF step response of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:SOLStep:Q
□ [:SOURce[1|2]]:FUNCtion:SOLStep:Q?
Description:
Sets/queries Q of LPF of second order step response.
Setting parameters:
<q>|MINimum|MAXimum
<q> ::= <REAL>
<REAL> → Q of LPF: 0.50 to 50.00, resolution: 0.01
MINimum → 0.50
MAXimum → 50.00
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:SOLStep:Q 10
Sets Q of LP of second order step response of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:SQUare:DCYCle
□ [:SOURce[1|2]]:FUNCtion:SQUare:DCYCle?
Description:
Sets/queries oscillator duty (square wave).
Setting parameters:
<duty>|MINimum|MAXimum
<duty> ::= <REAL>[<units>]
<REAL> → Duty (square wave): (normal range) 0.0100% to 99.9900%,
(extended range) 0.0000% to 100.0000%, resolution: 0.0001%
<units> ::= PCT|USER
MINimum → (normal range)0.0100%, (extended range)0.0000%
MAXimum → (normal range)99.9900%, (extended range)100.0000%

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:SQUare:DCYCle 20PCT
Sets CH1 duty (square wave) to 20%.
Remark:
*1: Extension/no extension is specified with:[:SOURce[1|2]]:FUNCtion:SQUare:EXTend
*2: Sequence duty setting/query is not possible with this command.

■ [:SOURce[1|2]]:FUNCtion:SQUare:EXTend
□ [:SOURce[1|2]]:FUNCtion:SQUare:EXTend?
Description:
Sets/queries square wave extension on/off.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Square wave extension off, 1/ON: Square wave extension on
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:FUNCtion:SQUare:EXTend ON
Sets square wave extension of CH1 to On.

■ [:SOURce[1|2]]:FUNCtion:SSINe:STEPs
□ [:SOURce[1|2]]:FUNCtion:SSINe:STEPs?
Description:
Sets/queries number of steps of staircase sine wave.
Setting parameters:
<steps>|MINimum|MAXimum
<steps> ::= <INT>
<INT> → Number of steps: 2 to 100
MINimum → 2
MAXimum → 100
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR1>
Setting example:
:SOURce1:FUNCtion:SSINe:STEPs 10
Sets number of steps of staircase sine wave of CH1 to 10.

■ [:SOURce[1|2]]:FUNCtion:TOFFset:DELay

□ [:SOURce[1|2]]:FUNCtion:TOFFset:DELay?

Description:

Sets/queries leading delay of trapezoid with offset.

Setting parameters:

<delay>|MINimum|MAXimum

<delay> ::= <REAL>[<units>]

<REAL> → Leading delay: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:TOFFset:DELay 30PCT

Sets leading delay of trapezoid with offset of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:TOFFset:FALL

□ [:SOURce[1|2]]:FUNCtion:TOFFset:FALL?

Description:

Sets/queries falling-slope width of trapezoid with offset.

Setting parameters:

<width>|MINimum|MAXimum

<width> ::= <REAL>[<units>]

<REAL> → Falling-slope width: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:TOFFset:FALL 30PCT

Sets falling-slope width of trapezoid with offset of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:TOFFset:OFFSet

□ [:SOURce[1|2]]:FUNCtion:TOFFset:OFFSet?

Description:

Sets/queries offset of trapezoid with offset.

Setting parameters:

<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<units>]
<REAL> → Offset: 0.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:TOFFset:OFFSet 30PCT
Sets offset of trapezoid with offset of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:TOFFset:RISe
□ [:SOURce[1|2]]:FUNCtion:TOFFset:RISe?
Description:
Sets/queries rising-slope width of trapezoid with offset.
Setting parameters:
<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Rising-slope width: 0.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:TOFFset:RISe 30PCT
Sets rising-slope width of trapezoid with offset of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:TOFFset:UBASe
□ [:SOURce[1|2]]:FUNCtion:TOFFset:UBASe?
Description:
Sets/queries upper base width of trapezoid with offset.
Setting parameters:
<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Upper base width: 0.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:TOFFset:UBASe 30PCT

Sets upper base width of trapezoid with offset of CH1 to 30%.

■ [:SOURce[1|2]]:FUNCtion:TPULse:RFAL1

□ [:SOURce[1|2]]:FUNCtion:TPULse:RFAL1?

Description:

Sets/queries slope width of trapezoid pulse.

Setting parameters:

<width>|MINimum|MAXimum

<width> ::= <REAL>[<units>]

<REAL> → Slope width: 0.00% to 50.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 50.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:TPULse:RFAL1 20PCT

Sets slope width of trapezoid pulse of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:TPULse:UBASe

□ [:SOURce[1|2]]:FUNCtion:TPULse:UBASe?

Description:

Sets/queries upper base width of trapezoid pulse.

Setting parameters:

<width>|MINimum|MAXimum

<width> ::= <REAL>[<units>]

<REAL> → Upper base width: 0.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:TPULse:UBASe 20PCT
Sets upper base width of trapezoid pulse of CH1 to 20%.

■ [:SOURce[1|2]]:FUNCtion:USER
□ [:SOURce[1|2]]:FUNCtion:USER?
Description:
Sets/queries arbitrary waveform.
Setting parameters:
<memory> ::= <INT>
<INT> → Memory number: 0 to 128
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:SOURce1:FUNCtion:USER 3
Sets data of memory number 3 of arbitrary waveform of CH1.
Remark:
* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:FUNCtion:USINe:AMPLitude[1]
□ [:SOURce[1|2]]:FUNCtion:USINe:AMPLitude[1]?
Description:
Sets/queries former amplitude of unbalanced sine wave.
Setting parameters:
<amplitude>|MINImum|MAXimum
<amplitude> ::= <REAL>[<units>]
<REAL> → Former amplitude: -100.00% to 100.00%, resolution: 0.01%
<units> ::= PCT
MINimum → -100.00%
MAXimum → 100.00%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:USINe:AMPLitude1 20PCT
Sets former amplitude of unbalanced sine wave of CH1 to 20%.
Remark:
* Regarding "AMPLitude[1]", use of "AMPLITUDE1", "AMPL1", and "AMPL" is possible (uppercase and lowercase mix possible).

■ [:SOURce[1|2]]:FUNCtion:USINe:AMPlitude2

□ [:SOURce[1|2]]:FUNCtion:USINe:AMPlitude2?

Description:

Sets/queries latter amplitude of unbalanced sine wave.

Setting parameters:

<amplitude>|MINImum|MAXimum

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

<REAL> → Latter amplitude: -100.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → -100.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:FUNCtion:USINe:AMPLitude2 20PCT

Sets latter amplitude of unbalanced sine wave of CH1 to 20%.

Remark:

*: Regarding "AMPLitude[2]", use of "AMPLITUDE2" and "AMPL2" is possible (uppercase and lowercase mix possible).

■ [:SOURce[1|2]]:MARKer:FREQuency

□ [:SOURce[1|2]]:MARKer:FREQuency?

Description:

Sets/queries marker value of frequency sweep.

Setting parameters:

<frequency>|CENTer|MINimum|MAXimum

<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Marker value: 0.01 μHz to 30 MHz, resolution: 0.01 μHz

* The setting range differs according to the waveform and the oscillation mode.

<eunits> ::= M(mega)|K|U|N

<units> ::= HZ

CENTer → Center value of frequency sweep

MINimum → Minimum value setting

MAXimum → Maximum value setting

Query parameters:

[CENTer|MINimum|MAXimum]

CENTer → Frequency sweep center value query

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:MARKer:FREQuency 1KHZ

Sets marker value of frequency sweep of CH1 to 1 kHz.

■ [:SOURce[1|2]]:MARKer:PHASe

□ [:SOURce[1|2]]:MARKer:PHASe?

Description:

Sets/queries marker value of phase sweep.

Setting parameters:

<phase>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value: -1800.000° to 1800.000°, resolution: 0.001°

<units> ::= DEG

CENTer → Center value of phase sweep

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameters:

[CNETer|MINimum|MAXimum]

CENTer → Phase sweep center value query

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:MARKer:PHASe 90DEG

Sets marker value of phase sweep of CH1 to 90°.

■ [:SOURce[1|2]]:MARKer:PULSe:DCYCle

□ [:SOURce[1|2]]:MARKer:PULSe:DCYCle?

Description:

Sets/queries marker value of duty sweep.

Setting parameters:

<duty>|CENTer|MINimum|MAXimum

<duty> ::= <REAL>[<units>]

(Square wave (normal variable duty range)) marker value: 0.0100% to 99.9900%, resolution: 0.0001%

(Square wave (extended variable duty range)) marker value: 0.0000% to 100.0000%, resolution: 0.0001%

(Pulse wave) marker value: 0.0170% to 99.9830%, resolution: 0.0001%

CENTer → Center value of duty sweep

MINimum →

(Square wave (normal variable duty range)) 0.0100%

(Square wave (extended variable duty range)) 0.0000%

(Pulse wave) 0.0170%

MAXimum →

(Square wave (normal variable duty range)) 99.9900%

(Square wave (extended variable duty range)) 100.0000%

(Pulse wave) 99.9830%

Query parameters:

[CENTer|MINimum|MAXimum]
CENTer → Duty sweep center value query
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:MARKer:PULSe:DCYCle 20PCT
Sets marker value of duty sweep of CH1 to 20%.

■ [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]
□ [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
Description:
Sets/queries marker value of amplitude sweep.
Setting parameters:
<amplitude>|CENTer|MINimum|MAXimum
<amplitude> ::= <REAL>[<eunits>][<units>]
<REAL> → Marker value: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω, resolution: (999.9 mVp-p or lower) 4 digits or 0.1 mVp-p, (1 Vp-p or higher) 5 digits or 1 mVp-p
<eunits> ::= M
<units> ::= VPP|VPK|VRMS|DBV|DBM
CENTer → Center value of amplitude sweep
MINimum → 0 Vp-p
MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω
Query parameters:
[CENTer|MINimum|MAXimum]
CENTer → Amplitude sweep center value query
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:MARKer:VOLTage:LEVel:IMMediate:AMPLitude 5VPP
Sets marker value of amplitude sweep of CH1 to 5 Vp-p.

■ [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet
□ [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet?
Description:
Sets/queries marker value of DC offset.
Setting parameters:
<offset>|CENTer|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → Marker value: ±10 Vp-p/open, ±5 Vp-p/50 Ω, resolution: (±499.0 mV or lower) 4 digits or 0.1 mV, (±0.5 V or higher) 5 digits or 1 mV
<eunits> ::= M
<units> ::= V

CENTer → Center value of DC offset sweep
MINimum → -10 V/open, -5 V/50 Ω
MAXimum → 10 V/open, 5 V/50 Ω

Query parameters:
[CENTer|MINimum|MAXimum]
CENTer → Amplitude sweep center value query
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:MARKer:VOLTage:LEVel:IMMediate:OFFSet 2.5 V
Sets marker value of DC offset of CH1 to 2.5 V.

■ [:SOURce[1|2]]:OFSM[:DEViation]
□ [:SOURce[1|2]]:OFSM[:DEViation]?

Description:
Sets/queries peak deviation of DC offset modulation.

Setting parameters:
<deviation>|MINimum|MAXimum
<deviation> ::= <REAL>[<eunits>][<units>]
<REAL> → Peak deviation: 0 V to 10 V/open, resolution: (499.9 mV or lower) 4 digits or 0.1 mV, (0.5 V or higher) 5 digits or 1 mV
<eunits> ::= M
<units> ::= V
MINimum → 0 V/open
MAXimum → 10 V/open

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:OFSM:DEViation 3V
Sets peak deviation of DC offset modulation of CH1 to 3 V.

■ [:SOURce[1|2]]:OFSM:INTernal:FREQuency
□ [:SOURce[1|2]]:OFSM:INTernal:FREQuency?

Description:
Sets/queries internal modulation frequency of DC offset modulation.

Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz, resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N

<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 100 kHz
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:OFSM:INTernal:FREQuency 1kHz
Sets internal modulation frequency of DC offset modulation of CH1 to 1 kHz.

■ [:SOURce[1|2]]:OFSM:INTernal:FUNCtion[:SHAPe]
□ [:SOURce[1|2]]:OFSM:INTernal:FUNCtion[:SHAPe]?
Description:
Sets/queries internal modulation waveform of DC offset modulation.
Setting parameters:
SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER
SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangular wave
PRAMp → Rising ramp wave
NRAMp → Falling ramp wave
NOISe → Noise
USER → Arbitrary wave
Response waveform:
SIN|SQU|TRI|PRAM|NRAM|NOIS|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid
Sets internal modulation waveform of DC offset modulation of CH1 to sine wave.

■ [:SOURce[1|2]]:OFSM:INTernal:FUNCtion:USER
□ [:SOURce[1|2]]:OFSM:INTernal:FUNCtion:USER?
Description:
Selects/queries arbitrary waveform of internal modulation waveform of DC offset modulation
Setting parameters:
<memory> ::= <INT>
<INT> → Memory number: 0 to 128
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:SOURce1:OFSM:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of internal modulation waveform of DC offset modulation of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:OFSM:SOURce

□ [:SOURce[1|2]]:OFSM:SOURce?

Description:

Sets/queries modulation source of DC offset modulation.

Setting parameters:

INTernal|EXTernal

INTernal → Internal

EXTernal → External

Query parameters:

None

Response waveform:

INT|EXT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:OFSM:SOURce INTernal

Sets modulation source of DC offset modulation of CH1 to internal.

■ [:SOURce[1|2]]:OFSM:STATe

□ [:SOURce[1|2]]:OFSM:STATe?

Description:

Switches oscillation mode between continuous oscillation and DC offset modulation.

Queries whether the oscillation mode is DC offset or not.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to DC offset modulation

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:SOURce1:OFSM:STATe ON

Switches oscillation mode of CH1 to DC offset.

■ [:SOURce[1|2]]:PHASe[:ADJust]

□ [:SOURce[1|2]]:PHASe[:ADJust]?

Description:

Sets/queries oscillator phase.

Setting parameters:

<phase>|MINimum|MAXimum

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

<REAL> → Phase: -1800.000° to 1800.000°, resolution: 0.001°

<units> ::= DEG|USER
MINimum → -1800.000°
MAXimum → 1800.000°

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:PHASe:ADJust 90DEG
Sets center value of phase sweep of CH1 to 90°.

Remark:
* Sequence phase setting/query is not possible with this command.

■ [:SOURce[1|2]]:PHASe:CENTer
□ [:SOURce[1|2]]:PHASe:CENTer?

Description:
Sets/queries center value of phase sweep.

Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Center value: -1800.000° to 1800.000°, resolution: 0.001°
<units> ::= DEG
MINimum → -1800.000°
MAXimum → 1800.000°

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:PHASe:CENTer 90DEG
Sets center value of phase sweep of CH1 to 90°.

■ [:SOURce[1|2]]:PHASe:INITiate

Description:
Executes phase synchronization.

Setting parameters:
None

■ [:SOURce[1|2]]:PHASe:MODE
□ [:SOURce[1|2]]:PHASe:MODE?

Description:
Switches oscillation mode between continuous and phase sweep.

Queries whether the oscillation mode is phase sweep or not.

Setting parameters:

FIXed|SWEep

FIXed → Continuous oscillation

SWEep → Phase sweep

Query parameters:

None

Response waveform:

FIX|SWE

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PHASe:MODE SWEep

Sets oscillation mode of CH1 to phase sweep.

■ [:SOURce[1|2]]:PHASe:SPAN

□ [:SOURce[1|2]]:PHASe:SPAN?

Description:

Sets/queries span value of phase sweep.

Setting parameters:

<phase>|MINimum|MAXimum

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

<REAL> → Span value: 0.000° to 3600.000°, resolution: 0.001°

<units> ::= DEG

MINimum → 0.000°

MAXimum → 3600.000°

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PHASe:SPAN 90DEG

Sets span value of phase sweep of CH1 to 90°.

■ [:SOURce[1|2]]:PHASe:STARt

□ [:SOURce[1|2]]:PHASe:STARt?

Description:

Sets/queries start value of phase sweep.

Setting parameters:

<phase>|MINimum|MAXimum

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

<REAL> → Start value: -1800.000° to 1800.000°, resolution: 0.001°

<units> ::= DEG

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:PHASe:STARt 90DEG
Sets start value of phase sweep of CH1 to 90.

■ [:SOURce[1|2]]:PHASe:STATe
Description:
Switches phase sweep state.
Setting parameters:
STARt|STOP
STARt → Switches output to start value
STOP → Switches output to stop value
Setting example:
:SOURce1:PHASe:STATe STARt
Switches state of phase sweep of CH1 to start value.

■ [:SOURce[1|2]]:PHASe:STOP
□ [:SOURce[1|2]]:PHASe:STOP?
Description:
Sets/queries stop value of phase sweep.
Setting parameters:
<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Stop value: -1800.000° to 1800.000°, resolution: 0.001°
<units> ::= DEG
MINimum → -1800.000°
MAXimum → 1800.000°
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:PHASe:STOP 90DEG
Sets stop value of phase sweep of CH1 to 90°.

■ [:SOURce[1|2]]:PHASe:SWAP
Description:
Swaps start value and stop value of phase sweep.
Setting parameters:

None

■ [:SOURce[1|2]]:PHASe:UNIT

□ [:SOURce[1|2]]:PHASe:UNIT?

Description:

Selects/queries phase unit

Setting parameters:

DEG|USER

DEG → °

USER → User unit

Query parameters:

None

Response waveform:

DEG|USER

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PHASe:UNIT V

Sets DC offset of CH1 to V

■ [:SOURce[1|2]]:PHASe:USER

□ [:SOURce[1|2]]:PHASe:USER?

Description:

Sets/queries user unit of phase.

Setting parameters:

[<name>],[<form>],[<m>],[<n>]

<name> ::= <STR>

<STR> → User unit name (up to 4 characters)

* Omissible (If omitted, will not be changed)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Logarithmic

* Omissible (If omitted, will not be changed)

<m> ::= <REAL>|MINimum|MAXimum

<REAL> → m (scale)

MINimum → Minimum value setting

MAXimum → Maximum value setting

* Omissible (If omitted, will not be changed)

<n> ::= <REAL>|MINimum|MAXimum

<REAL> → n (offset)

MINimum → Minimum value setting

MAXimum → Maximum value setting

* Omissible (If omitted, will not be changed)

Query parameters:

None

Response waveform:

<name>,<form>,<m>,<n>

<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR2>
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:PHASe:USER "rad",LINear,57.32,0
Sets "rad" as user unit for phase of CH1

■ [:SOURce[1|2]]:PM[:DEViation]
□ [:SOURce[1|2]]:PM[:DEViation]?

Description:
Sets/queries PM peak deviation

Setting parameters:
<deviation>|MINimum|MAXimum
<deviation> ::= <REAL>[<units>]
<REAL> → Peak deviation: 0.000° to 180.000°, resolution: 0.001°
<units> ::= DEG
MINimum → 0.000°
MAXimum → 180.000°

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:PM:DEViation 30DEG
Sets PM peak deviation of CH1 to 30°.

■ [:SOURce[1|2]]:PM:INTernal:FREQuency
□ [:SOURce[1|2]]:PM:INTernal:FREQuency?

Description:
Sets/queries internal modulation frequency of PM

Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz, resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 100 kHz

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PM:INTernal:FREQuency 1kHz

Sets internal modulation frequency of PM of CH1 to 1 kHz

■ [:SOURce[1|2]]:PM:INTernal:FUNCtion[:SHAPe]

□ [:SOURce[1|2]]:PM:INTernal:FUNCtion[:SHAPe]?

Description:

Selects/queries internal modulation waveform of PM

Setting parameters:

SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER

SINusoid → Sine wave

SQUare → Square wave

TRIangle → Triangular wave

PRAMp → Rising ramp wave

NRAMp → Falling ramp wave

NOISe → Noise

USER → Arbitrary wave

Query parameters:

None

Response waveform:

SIN|SQU|TRI|PRAM|NRAM|NOIS|USER

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PM:INTernal:FUNCtion:SHAPe SINusoid

Sets internal modulation waveform of PM of CH1 to sine wave.

■ [:SOURce[1|2]]:PM:INTernal:FUNCtion:USER

□ [:SOURce[1|2]]:PM:INTernal:FUNCtion:USER?

Description:

Selects/queries PM internal modulation arbitrary waveform

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:SOURce1:PM:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of PM internal modulation waveform of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:PM:SOURce
□ [:SOURce[1|2]]:PM:SOURce?

Description:
Selects/queries PM modulation source.

Setting parameters:
INTernal|EXTernal
INTernal → Internal
EXTernal → External

Query parameters:
None

Response waveform:
INT|EXT
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:PM:SOURce INTernal
Sets PM modulation source of CH1 to internal.

■ [:SOURce[1|2]]:PM:STATe
□ [:SOURce[1|2]]:PM:STATe?

Description:
Switches oscillation mode between continuous oscillation and PM.
Queries whether the oscillation mode is PM or not.

Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to PM

Query parameters:
None

Response waveform:
<NBOL>

Setting example:
:SOURce1:PM:STATe ON
Switches oscillation mode of CH1 to PM.

■ [:SOURce[1|2]]:PSKey[:DEViation]
□ [:SOURce[1|2]]:PSKey[:DEViation]?

Description:
Sets/queries PSK deviation.

Setting parameters:
<deviation>|MINimun|MAXimum
<deviation> ::= <REAL>[<units>]
<REAL> → Deviation: -1800.000° to 1800.000°, resolution: 0.001°
<units> ::= DEG
MINimum → -1800.000°
MAXimum → 1800.000°

Query parameters:

[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:PSKey:DEViation 30DEG
Sets PSK deviation of CH1 to 30°.

■ [:SOURce[1|2]]:PSKey:INTernal:FREQuency
□ [:SOURce[1|2]]:PSKey:INTernal:FREQuency?
Description:
Sets/queries internal modulation frequency of PSK.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 1 MHz, resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 1 MHz
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:PSKey:INTernal:FREQuency 1kHz
Sets internal modulation frequency of PSK of CH1 to 1 kHz.

■ [:SOURce[1|2]]:PSKey:SOURce
□ [:SOURce[1|2]]:PSKey:SOURce?
Description:
Selects/queries PSK modulation source.
Setting parameters:
INTernal|EXTernal|CH1
INTernal → Internal
EXTernal → External
CH1 → External of CH1 (Only selectable for CH2)
Query parameters:
None
Response waveform:
INT|EXT|CH1
* For the meaning of the response data, refer to the setting parameters.
Setting example:

:SOURce1:PSKey:SOURce INTernal
Sets PSK modulation source of CH1.

■ [:SOURce[1|2]]:PSKey:STATe
□ [:SOURce[1|2]]:PSKey:STATe?
Description:
Switches oscillation mode between continuous oscillation and PSK
Queries whether the oscillation mode is PSK or not
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation
1/ON: Switches oscillation mode to PSK
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:FSKey:STATe ON
Switches oscillation mode of CH1 to PSK.

■ [:SOURce[1|2]]:PULSe:DCYCle
□ [:SOURce[1|2]]:PULSe:DCYCle?
Description:
Sets/queries duty (pulse wave)
Setting parameters:
<duty>|MINimum|MAXimum
<duty> ::= <REAL>[<units>]
<REAL> → Duty (pulse wave): 0.0170% to 99.9830%, resolution: 0.0001
<units> ::= PCT|USER
MINimum → 0.0170%
MAXimum → 99.9830%
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:FUNCtion:PULSe:DCYCle 20PCT
Sets duty (pulse wave) of CH1 to 20%.

■ [:SOURce[1|2]]:PULSe:DCYCle:CENTer
□ [:SOURce[1|2]]:PULSe:DCYCle:CENTer?
Description:
Sets/queries center value of duty sweep.
Setting parameters:
<duty>|MINimum|MAXimum

<duty> ::= <REAL>[<units>]
<REAL> →
(Square wave (normal variable duty range)) center value: 0.0100% to 99.9900%, resolution: 0.0001%
(Square wave (extended variable duty range)) center value: 0.0000% to 100.0000%, resolution: 0.0001%
(Pulse wave) center value: 0.0170% to 99.9830%, resolution: 0.0001%
<units> ::= PCT
MINimum →
(Square wave (normal variable duty range)) 0.0100%
(Square wave (extended variable duty range)) 0.0000%
(Pulse wave) 0.0170%
MAXimum →
(Square wave (normal variable duty range)) 99.9900%
(Square wave (extended variable duty range)) 100.0000%
(Pulse wave) 99.9830%

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:PULSe:DCYCle:CENTer 20PCT
Sets center value of duty sweep of CH1 to 20%.

■ [:SOURce[1|2]]:PULSe:DCYCle:MODE
□ [:SOURce[1|2]]:PULSe:DCYCle:MODE?

Description:
Switches oscillation mode between continuous and duty sweep.
Queries whether the oscillation mode is duty sweep or not.

Setting parameters:
FIXed|SWEep
FIXed → Continuous oscillation
SWEep → Duty sweep

Query parameters:
None

Response waveform:
FIX|SWE
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:PULSe:DCYCle:MODE SWEep
Sets oscillation mode of CH1 to duty sweep.

■ [:SOURce[1|2]]:PULSe:DCYCle:SPAN
□ [:SOURce[1|2]]:PULSe:DCYCle:SPAN?

Description:

Sets/queries span value of duty sweep.

Setting parameters:

<duty>|MINimum|MAXimum

<duty> ::= <REAL>[<units>]

<REAL> →

(Square wave (normal variable duty range)) span value: 0.0000% to 98.9800%, resolution: 0.0001%

(Square wave (extended variable duty range)) span value: 0.0000% to 100.0000%, resolution: 0.0001%

(Pulse wave) span value: 0.0000% to 99.9660%, resolution: 0.0001%

<units> ::= PCT

MINimum → 0.0000%

MAXimum →

(Square wave (normal variable duty range)) 98.9800%

(Square wave (extended variable duty range)) 100.0000%

(Pulse wave) 99.9660%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:DCYCle:SPAN 20PCT

Sets span value of duty sweep of CH1 to 20%.

■ [:SOURce[1|2]]:PULSe:DCYCle:STARt

□ [:SOURce[1|2]]:PULSe:DCYCle:STARt?

Description:

Sets/queries start value of duty sweep.

Setting parameters:

<duty>|MINimum|MAXimum

<duty> ::= <REAL>[<units>]

<REAL> →

(Square wave (normal variable duty range)) start value: 0.0100% to 99.9900%, resolution: 0.0001%

(Square wave (extended variable duty range)) start value: 0.0000% to 100.0000%, resolution: 0.0001%

(Pulse wave) start value: 0.0170% to 99.9830%, resolution: 0.0001%

<units> ::= PCT

MINimum →

(Square wave (normal variable duty range)) 0.0100%

(Square wave (extended variable duty range)) 0.0000%

(Pulse wave) 0.0170%

MAXimum →

(Square wave (normal variable duty range)) 99.9900%

(Square wave (extended variable duty range)) 100.0000%

(Pulse wave) 99.9830%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:DCYCle:STARt 20PCT

Sets start value of duty sweep of CH1 to 20%.

■ [:SOURce[1|2]]:PULSe:DCYCle:STATe

Description:

Switches duty sweep state.

Setting parameters:

STARt|STOP

STARt → Switches output to start value

STOP → Switches output to stop value

Setting example:

:SOURce1:PULSe:DCYCle:STATe STARt

Switches state of duty sweep of CH1 to start value.

■ [:SOURce[1|2]]:PULSe:DCYCle:STOP

□ [:SOURce[1|2]]:PULSe:DCYCle:STOP?

Description:

Sets/queries stop value of duty sweep.

Setting parameters:

<duty>|MINimum|MAXimum

<duty> ::= <REAL>[<units>]

<REAL> →

(Square wave (normal variable duty range)) stop value: 0.0100% to 99.9900%, resolution: 0.0001%

(Square wave (extended variable duty range)) stop value: 0.0000% to 100.0000%, resolution: 0.0001%

(Pulse wave) stop value: 0.0170% to 99.9830%, resolution: 0.0001%

<units> ::= PCT

MINimum →

(Square wave (normal variable duty range)) 0.0100%

(Square wave (extended variable duty range)) 0.0000%

(Pulse wave) 0.0170%

MAXimum →

(Square wave (normal variable duty range)) 99.9900%

(Square wave (extended variable duty range)) 100.0000%

(Pulse wave) 99.9830%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:DCYCle:STOP 20PCT

Sets stop value of duty sweep of CH1 to 20%.

■ [:SOURce[1|2]]:PULSe:DCYCle:SWAP

Description:

Swaps start value and stop value of duty sweep.

Setting parameters:

None

■ [:SOURce[1|2]]:PULSe:DCYCle:UNIT

□ [:SOURce[1|2]]:PULSe:DCYCle:UNIT?

Description:

Selects/queries phase unit.

Setting parameters:

PCT|USER

PCT → %

USER → User unit

Query parameters:

None

Response waveform:

PCT|USER

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PULSe:DCYCle:UNIT PCT

Sets duty of CH1 to PCT.

■ [:SOURce[1|2]]:PULSe:DCYCle:USER

□ [:SOURce[1|2]]:PULSe:DCYCle:USER?

Description:

Sets/queries user unit of duty.

Setting parameters:

[<name>],[<form>],[<m>],[<n>]

<name> ::= <STR>

<STR> → User unit name (up to 4 characters)

* Omissible (If omitted, will not be changed)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Logarithmic

* Omissible (If omitted, will not be changed)

<m> ::= <REAL>|MINimum|MAXimum

<REAL> → m (scale)

MINimum → Minimum value setting

MAXimum → Maximum value setting

* Omissible (If omitted, will not be changed)

<n> ::= <REAL>|MINimum|MAXimum

<REAL> → n (offset)

MINimum → Minimum value setting

MAXimum → Maximum value setting

※* Omissible (If omitted, will not be changed)

Query parameters:

None

Response waveform:

<name>,<form>,<m>,<n>

<name> ::= <STR>

<form> ::= LIN|LOG

<m> ::= <NR3>

<n> ::= <NR2>

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PHASe:USER "INTN",LINear,100,0

Sets "INTN" as user unit of duty of CH1.

■ [:SOURce[1|2]]:PULSe:PERiod

□ [:SOURce[1|2]]:PULSe:PERiod?

Description:

Sets/queries period.

Setting parameters:

<period>|MINimum|MAXimum

<period> ::= <REAL>[<eunits>][<units>]

<REAL> → Period: 33.33 ns to 100 Ms

* The setting range differs according to the waveform and the oscillation mode.

<eunits> ::= MA|K|M|U|N

<units> ::= S|USER

MINimum → Minimum value setting

MAXimum → Maximum value setting

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:PERiod 1US

Sets period of CH1 to 1 μs.

■ [:SOURce[1|2]]:PULSe:PERiod:UNIT

□ [:SOURce[1|2]]:PULSe:PERiod:UNIT?

Description:

Sets/queries period unit

Setting parameters:
S|USER
S → s
USER → User unit
Query parameters:
None
Response waveform:
S|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:PULSe:PERiod:UNIT S
Sets period unit of CH1 to s.

■ [:SOURce[1|2]]:PULSe:PERiod:USER
□ [:SOURce[1|2]]:PULSe:PERiod:USER?
Description:
Sets/queries user unit of period
Setting parameters:
[<name>],[<form>],[<m>],[<n>]
<name> ::= <STR>
<STR> → User unit name (up to 4 characters)
* Omissible (If omitted, will not be changed)
<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Logarithmic
* Omissible (If omitted, will not be changed)
<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Minimum value setting
MAXimum → Maximum value setting
* Omissible (If omitted, will not be changed)
<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Minimum value setting
MAXimum → Maximum value setting
* Omissible (If omitted, will not be changed)
Query parameters:
None
Response waveform:
<name>,<form>,<m>,<n>
<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR2>
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:PULSe:PERiod:USER "ms",LINear,0.001,0

Sets "ms" as the user unit for period of CH1.

■ [:SOURce[1|2]]:PULSe:TRANsition[:LEADing]

□ [:SOURce[1|2]]:PULSe:TRANsition[:LEADing]?

Description:

Sets/queries leading-edge time of pulse wave.

Setting parameters:

<seconds>|MINimum|MAXimum

<seconds> ::= <REAL>[<eunits>][<units>]

<REAL> → Leading-edge time: 15.0 ns to 58.8 Ms, resolution: 3 digits or 0.1 ns

<eunits> ::= MA|K|M|U|N

<units> ::= S

MINimum → 15.0 ns

MAXimum → 58.8 Ms

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:TRANsition:LEADing 1ms

Sets leading-edge time of pulse wave of CH1 to 1 ms.

■ [:SOURce[1|2]]:PULSe:TRANsition:TRAiling

□ [:SOURce[1|2]]:PULSe:TRANsition:TRAiling?

Description:

Sets/queries trailing-edge time of pulse wave

Setting parameters:

<seconds>|MINimum|MAXimum

<seconds> ::= <REAL>[<eunits>][<units>]

<REAL> → Trailing-edge time: 15.0 ns to 58.8 Ms, resolution: 3 digits or 0.1 ns

<eunits> ::= MA|K|M|U|N

<units> ::= S

MINimum → 15.0 ns

MAXimum → 58.8 Ms

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:TRANsition:TRAiling 1ms

Sets trailing-edge time of pulse wave of CH1 to 1 ms.

■ [:SOURce[1|2]]:PULSe:WIDTh

□ [:SOURce[1|2]]:PULSe:WIDTh?

Description:

Sets/queries pulse width

Setting parameters:

<width>|MINimum|MAXimum

<width> ::= <REAL>[<eunits>][<units>]

<REAL> → Pulse width: 25.50 ns to 99.9830 Ms, resolution: 0.001% of frequency or 0.01 ns

<eunits> ::= MA|K|M|U|N

<units> ::= S

MINimum → Minimum value setting

MAXimum → Maximum value setting

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:PULSe:WIDTh 1ms

Sets pulse width of CH1 to 1 ms.

■ [:SOURce[1|2]]:PWM[:DEViation]:DCYCle

□ [:SOURce[1|2]]:PWM[:DEViation]:DCYCle?

Description:

Sets/queries PWM peak deviation

Setting parameters:

<deviation>|MINimum|MAXimum

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

<REAL> →

(Square wave (normal variable duty range)) peak deviation: 0.0000% to 49.9900%, resolution: 0.0001%

(Square wave (extended variable duty range)) peak deviation: 0.0000% to 50.0000%, resolution: 0.0001%

(Pulse wave) peak deviation: 0.0000% to 49.9000%, resolution: 0.0001%

<units> ::= PCT

MINimum → 0.0000%

MAXimum →

(Square wave (normal variable duty range)) 49.9900%

(Square wave (extended variable duty range)) 50.0000%

(Pulse wave) 49.9000%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>
Setting example:
:SOURce1:PWM:DEViation:DCYCle 30PCT
Sets PWM peak deviation of CH1 to 30%.

■ [:SOURce[1|2]]:PWM:INTernal:FREQuency
□ [:SOURce[1|2]]:PWM:INTernal:FREQuency?
Description:
Sets/queries internal modulation frequency of PWM.
Setting parameters:
<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Internal modulation frequency: 0.1 mHz to 100 kHz, resolution: 5 digits or 0.1 mHz
<eunits> ::= M(mega)|K|U|N
<units> ::= HZ
MINimum → 0.1 mHz
MAXimum → 100 kHz
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:PWM:INTernal:FREQuency 1kHz
Sets internal modulation frequency of PWM of CH1 to 1 kHz.

■ [:SOURce[1|2]]:PWM:INTernal:FUNCtion[:SHAPe]
□ [:SOURce[1|2]]:PWM:INTernal:FUNCtion[:SHAPe]?
Description:
Selects/queries internal modulation waveform of PWM.
Setting parameters:
SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe|USER
SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangular wave
PRAMp → Rising ramp wave
NRAMp → Falling ramp wave
NOISe → Noise
USER → Arbitrary wave
Query parameters:
None
Response waveform:
SIN|SQU|TRI|PRAM|NRAM|NOIS|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:

:SOURce1:PWM:INTernal:FUNCtion:SHAPe SINusoid

Sets internal modulation frequency of PWM of CH1 to sine wave.

■ [:SOURce[1|2]]:PWM:INTernal:FUNCtion:USER

□ [:SOURce[1|2]]:PWM:INTernal:FUNCtion:USER?

Description:

Selects/queries arbitrary waveform of PWM internal modulation

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number:0 to 128

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:SOURce1:PWM:INTernal:FUNCtion:USER 3

Sets data of memory number 3 to arbitrary waveform of PWM internal modulation waveform of CH1

Remark:

* Memory number 0 is edit memory.

■ [:SOURce[1|2]]:PWM:SOURce

□ [:SOURce[1|2]]:PWM:SOURce?

Description:

Selects/queries PWM modulation source.

Setting parameters:

INTernal|EXTernal

INTernal → Internal

EXTernal → External

Query parameters:

None

Response waveform:

INT|EXT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:PWM:SOURce INTernal

Sets modulation source of PWM of CH1 to internal.

■ [:SOURce[1|2]]:PWM:STATe

□ [:SOURce[1|2]]:PWM:STATe?

Description:

Switches oscillation mode between continuous oscillation and PWM.

Queries whether the oscillation mode is PWM or not.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Switches oscillation mode to continuous oscillation

1/ON: Switches oscillation mode to PWM

Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:PWM:STATe ON
Switches oscillation mode of CH1 to PWM.

■ [:SOURce[1|2]]:ROSCillator:SOURce
□ [:SOURce[1|2]]:ROSCillator:SOURce?
Description:
Sets/queries reference frequency source.
Setting parameters:
INTernal|EXTernal
INTernal → Internal clock
EXTernal → External reference frequency input
Query parameters:
None
Response waveform:
INT|EXT
Setting example:
:SOURce:ROSCillator:SOURce INTernal
Sets reference frequency source to internal clock.
Remark:
* Whether "[1|2]" exists has no influence on the operation.

□ [:SOURce[1|2]]:SEQuence:CSTep?
Description:
Queries current step of sequence.
Response waveform:
<NR1>
Remark:
* Whether "[1|2]" exists has no influence on the operation.

■ [:SOURce[1|2]]:SEQuence:STATe
□ [:SOURce[1|2]]:SEQuence:STATe?
Description:
Switches oscillation mode between continuous and sequence.
Queries whether the oscillation mode is sequence or not.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Continuous, 1/ON: Sequence
Query parameters:
None
Response waveform:
<NBOL>
Setting example:

:SOURce1:SEQuence:STATe ON
Sets oscillation mode of CH1 to sequence.
Remark:
* Whether "[1|2]" exists has no influence on the operation.

■ [:SOURce[1|2]]:SWEep:INTernal:FUNCtion
□ [:SOURce[1|2]]:SWEep:INTernal:FUNCtion?
Description:
Selects/queries sweep direction.
Setting parameters:
RAMP|TRIangle
RAMP → One-way
TRIangle → Shuttle
Query parameters:
None
Response waveform:
RAMP|TRI
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:SWEep:INTernal:FUNCtion RAMP
Sets sweep direction of CH1 to one-way.

■ [:SOURce[1|2]]:SWEep:MCONnector:STATe
□ [:SOURce[1|2]]:SWEep:MCONnector:STATe?
Description:
Selects/queries multiconnector control enable/disable.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Disable 1/ON: Enable
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:SWEep:MCONnector:STATe ON
Enables multiconnector control of CH1.

■ [:SOURce[1|2]]:SWEep:MODE
□ [:SOURce[1|2]]:SWEep:MODE?
Description:
Selects/queries sweep mode.
Setting parameters:
SINGle|CONTinuous|GATed
SINGle → Single-shot
CONTinuous → Continuous
GATed → Gated single-shot
Query parameters:

None

Response waveform:

SING|CONT|GAT

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:SWEep:MODE SINGle

Sets sweep mode of CH1 to single-shot.

■ [:SOURce[1|2]]:SWEep:OSTop

□ [:SOURce[1|2]]:SWEep:OSTop?

Description:

Selects/queries oscillation stop unit during sweep oscillation

Setting parameters:

HALF|CYCLe

HALF → half cycle

CYCLe → 1 cycle

Query parameters:

None

Response waveform:

HALF|CYCL

* For the meaning of the response data, refer to the setting parameters

Setting example:

:SOURce1:SWEep:OSTop HALF

Sets CH1 oscillation stop unit during sweep oscillation to half cycle

■ [:SOURce[1|2]]:SWEep:SLEVel

□ [:SOURce[1|2]]:SWEep:SLEVel?

Description:

Sets/queries stop level value when oscillation is stopped during gated single-shot sweep.

Setting parameters:

<level>|MAXimum|MINimum

<level> ::= <REAL>[<units>]

<REAL> → Stop level value: -100.00% to 100.00%, resolution: 0.01%

<units> ::= PCT

MINimum → -100.00%

MAXimum → 100.00%

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:SWEep:SLEVel 20PCT

Sets to 20% CH1's stop level value when oscillation is stopped during gated single sweep.

■ [:SOURce[1|2]]:SWEep:SLEVel:STATe

□ [:SOURce[1|2]]:SWEep:SLEVel:STATe?

Description:

Sets/queries stop level when oscillation is stopped during single-shot sweep or gated single-shot sweep.

Setting parameters:

<state> ::= <BOL>

<BOL> → 0/OFF: Disabled 1/ON: Enabled

Query parameters:

None

Response waveform:

<NBOL>

Setting example:

:SOURce1:SWEep:SLEVel:STATe ON

Sets to Enable stop level when oscillation is stopped during single sweep or gated single sweep of CH1.

■ [:SOURce[1|2]]:SWEep:SPACing

□ [:SOURce[1|2]]:SWEep:SPACing?

Description:

Selects/queries slope of sweep.

Setting parameters:

LINear|LOGarithmic

LINear → Linear

LOGarithmic → Logarithmic

Query parameters:

None

Response waveform:

LIN|LOG

* For the meaning of the response data, refer to the setting parameters.

Setting example:

:SOURce1:SWEep:SPACing LINear

Sets slope of sweep of CH1 to linear.

■ [:SOURce[1|2]]:SWEep:TIME

□ [:SOURce[1|2]]:SWEep:TIME?

Description:

Sets/queries sweep time.

Setting parameters:

<time>|MINimum|MAXimum

<time> ::= <REAL>[<eunits>][<units>]

<REAL> → Sweep time: 0.1 ms to 10,000 ms, resolution: 4 digits or 0.1 ms

<eunits> ::= MA|K|M|U|N

<units> ::= S

MINimum → 0.1 ms

MAXimum → 10,000 s

Query parameters:

[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:SWEep:TIME 1MS
Sets sweep time of CH1 to 1 ms.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]?
Description:
Sets/queries amplitude of oscillator.
Setting parameters:
<amplitude>|MINimum|MAXimum
<amplitude> ::= <REAL>[<eunits>][<units>]
<REAL> → Amplitude: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω,
resolution: (999.9 mVp-p or lower) 4 digits or 0.1 mVp-p,
(1 Vp-p or higher) 5 digits or 1 mVp-p
<eunits> ::= M
<units> ::= VPP|VPK|VRMS|DBV|DBM|USER
MINimum → 0 Vp-p
MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:VOLTager:LEVel:IMMediate:AMPLitude 10VPP
Sets amplitude of CH1 to 10 Vp-p.
Remark:
* Sequence amplitude setting/query is not possible with this command.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CENTer
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CENTer?
Description:
Sets/queries center value of amplitude sweep.
Setting parameters:
<amplitude>|MINimum|MAXimum
<amplitude> ::= <REAL>[<eunits>][<units>]
<REAL> → Center value: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω,
resolution: (999.9 mVp-p or lower) 4 digits or 0.1 mVp-p,
(1 Vp-p or higher) 5 digits or 1 mVp-p
<eunits> ::= M
<units> ::= VPP|VPK|VRMS|DBV|DBM

MINimum → 0 Vp-p
MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:CENTer 5VPP
Sets center value of amplitude sweep of CH1 to 5 Vp-p.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE?

Description:
Switches oscillation mode between continuous and amplitude sweep.
Queries whether the oscillation mode is amplitude sweep or not.

Setting parameters:
FIXed|SWEep
FIXed → Continuous oscillation
SWEep → Amplitude sweep

Query parameters:
None

Response waveform:
FIX|SWE
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:MODE SWEep
Sets oscillation mode of CH1 to amplitude sweep.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN?

Description:
Sets/queries span value of amplitude sweep.

Setting parameters:
<amplitude>|MINimum|MAXimum
<amplitude> ::= <REAL>[<eunits>][<units>]
<REAL> → Span value: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50.
* The resolution depends on the start value and stop value.
<eunits> ::= M
<units> ::= VPP|VPK|VRMS|DBV|DBM
MINimum → 0 Vp-p
MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:SPAN 5VPP

Sets span value of amplitude sweep of CH1 to 5 Vp-p.

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

□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt?

Description:

Sets/queries start value of amplitude sweep.

Setting parameters:

<amplitude>|MINimum|MAXimum

<amplitude> ::= <REAL>[<eunits>][<units>]

<REAL> → Start value: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω,
resolution: (999.9 mVp-p or lower) 4 digits or 0.1 mVp-p,
(1 Vp-p or higher) 5 digits or 1 mVp-p

<eunits> ::= M

<units> ::= VPP|VPK|VRMS|DBV|DBM

MINimum → 0 Vp-p

MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:STARt 5VPP

Sets start value of amplitude sweep of CH1 to 5 Vp-p.

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

Description:

Switches amplitude sweep state.

Setting parameters:

STARt|STOP

STARt → Switches output to start value

STOP → Switches output to stop value

Setting example:

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:STATe STARt

Switches amplitude sweep state of CH1 to start value.

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

□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STOP?

Description:

Sets/queries stop value of amplitude sweep.

Setting parameters:

<amplitude>|MINimum|MAXimum
<amplitude> ::= <REAL>[<eunits>][<units>]
<REAL> → Stop value: 0 Vp-p to 20 Vp-p/open, 0 Vp-p to 10 Vp-p/50 Ω,
resolution: (999.9 mVp-p or lower) 4 digits or 0.1 mVp-p,
(1 Vp-p or higher) 5 digits or 1 mVp-p
<eunits> ::= M
<units> ::= VPP|VPK|VRMS|DBV|DBM
MINimum → 0 Vp-p
MAXimum → 20 Vp-p/open, 10 Vp-p/50 Ω

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:STOP 5VPP
Sets stop value of amplitude sweep of CH1 to 5 Vp-p.

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

Description:
Swaps start value and stop value of amplitude sweep.

Setting parameters:
None

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:UNIT
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:UNIT?

Description:
Selects/queries amplitude unit.

Setting parameters:
VPP|VPK|VRMS|DBV|DBM|USER
VPP → Vp-p
VPK → Vpk
VRMS → Vrms
DBV → dBV
DBM → dBm
USER → User unit

Query parameters:
None

Response waveform:
VPP|VPK|VRMS|DBV|DBM|USER
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:UNIT VPP
Sets amplitude unit of CH1 to Vp-p.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:USER
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:USER?

Description:
Sets/queries amplitude user unit

Setting parameters:
[<name>],[<form>],[<m>],[<n>]
<name> ::= <STR>
<STR> → User unit name (up to 4 digits)
* Omissible (If omitted, will not be changed)
<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Logarithmic
* Omissible (If omitted, will not be changed)
<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Minimum value setting
MAXimum → Maximum value setting
* Omissible (If omitted, will not be changed)
<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Minimum value setting
MAXimum → Maximum value setting
* Omissible (If omitted, will not be changed)

Query parameters:
None

Response waveform:
<name>,<form>,<m>,<n>
<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR2>
* For the meaning of the response data, refer to the setting parameters

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:USER "mVpk",LINear,0.001,0
Sets "mVpk" as amplitude user unit of CH1.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH?

Description:
Sets/queries high level.

Setting parameters:
<high>|MINimum|MAXimum
<high> ::= <REAL>[<eunits>][<units>]
<REAL> → High level
* The setting range depends on the state.
<eunits> ::= M
<units> ::= V|USER

MINimum → Minimum value setting
MAXimum → Maximum value setting
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:HIGH 5
Sets high level of CH1 to 5 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT?
Description:
Selects/queries high level unit.
Setting parameters:
V|USER
V → V
USER → User unit
Query parameters:
None
Response waveform:
V|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:HIGH:UNIT V
Sets high level unit of CH1 to V.
Remark:
* The user units are the same as the DC offset user units.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW?
Description:
Sets/queries low level.
Setting parameters:
<low>|MINimum|MAXimum
<low> ::= <REAL>[<eunits>][<units>]
<REAL> → Low level
* The setting range depends on the state.
<eunits> ::= M
<units> ::= V|USER
MINimum → Minimum value setting
MAXimum → Maximum value setting
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value setting

MAXimum → Maximum value setting
Response waveform:
<NR3>
Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:LOW 0
Sets low level of CH1 to 0 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT?
Description:
Selects/queries low level unit.
Setting parameters:
V|USER
V → V
USER → User unit
Query parameters:
None
Response waveform:
V|USER
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:LOW:UNIT V
Sets low level unit of CH1 to V.
Remark:
* The user units are the same as the DC offset user units.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet?
Description:
Sets/queries DC offset of oscillator
Setting parameters:
<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → DC offset: ±10 V/open, ±5 V/50 Ω,
resolution: ±499.9 mV or lower) 4 digits or 0.1 mV,
(±0.5 V or higher) 5 digits or 1 mV
<eunits> ::= M
<units> ::= V|USER
MINimum → -10 V/open, -5 V/50 Ω
MAXimum → 10 V/open, 5 V/50 Ω
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet 2.5V
Sets DC offset of CH1 to 2.5 V
Remark:
* Sequence DC offset setting/query is not possible with this command.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer?
Description:
Sets/queries center value of DC offset.
Setting parameters:
<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → DC offset: ±10 V/open, ±5 V/50 Ω,
resolution: (±499.9 mV or lower) 4 digits or 0.1 mV,
(±0.5 V or higher) 5 digits or 1 mV
<eunits> ::= M
<units> ::= V
MINimum → -10 V/open, -5 V/50 Ω
MAXimum → 10 V/open, 5 V/50 Ω
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:SOURce1:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer 2.5V
Sets center value of DC offset of CH1 to 2.5 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE?
Description:
Switches oscillation mode between continuous and DC offset sweep.
Queries whether the oscillation mode is DC offset sweep or not.
Setting parameters:
FIXed|SWEep
FIXed → Continuous oscillation
SWEep → DC offset sweep
Query parameters:
None
Response waveform:
FIX|SWE
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:SOURce1:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE SWEep
Sets oscillation mode of CH1 to DC offset sweep.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN?

Description:
Sets/queries span value of DC offset

Setting parameters:
<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → DC offset: 0 V to 20 V/open, 0 V to 10 V/50 Ω
* The resolution depends on the start value and stop value.
<eunits> ::= M
<units> ::= V
MINimum → 0 V
MAXimum → 20 V/open, 10 V/50 Ω

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN 2.5V
Sets span value of DC offset of CH1 to 2.5 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt?

Description:
Sets/queries start value of DC offset

Setting parameters:
<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → Start value: ±10 V/open, ±5 V/50 Ω,
resolution: (±499.9 mV or lower) 4 digits or 0.1 mV,
(±0.5 V or higher) 5 digits or 1 mVp-p
<eunits> ::= M
<units> ::= V
MINimum → -10 V/open, -5 V/50 Ω
MAXimum → 10 V/open, 5 V/50 Ω

Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query

Response waveform:
<NR3>

Setting example:
:SOURce1:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt 2.5V
Sets start value of DC offset of CH1 to 2.5 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe

Description:

Switches DC offset sweep state.

Setting parameters:

STARt|STOP

STARt → Switches output to start value

STOP → Switches output to stop value

Setting example:

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:STATe STARt

Switches DC offset sweep state of CH1 to start value.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP

□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP?

Description:

Sets/queries stop value of DC offset.

Setting parameters:

<offset>|MINimum|MAXimum

<offset> ::= <REAL>[<eunits>][<units>]

<REAL> → Stop value: ±10 V/open, ±5 V/50 Ω,
resolution: (±499.9 mV or lower) 4 digits or 0.1 mV,
(±0.5 V or higher) 5 digits or 1 mVp-p

<eunits> ::= M

<units> ::= V

MINimum → -10 V/open, -5 V/50 Ω

MAXimum → 10 V/open, 5 V/50 Ω

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:SOURce1:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP 2.5V

Sets stop value of DC offset of CH1 to 2.5 V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP

Description:

Swaps start value and stop value of DC offset sweep.

Setting parameters:

None

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT

□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT?

Description:

Selects/queries DC offset unit.

Setting parameters:

V|USER

V → V
USER → User unit

Query parameters:
None

Response waveform:
V|USER
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:UNIT V
Sets DC offset of CH1 to V.

■ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:USER
□ [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:USER?

Description:
Sets/queries user unit of DC offset.

Setting parameters:
[<name>],[<form>],[<m>],[<n>]
<name> ::= <STR>
<STR> → User unit name (up to 4 digits)
* Omissible (If omitted, will not be changed)
<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Logarithmic
* Omissible (If omitted, cannot be changed)
<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Minimum value
MAXimum → Maximum value
* Omissible (If omitted, cannot be changed)
<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Minimum value
MAXimum → Maximum value
* Omissible (If omitted, cannot be changed)

Query parameters:
None

Response waveform:
<name>,<form>,<m>,<n>
<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR2>
* For the meaning of the response data, refer to the setting parameters.

Setting example:
:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:USER "mV",LINear,0.001,0
Sets the user unit of DC offset of CH1 to "mV".

■ [:SOURce[1|2]]:VOLTage:RANGe:AUTO
□ [:SOURce[1|2]]:VOLTage:RANGe:AUTO?
Description:
Selects/queries auto range on/off.
Setting parameters:
<state> ::= <BOL>
<BOL> → 0/OFF: Auto range off, 1/ON: Auto range on
Query parameters:
None
Response waveform:
<NBOL>
Setting example:
:SOURce1:VOLTage:RANGe:AUTO ON
Sets auto range of CH1 to on.

□ :STATus:OPERation:CH1:CONDition?
Description:
CHI operation status condition register query
Query parameters:
None
Response waveform:
<NR1>

■ :STATus:OPERation:CH1:ENABle
□ :STATus:OPERation:CH1:ENABle?
Description:
Sets/queries CH1 operation status event enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:CH1:ENABle 8
Sets CH1 operation status event enable register bits 3 to 1.

□ :STATus:OPERation:CH1[:EVENt]?
Description:
Queries CH1 operation status event register.
Query parameters:
None
Response waveform:
<NR1>

■ :STATus:OPERation:CH1:NTRansition

□ :STATus:OPERation:CH1:NTRansition?

Description:

Sets/queries CH1 operation status transition filter (negative).

Setting parameters:

<value> ::= <INT>

<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:STATus:OPERation:CH1:NTRansition 8

Sets CH1 operation status transition filter (negative) bits 3 to 1.

■ :STATus:OPERation:CH1:PTRansition

□ :STATus:OPERation:CH1:PTRansition?

Description:

Sets/queries CH1 operation status transition filter (positive).

Setting parameters:

<value> ::= <INT>

<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:STATus:OPERation:CH1:PTRansition 8

Sets CH1 operation status transition filter (positive) bits 3 to 1.

□ :STATus:OPERation:CH2:CONDition?

Description:

Queries CH2 operation status condition register.

Query parameters:

None

Response waveform:

<NR1>

■ :STATus:OPERation:CH2:ENABle

□ :STATus:OPERation:CH2:ENABle?

Description:

Sets/queries CH2 operation status event enable register.

Setting parameters:

<value> ::= <INT>

<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:

None

Response waveform:
<NR1>
Setting example:
:STATus:OPERation:CH2:ENABle 8
Sets CH2 operation status event enable register bits 3 to 1.

□ :STATus:OPERation:CH2[:EVENt]?
Description:
Queries CH2 operation status event register.
Query parameters:
None
Response waveform:
<NR1>

■ :STATus:OPERation:CH2:NTRansition
□ :STATus:OPERation:CH2:NTRansition?
Description:
Sets/queries CH2 operation status transition filter (negative).
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:CH2:NTRansition 8
Sets CH2 operation status transition filter (negative) bits 3 to 1.

■ :STATus:OPERation:CH2:PTRansition
□ :STATus:OPERation:CH2:PTRansition?
Description:
Sets/queries CH2 operation status transition filter (positive).
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:CH2:PTRansition 8
Sets CH2 operation status transition filter (negative) bits 3 to 1.

□ :STATus:OPERation:CONDition?
Description:
Queries operation status condition register.

Query parameters:
None
Response waveform:
<NR1>

■ :STATus:OPERation:ENABle
□ :STATus:OPERation:ENABle?
Description:
Sets/queries operation status event enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:ENABle 512
Sets operation status event enable register bits 9 to 1.

□ :STATus:OPERation[:EVENt]?
Description:
Queries operation status event register.
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:EVENt?
Operation status event register query

■ :STATus:OPERation:NTRansition
□ :STATus:OPERation:NTRansition?
Description:
Sets/queries operation status transition filter (negative).
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:OPERation:NTRansition 512
Sets operation status transition filter (negative) bits 9 to 1.

■ :STATus:OPERation:PTRansition

□ :STATus:OPERation:PTRansition?

Description:

Sets/queries operation status transition filter (positive).

Setting parameters:

<value> ::= <INT>

<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:

None

Response waveform:

<NR1>

Setting example:

:STATus:OPERation:PTRansition 512

Sets operation status transition filter (positive) bits 9 to 1.

■ :STATus:PRESet

Description:

Register preset

Parameters:

None

Remark:

* The items cleared by this command consist of the following registers.
  - Operation status transition filter (negative)
  - Operation status transition filter (positive)
  - Operation status enable register
  - CH1 operation status transition filter (negative)
  - CH1 operation status transition filter (positive)
  - CH1 operation status enable register
  - CH2 operation status transition filter (negative)
  - CH2 operation status transition filter (positive)
  - CH2 operation status enable register
  - Questionable data status transition filter (negative)
  - Questionable data status transition filter (positive)
  - Questionable data status enable register
  - Warning event enable register
  - CH1 warning event enable register
  - CH2 warning event enable register

□ :STATus:QUEStionable:CONDition?

Description:

Queries questionable data status condition register.

Query parameters:

None

Response waveform:

<NR1>

■ :STATus:QUEStionable:ENABle
□ :STATus:QUEStionable:ENABle?

Description:
Sets/queries questionable data status event enable register.

Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:
None

Response waveform:
<NR1>

Setting example:
:STATus:QUEStionable:ENABle 16
Sets questionable data status event enable register bits 4 to 1.

□ :STATus:QUEStionable[:EVENt]?

Description:
Queries questionable data status event register.

Query parameters:
None

Response waveform:
<NR1>

■ :STATus:QUEStionable:NTRansition
□ :STATus:QUEStionable:NTRansition?

Description:
Sets/queries questionable data status transition filter (negative).

Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:
None

Response waveform:
<NR1>

Setting example:
:STATus:QUEStionable:NTRansition 16
Sets questionable data status transition filter (negative) bits 4 to 1.

■ :STATus:QUEStionable:PTRansition
□ :STATus:QUEStionable:PTRansition?

Description:
Sets/queries questionable data status transition filter (positive).

Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:
None

Response waveform:
<NR1>
Setting example:
:STATus:QUEStionable:PTRansition 16
Sets questionable data status transition filter (positive) bits 4 to 1.

■ :STATus:WARNing:CH1:ENABle
□ :STATus:WARNing:CH1:ENABle?
Description:
Sets/queries CH1 warning event enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:WARNing:CH1:ENABle 16
Sets CH1 warning event enable register bits 4 to 1.

□ :STATus:WARNing:CH1[:EVENt]?
Description:
Queries CH1 warning event register.
Query parameters:
None
Response waveform:
<NR1>

■ :STATus:WARNing:CH2:ENABle
□ :STATus:WARNing:CH2:ENABle?
Description:
Sets/queries CH2 warning event enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:WARNing:CH2:ENABle 16
Sets CH2 warning event enable register bits 4 to 1.

□ :STATus:WARNing:CH2[:EVENt]?
Description:
Queries CH2 warning event register.

Query parameters:
None
Response waveform:
<NR1>

■ :STATus:WARNing:ENABle
□ :STATus:WARNing:ENABle?
Description:
Sets/queries warning event enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
:STATus:WARNing:ENABle 512
Sets warning event enable register bits 9 to 1.

□ :STATus:WARNing[:EVENt]?
Description:
Queries warning event register.
Query parameters:
None
Response waveform:
<NR1>

□ :SYSTem:ERRor?
Description:
Queries errors
Query parameters:
None
Response waveform:
<code>,<message>
<code> ::= <INT>
<INT> → Error code
<message> ::= <STR>
<STR> → Error message

■ :TRACe|DATA:COPY
Description:
Copies embedded waveform data to arbitrary waveform memory.
Setting parameters:
<memory>,[<name>],<chan>,<wave>
<memory> ::= <INT>
<INT> → Memory number:0 to 128

<name> ::= <STR>
<STR> → Arbitrary waveform name (20 characters)
*1: Omissible (if omitted, the copy source name is used)
*2: If the name is less than 20 characters, fill it out with spaces (ASCII code 32).
<chan> ::= <INT>
<INT> → Channel number: 1, 2
<wave> ::=
SINusoid|SQUare|PULSe|RAMP
|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSsian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFALl|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|BRRamp

SINusoid	→ Sine wave
SQUare	→ Square wave
PULSe	→ Pulse wave
RAMP	→ Ramp wave
USINe	→ Unbalanced sine wave
CSINe	→ Clipped sine wave
CFCSine	→ CF controlled sine wave
ACSine	→ Conduction angle controlled sine wave
SSINe	→ Staircase sine wave
MCSine	→ Multi-cycle sine wave
ONPSine	→ On-phase controlled sine wave
OFPSine	→ Off-phase controlled sine wave
CONSine	→ Chattering-on sine wave
COFSine	→ Chattering-off sine wave
GAUSsian	→ Gaussian pulse
LORentz	→ Lorentz pulse
HAVersine	→ Haversine
HSPulse	→ Half-sine pulse
TPULse	→ Trapezoid pulse
SINC	→ Sin(x)/x
ERISe	→ Exponential rise
EFALl	→ Exponential fall
SOLStep	→ Second order LPF step response
DOSCillation	→ Damped oscillation
OSURge	→ Oscillation surge
PSURge	→ Pulse surge
TOFFset	→ Trapezoid with offset
HSEPulse	→ Half-sine edge pulse
BRRamp	→ Bottom referenced ramp wave
USER	→ Arbitrary wave

* Copies channel number <chan> waveform <wave> with arbitrary wave name <name> to memory number <memory>.

Setting example:

:TRACe:COPY 1,"name"1,SINusoid

Copies waveform memory of sine wave of CH1 to arbitrary wave memory 1 with arbitrary wave name,"name".

Remark:

<1> Memory 0 is edit memory.

<2> Arbitrary wave name of Memory 0 is <Edit Memory> (20 characters).

<3> Arbitrary wave copy consists in copy of the memory selected with "[:SOURce[1|2]:FUNCtion:USER".

■ :TRACe|DATA[:DATA]

□ :TRACe|DATA[:DATA]?

Description:

Inputs/outputs arbitrary wave data.

Setting parameters:

<memory>,[<name>],<data>

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

<name> ::= <STR>

<STR> → Arbitrary wave name (up to 20 characters)

*1. Omissible (if omitted, will not be changed)

*2. If the name is less than 20 characters, fill it out with spaces (ASCII code 32).

<data> ::= <BLK>

<BLK> → Arbitrary wave data. The format is as follows.

In case of array format:

#<digit><byte><format><number><data[0]>…<data[n-1]>

→ Binary data start

<digit> → Number of subsequent digits <byte>

<byte> → Number of bytes of subsequent data

<format> → Data format (4 bytes)

* Specify 1 in the case of the control point format.

<number> → Number of data points (4 bytes)

<data[i]> → ith value (2 bytes)

In case of control point format:

#<digit><byte><format><number><x[0]><y[0]>…<x[n-1]><y[n-1]>

→ Binary data start

<digit> → Number of subsequent digits <byte>

<byte> → Number of bytes of subsequent data

<format> → Data format (4 bytes)

* Specify 0 in the case of the array format.

<number> → Number of data points (4 bytes)

<x[i]> → ith x value (4 bytes)

<y[i]> → ith y value (2 bytes)

* The arbitrary wave data <data> is saved with arbitrary wave name <name> to memory

number <memory>.

<memory>

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Response waveform:

<name>,<data>

<name> ::= <STR>

<STR> → Arbitrary wave name (20 characters)

<data> ::= <BLK>

* For <BLK>, refer to the setting parameters.

Remark:

<1> <format>, <number>, <x[i]>, <y[i]>, and <data[i]> are binary data (big endian).

<2> Regarding <x[i]>, 1 LSB = $1/(2^{31})$.

The setting range is H'00000000 to H'7FFFFFFF. H'00000000 is the regular expression corresponding to 0, while H'80000000 is the regular expression corresponding to 1.

If data that exceeds the setting range is included, an error results.

<3> <x[i]> is obtained by sorting the values in ascending order from the data start.

If the values are not sorted, an error results.

<4> <y[i]> is in 2's complement notation, with 1LSB = 1/32767.

H'8000 is handled as H'8001.

Examples: <y[i]>=H'7FFF → 1 in regular expression

<y[i]>=H'0000 → 0 in regular expression

<y[i]>=H'8001 → -1 in regular expression

<y[i]>=H'8000 → -1 in regular expression

<5> <data[i]> is in 2's complement representation, and ranges from (32767 (H'8001) to 32767 (H'7FFF).

In the case of (32768 (H'8000), the value is set as (32767 (H'8001).

<6> Arbitrary wave Memory 0 is edit memory.

<7> Arbitrary wave name of Memory 0 is <Edit Memory> (20 characters).

<8> Array format data cannot be set for the arbitrary wave Memory 0.

<9> An arbitrary wave name cannot be set for arbitrary wave Memory 0. If a value is specified, it is ignored.

■ :TRACe|DATA:DELete

Description:

Deletes arbitrary wave memory

Setting parameters:

<memory>

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

Setting example:

:TRACe:DELete 1

Deletes Memory 1.

Remark:

<1> Memory 0 is edit memory.

<2> Specifying memory 0 has the same effect as operating the [new] soft key displayed on the arbitrary wave edit screen of a main system.

☐ :TRACe|DATA:INFormation?

Description:

Obtains information of arbitrary wave memory.

Query parameters:

<memory> ::= <INT>

<INT> → Memory number: 1 to 128

Response waveform:

<name>,<format>,<number>

<name> ::= <STR>

<STR> → Arbitrary wave name (20 characters)

<format> ::= <INT>

<INT> → Data format

0 → Array format

1 → Control point format

<number> ::= <INT>

<INT> → Number of data points

■ :TRACe|DATA:RECall

Description:

Reads arbitrary wave memory contents into edit memory.

Setting parameters:

<file>

<file> ::= <INT>

<INT> → Number of memory to be called: 1 to 128

Setting example:

:TRACe:STORe:RECall 2

Reads the contents of Memory 2 into the edit memory.

■ :TRACe|DATA:SEQuence

☐ :TRACe|DATA:SEQuence?

Description:

Inputs/outputs sequence data.

Setting parameters:

<memory>,[<name>],<data>

<memory> ::= <INT>

<INT> → Memory number: 0 to 10

<name> ::= <STR>

<STR> → Sequence name (up to 20 characters)

*1. Omissible (if omitted, will not be changed.)

*2. If the name is less than 20 characters, fill it out with spaces (ASCII code 32).

<data> ::= <BLK>

<BLK> → Sequence data (Refer to "2.4 Sequence I/O Data Specifications".)

Query parameters:

<memory>

<memory> ::= <INT>

<INT> → Memory number: 0 to 10

Response waveform:
<name>,<sequence>
<name> → Sequence name (20 characters)
<sequence>::= <BLK>
<BLK> → #<digit><byte><data>
→ Binary data start
<digit> → Number of subsequent digits <byte>
<byte> → Number of bytes of subsequent data
<data> → Sequence data (Refer to 2.4 Sequence I/O Data Specifications.)
Remark:
<1> The sequence data is in text format.
<2> Memory 0 is current memory.
<3> Sequence name of Memory 0 is <Current Memory> (20 characters).

■ :TRACe|DATA:SEQuence:CLEar
Description:
Initializes sequence data.
Setting parameters:
<memory>
<memory> ::= <INT>
<INT> → Memory number: 0 to 10
Remark:
* Memory 0 is current memory.

■ :TRACe|DATA:SEQuence:RECall
Description:
Reads out sequence data
Setting parameters:
<file> ::= <INT>|MINimum|MAXimum
<INT> → Number of memory to be read out: 1 to 10
MINimum → 1
MAXimum → 10
Setting example:
:SOURce:SEQuence:RECall 2
Reads in sequence data of Memory 2.

■ :TRACe|DATA:SEQuence:STORe
Description:
Saves sequence data.
Setting parameters:
<file>,<name>
<file> ::= <INT>
<INT> → Number of memory to which data is to be saved: 1 to 10.
<name> ::= <STR>
<STR> → Sequence name (up to 20 characters)
*1: Omissible (if omitted, will not be changed.)
*2: If the name is less than 20 characters, fill it out with spaces

(ASCII code 32).

Setting example:

:TRACe:SEQuence:STORe 2, "name"

Saves the sequence data to Memory 2 with sequence name "name"

■ :TRACe|DATA:STORe

Description:

Saves the edit memory contents to arbitrary wave memory.

Setting parameters:

<file>,<name>

<file> ::= <INT>

<INT> → Number of memory to which data is to be saved: 1 to 128

<name> ::= <STR>

<STR> → Arbitrary wave name (up to 20 characters)

*1: Omissible (if omitted, will not be changed.)

*2: If the name is less than 20 characters, fill it out with spaces (ASCII code 32).

Setting example:

:TRACe:STORe 2,"name"

Saves the edit memory contents to Memory 2 with arbitrary wave name "name".

■ :TRIGger[1|2]:BURSt:SLOPe

□ :TRIGger[1|2]:BURSt:SLOPe?

Description:

Selects/queries external trigger polarity during burst

Setting parameters:

POSitive|NEGative|OFF

POSitive → Rising

NEGative → Falling

OFF → Prohibited

Query parameters:

None

Response waveform:

POS|NEG|OFF

* For the meaning of the response data, refer to the setting parameters

Setting example:

:TRIGger:BURSt:SLOPe NEGative

Sets external trigger polarity during burst to falling.

■ :TRIGger[1|2]:BURSt:SOURce

□ :TRIGger[1|2]:BURSt:SOURce?

Description:

Selects/queries trigger source during burst

Setting parameters:

TIMer|EXTernal|CH1

TIMer → Trigger through internal trigger cycle

EXTernal → External trigger

CH1 → External trigger of CH1 (Only selectable for CH2)

Query parameters:

None

Response waveform:

TIM|EXT|CH1

* For the meaning of the response data, refer to the setting parameters

Setting example:

:TRIGger2:BURSt:SOURce EXT

Sets trigger source of CH2 during burst to external

■ :TRIGger[1|2]:BURSt:TIMer

□ :TRIGger[1|2]:BURSt:TIMer?

Description:

Sets/queries internal trigger cycle during burst

Setting parameters:

<period>|MINimum|MAXimum

<period> ::= <REAL>[<eunits>][<units>]

<REAL> → Period: 1.0 μs to 1,000 s, resolution: 5 digits or 0.1 μs

<eunits> ::= MA|K|M|U|N

<units> ::= S

MINimum → 1.0 μs

MAXimum → 1,000 s

Query parameters:

[MINimum|MAXimum]

MINimum → Minimum value query

MAXimum → Maximum value query

Response waveform:

<NR3>

Setting example:

:TRIGger1:BURSt:TIMer 1MS

Sets CH1 internal trigger cycle during burst to 1 ms

■ :TRIGger[1|2]:COMPile[:IMMediate]

Description:

Compiles sequence data

Setting parameters:

None

Remark:

* Whether "[1|2]" exists has no influence on the operation.

■ :TRIGger[1|2]:SELected:EXECute

Description:

Controls oscillation modes

Setting parameters:

Modulated oscillation mode

STARt|STOP

STARt → Start

STOP → Stop
Sweep oscillation mode
STARt|STOP|HOLD|RESume
STARt → Start
STOP → Stop
HOLD → Hold
RESume → Resume
Sequence
STARt|STOP|ISTop|HOLD|RESume|EBRanc
STARt → Start
STOP → Stop
ISTop → Forced stop
HOLD → Hold
RESume → Resume
EBRanch → Event branch
Remark:
<1> Whether "[1|2]" exists in sequence has no influence on the operation.
<2> Cannot be used in the burst oscillation mode.

■ :TRIGger[1|2][:SEQuence][:IMMediate]
Description:
Corresponds to [MANUAL TRIGGER] button.
Setting parameters:
None
Remark:
* May not be used depending on the oscillation mode (refer to table 2.3).

■ :TRIGger[1|2]:SWEep:SLOPe
□ :TRIGger[1|2]:SWEep:SLOPe?
Description:
Selects/queries external trigger polarity during sweep
Setting parameters:
POSitive|NEGative|OFF
POSitive → Rising
NEGative → Falling
OFF → Prohibited
Query parameters:
None
Response waveform:
POS|NEG|OFF
* For the meaning of the response data, refer to the setting parameters.
Setting example:
:TRIGger:SWEep:SLOPe NEGative
Sets external trigger polarity during sweep to falling.

■ :TRIGger[1|2]:SWEep:SOURce
□ :TRIGger[1|2]:SWEep:SOURce?

Description:
Selects/queries trigger source during sweep
Setting parameters:
TIMer|EXTernal|CH1
TIMer → Trigger through internal trigger cycle
EXTernal → External trigger
CH1 → External trigger of CH1 (Only selectable for CH2)
Query parameters:
None
Response waveform:
TIM|EXT|CH1
* For the meaning of the response data, refer to the setting parameters
Setting example:
:TRIGger2:SWEep:SOURce EXT
Sets trigger source of CH2 during sweep to external

■ :TRIGger[1|2]:SWEep:TIMer
□ :TRIGger[1|2]:SWEep:TIMer?
Description:
Sets/queries internal trigger cycle during sweep
Setting parameters:
<period>|MINimum|MAXimum
<period> ::= <REAL>[<eunits>][<units>]
<REAL> → Period: 100.0 μs to 10,000 s, resolution: 5 digits or 0.1 μs
<eunits> ::= MA|K|M|U|N
<units> ::= S
MINimum → 100.0 μs
MAXimum → 10,000 s
Query parameters:
[MINimum|MAXimum]
MINimum → Minimum value query
MAXimum → Maximum value query
Response waveform:
<NR3>
Setting example:
:TRIGger1:SWEep:TIMer 1MS
Sets CH1 internal trigger cycle during sweep to 1 ms

■ *CLS
Description:
Clears event register and error queue.
Setting parameters:
None
Remark:
<1> This command clears the following registers.
- Status byte register
- Standard event status register

- Operation status event register
- CH1 operation status event register
- CH2 operation status event register
- Questionable data status event register
- Warning event register
- CH1 warning event register
- CH2 warning event register
- Error queue

<2> This command also clears the overload message (No.23133).

■ *ESE

□ *ESE?

Description:

Sets/queries standard event status enable register.

Setting parameters:

<value> ::= <INT>

<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".

Query parameters:

None

Response waveform:

<NR1>

Setting example:

*ESE 8

Sets standard event status enable register to 8.

□ *ESR?

Description:

Queries standard event status register.

Query parameters:

None

Response waveform:

<NR1>

□ *IDN?

Description:

Reads out equipment ID.

Query parameters:

None

Response waveform:

<corporation>,<model>,<serial>,<firmware>

<corporation> → Manufacturer:NF Corporation

<model> → Model: (Example) WF1974

<serial> → Serial No.: (Example) 1234567

<firmware> → Firmware version: (Example) Ver1.00

■ *OPC

Description:

Sets OPC bit at end of all previous commands to 1.

Setting parameters:

None

□ *OPC?

Description:

Sets output buffer at end of all previous commands to 1.

Query parameters:

None

■ *PSC

□ *PSC?

Description:

Sets/queries power-on status clear flag.

Setting parameters:

<state> ::= <INT>

<INT> → 0:OFF, 1:ON

Query parameters:

None

Response waveform:

<NR1>

Setting example:

*PSC 1

Sets to Enable automatic clear of enable register, etc., at power-on.

■ *RCL

Description:

Recalls from setting memory.

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 1 to 10

■ *RST

Description:

Initializes settings

Setting parameters:

None

■ *SAV

Description:

Stores to setting memory

Setting parameters:

<memory> ::= <INT>

<INT> → Memory number: 1 to 10

■ *SRE

□ *SRE?

Description:
Sets/queries service request enable register.
Setting parameters:
<value> ::= <INT>
<INT> → For the setting values, refer to "CHAPTER 3. STATUS SYSTEM".
Query parameters:
None
Response waveform:
<NR1>
Setting example:
*SRE 8
Sets service request enable register to 8.

☐ *STB?
Description:
Queries status byte register.
Query parameters:
None
Response waveform:
<NR1>

■ *TRG
Description:
Equivalent to [MANUAL TRIGGER] button
Setting parameters:
None
Remark:
<1> Cannot specify channels. It becomes trigger to CH1.
<2> May not be used depending on the oscillation mode (refer to table 2.3).

☐ *TST?
Description:
Queries self-check results at power-on.
Query parameters:
None
Response waveform:
<NR1> → 0
Remark:
<1> 0 is always responded in this device.
<2> Cannot check the internal status by the external control. Check by the operation from the panel.

■ *WAI
Description:
Waits end of all previous commands.
Setting parameters:
None

2.4 Sequence I/O Data Specifications

The INI file format is used for the data handled with the :TRACe|DATA:SEQuence input/output command of the sequence.

The INI file sections and keys are described below.

2.4.1 [FILE] section

Sets the parameters related to the file format. This section is mandatory.

(1) File version

```
VERSION = <version>
  <version> ::= <STR>
   <STR> → File version
* Specify "1.00" for file version
```

2.4.2 [SYSTEM] section

Sets the system information on the equipment side. This section is mandatory.

(1) Model

```
MODEL = <mod>
  <mod> ::= <STR>
    <STR> → Model
```

(2) Number of channels

```
NCHAN = <chan>
  <chan> ::= <INT>
    <INT> → Number of channels
```

(3) Firmware version

```
VERSION = <version>
 <version> ::= <STR>
  <STR> → Firmware version
* Specify "1.00" for firmware version
```

2.4.3 [DATA] section

(1) Sequence

Set the data related to the entire sequence.

```
SEQ = <ststp>,<syncout>,<dctrl>,<dctrl_mode>,<trgslp>
 <ststp> ::= <INT>
  <INT> → Start step (1 to 255)
```

<syncout> ::= <DISC>
 <DISC> → Sync output (SYNC: Waveform sync, SSYN: Sequence sync)
<dctrl> ::= <BOL>
 <BOL> → Digital control input ON/OFF (0/OFF: OFF, 1/ON: ON)
<dctrl_mode> ::= <DISC>
 <DISC> → Digital control usage method (STAR: Start, SBR: State branch)
<trgslp> ::= <DISC>
 <DISC> → Trigger polarity (POS: Positive, NEG: Negative, OFF: Prohibited)

(2) Step

Set the data related to each step.

STEP#<step> = <time>,<sterm>,<auto_hold>,<scode>,<stbra_sw>,<stbra>,<evbra_sw>,<evbra>,
 <jpstp_sw>,<jpstp>,<jpcnt_sw>,<jpcnt>,<sphase_sw>,<sphase>
<step> ::= <INT>
 <INT> → Number of steps (0 to 255)
<time> ::= <REAL>
 <REAL> → Step time
<sterm> ::= <DISC>
 <DISC> → Step termination (CONT: Continuous, STOP: End)
<auto_hold> ::= <BOL>
 <BOL> → Auto hold ON/OFF (0/OFF: OFF, 1/ON: ON)
<scode> ::= <INT>
 <INT> → Step code
<stbra_sw> ::= <BOL>
 <BOL> → State branch step ON/OFF (0/OFF: OFF, 1/ON: ON)
<stbra> ::= <INT>
 <INT> → State branch step (0 to 255)
<evbra_sw> ::= <BOL>
 <BOL> → Event branch step ON/OFF (0/OFF: OFF, 1/ON: ON)
<evbra> ::= <INT>
 <INT> → Event branch step (0 to 255)
<jpstp_sw> ::= <BOL>
 <INT> → Jump step ON/OFF (0/OFF: OFF, 1/ON: ON)
<jpstp> ::= <INT>
 <INT> → Jump step (0 to 255)
<jpcnt_sw> ::= <DISC>
 <DISC> → Jump count specification (INF: Infinite number, ON: Jump only the
 specified number of jumps)
<jpcnt> ::= <INT>
 <INT> → Jump count
<sphase_sw> ::= <BOL>
 <BOL> → End phase ON/OFF (0/OFF: OFF, 1/ON: ON)
<sphase> ::= <REAL>
 <REAL> → End phase

(3) Channel data

Set the data of each channel.

```
CHAN#<step>#<chan> = <wf_type>,<wf_arb_no>,<wf_polarity>,<wf_scale>,<wf_squex>,
                     <freq_val>,<freq_actn>,<amptd_val>,<amptd_actn>,
                     <ofs_val>,<ofs_actn>,<ph_val>,<ph_actn>,<dy_val>,<dy_actn>
 <step> ::= <INT>
  <INT> → Step number (0 to 255)
 <chan> ::= <INT>
  <INT> → Channel number (1, 2)
 <wf_type> ::= <DISC>
  <DISC> → Waveform (DC: DC, NOIS: Noise, SIN: Sine wave, SQU: Square wave, USER:
           Arbitrary wave)
 <wf_arb_no> ::= <INT>
  <INT> → Arbitrary wave number (0 to 128)
 <wf_polarity> ::= <DISC>
  <DISC> → Waveform polarity (NORM: Normal, INV: Inverted)
 <wf_scale> ::= <DISC>
  <DISC> → Waveform amplitude range (PFS: 0/+FS, FS: ±FS, MFS:-FS/0)
 <wf_squex> ::= <BOL>
  <BOL> → Square wave extension (0/OFF: OFF, 1/ON: ON)
 <freq_val> ::= <REAL>
  <REAL> → Frequency
 <freq_actn> ::= <DISC>
  <DISC> → Operation type (CONS: Constant, KEEP: Keep, SWE: Sweep)
 <amptd_val> ::= <REAL>
  <REAL> → Amplitude
 <amptd_actn> ::= <DISC>
  <DISC> → Operation type (CONS: Constant, KEEP: Keep, SWE: Sweep)
 <ofs_val> ::= <REAL>
  <REAL> → DC offset
 <ofs_actn> ::= <DISC>
  <DISC> → Operation type (CONS: Constant, KEEP: Keep, SWE: Sweep)
 <ph_val> ::= <REAL>
  <REAL> → Phase
 <ph_actn> ::= <DISC>
  <DISC> → Operation type (CONS: Constant, KEEP: Keep, SWE: Sweep)
 <dy_val> ::= <REAL>
  <REAL> → Duty
 <dy_actn> ::= <DISC>
  <DISC> → Operation type (CONS: Constant, KEEP: Keep, SWE: Sweep)
```

2.5 Trigger/Oscillation Status Control

The command for activating the trigger from the external control (GET (Group Execution Trigger) "*TRG" and "TRIGgerr[1|2][:SEQuence][:IMMediate]"), and the command for controlling the oscillation status (":TRIGger[1|2]:SELected:EXEcute") are supported for the WF1973 and WF1974.

These commands may be invalid, depending on the oscillation mode as shown in Table 2.3. When the invalid command is received, it is ignored.

Table 2.3. Validity of Trigger/Oscillation Status Control Command on Each Oscillation Mode

Oscillation mode	GET/*TRG/ :TRIGger[1|2][:SEQuence][:IMMediate]	:TRIGger[1|2]:SELected:EXEcute
Continuous	Invalid	Invalid
Modulation	Invalid	Valid
Sweep		
Continuous	Invalid	Valid
Single-shot	Valid	Valid
Gated single-shot	Valid	Valid
Burst		
Auto burst	Invalid	Invalid
Trigger burst	Valid	Invalid
Gate	Invalid	Invalid
Trigger gate	Valid	Invalid
Sequence	Invalid	Valid

In the above commands, GET and "*TRG" are only applied to CH1, and therefore cannot specify the channels. However, when the setting of the same value to two channels is ON, they are applied to both CH1 and CH2 (in the WF1974 only).

2.6 System Unit

A system unit is the default unit in setting/querying the amplitude and frequency by the external control. When the unit is omitted by the parameter setting, it is interpreted that a system unit is specified as the unit and is being executed. In addition, when querying parameters, a response message is replied based on the system unit.

For example, if the system unit of the amplitude is Vrms, the amplitude is set as below in this device.

When Vp-p is specified as the unit:

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 1.0Vpp

→ The amplitude is set to 1.0 Vp-p because the command is interpreted in the specified unit.

When the unit is omitted:

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 1.0

→ The amplitude is set to 1.0 Vrms because the command is interpreted as if the system unit is specified for the unit.

For setting the system unit, the following commands are used.

Frequency system unit setting:

[:SOURce[1|2]]:FREQuency:UNIT

Amplitude system unit setting:

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

DC offset and high/low level system unit settings:

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

[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT

[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT

* DC offset and high/low level settings share one system unit. The commands of the above three units have the same function.

Phase system unit setting:

[:SOURce[1|2]]:PHASe:UNIT

Square wave/pulse duty system unit setting:

[:SOURce[1|2]]:PULSe:DCYCle:UNIT

Frequency system unit setting:

[:SOURce[1|2]]:PULSe:PERiod:UNIT

3. STATUS SYSTEM

The WF1973/WF1974 include a status reporting function defined in IEEE488.2.

3.1 Status Byte Register and Service Request Enable Register

Figure 3.1 shows the configurations of the service byte register and service request enable register.

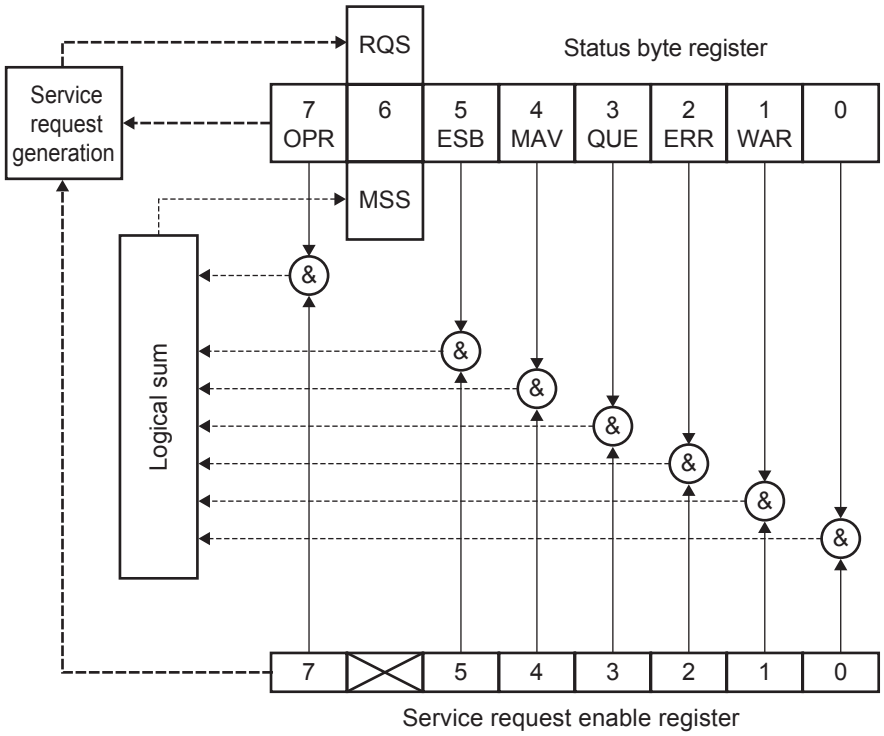


Figure 3.1. Status Byte Register and Service Request Enable Register

3.1.1 Status byte register

Table 3.1 describes the bits of the status byte register.

Table 3.1. Status Byte Register

Bit	Weight	Symbol	Description
0			(Unused)
1	2	WAR	Warning event register summary
2	4	ERR	Error queue summary
3	8	QUE	Questionable data status register summary
4	16	MAV	Message queue summary
5	32	ESB	Event summary bit
6	64	RQS/MSS	Request service/master summary status
7	128	OPR	Operation status register summary

The status byte register is cleared upon reception of the *CLS command.

3.1.2 Service request enable register

The service request enable register is used to select the summary bit in the status byte register that generates service requests shown in Figure 3.1.

The service request enable register is cleared at power-on if the status of the power-on status clear flag (set with *PSC) is True.

3.2 Standard Event Status Register Group

Figure 3.2 shows the standard event status register group.

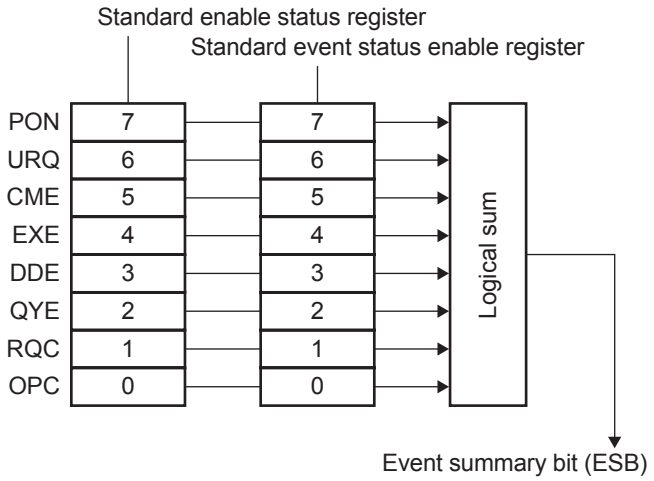


Figure 3.2. Standard Event Status Register Group

3.2.1 Standard event status register

Table 3.2 describes the bits of the standard event status register.

Table 3.2. Standard Event Status Register

Bit	Weight	Symbol	Description
0	1	OPC	Operation completion
1	2	RQC	Request control
2	4	QYE	Query error
3	8	DDE	Device specific error
4	16	EXE	Execution error
5	32	CME	Command error
6	64	URQ	User request
7	128	PON	Power on

The standard event status register is cleared upon reception of the *ESR? query addressed to this register or *CLS command.

3.2.2 Standard event status enable register

The standard event status enable register, as shown in Figure 3.2, is used to select the bit of the standard event status register, and reflect the status of the selected bit to the ESB of the status byte register.

The standard event status enable register is cleared at power-on when the status of the power-on status clear flag (set with *PSC) is True.

3.3 Operation Status Register Group/Questionable Data Status Register Group

Figure 3.3. shows the configurations of the operation status register group and questionable data status register group.

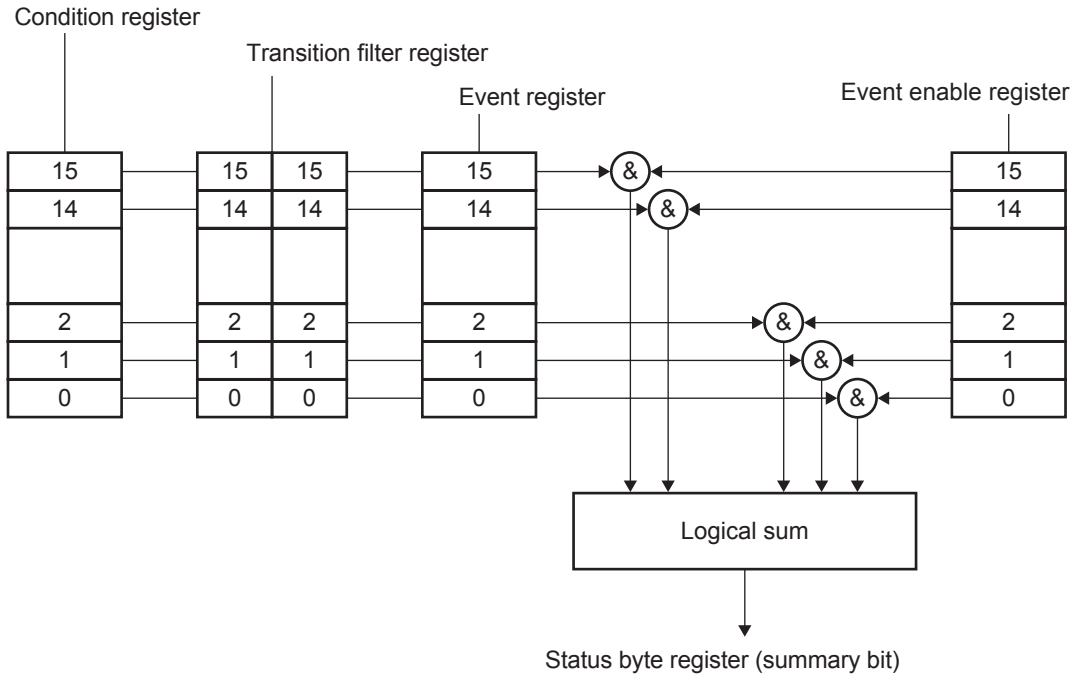


Figure 3.3. Operation Status Register Group/Questionable Data Status Register Group

3.3.1 Outline of registers

3.3.1.1 Condition register

The condition register indicates the current status of the WF1973/WF1974.

This register is not cleared even when a query addressed to this register is received.

3.3.1.2 Transition filter register

The transition filter register is used to determine the event bit transition.

Table 3.3 shows the relationship between the transition filter setting and event register transitions.

Table 3.3. Transition Filter and Event Register Transitions

Each Bit Setting of Positive Transition Filter	Each Bit Setting of Negative Transition Filter	Transition of Condition Register to Set Event Register to 1
1	0	0 → 1
0	1	1 → 0
1	1	0 → 1 or 1 → 0
0	0	Event register bit does not become 1.

The transition filter register is cleared upon reception of the :STATus:PRESet command, or at power-on when the status of the power-on status clear flag (set with *PSC) is True.

3.3.1.3 Event register

The event register reflects the changes to the condition register according to the setting of the transition filter register.

The event register is cleared upon reception of a query addressed to this register or the *CLS command.

3.3.1.4 Event enable register

The event enable register is used to select bits in the event register to be summarized.

The event enable register, as shown in Figure 3.3, is used to select bits of the event register, and reflects the status of the selected bit to the summary bit of the status byte register.

The event enable register is cleared upon reception of the :STATus:PRESet command, or at power-on when the status of the power-on status clear flag (set with *PSC) is True.

3.3.2 Operation status register group

Figure 3.3 shows the operation status register group. It comprises one register set per channel and one register set for summarizing these sets.

Table 3.4 and Table 3.5 describe the operation status registers.

Table 3.4. Operation Status Register

Bit	Weight	Description
0		(Unused)
1		(Unused)
2		(Unused)
3		(Unused)
4		(Unused)
5		(Unused)
6		(Unused)
7		(Unused)
8		(Unused)
9	512	CH1 operation status register summary
10	1024	CH2 operation status register summary
11		(Unused)
12		(Unused)
13		(Reserved)
14		(Reserved)
15		Always 0

Table 3.5. CH1 (CH2) Operation Status Register

Bit	Weight	Description
0	1	Sequence: EDIT Indicates the Edit status.
1	2	Sequence: READY Indicates the ready status.
2	4	Sequence: RUN Indicates the Run status and the Hold status.
3	8	Sequence: HOLD Indicates the Hold status.
4		(Unused)
5		(Unused)
6		(Unused)
7	128	Modulation/sweep/burst: STO Indicates a status in which the oscillation mode basically does not perform oscillation, such as the Stop status and the Conflict status. Moreover, even in the Run status, the value of this bit is 1 during the trigger delay period in the case of trigger burst, the half pulse from when the gate closes in the case of triggered gate, and also during the oscillation period for all waves.
8	256	Continuous oscillation/modulation/sweep/burst: RUN Indicates the Run status and the Hold status.
9	512	Modulation/sweep/burst: HOLD Indicates the Hold status.
10	1024	Modulation/sweep/burst: TRIGGER WAIT Indicates the TrigWait status.
11	2048	Modulation/sweep/burst: CONFLICT Indicates the Conflict status.
12		(Unused)
13		(Unused)
14		(Unused)
15		Always 0

The relationships between the bits listed in Table 3.5 and the output waveform are described below.

3.3.2.1 Continuous oscillation

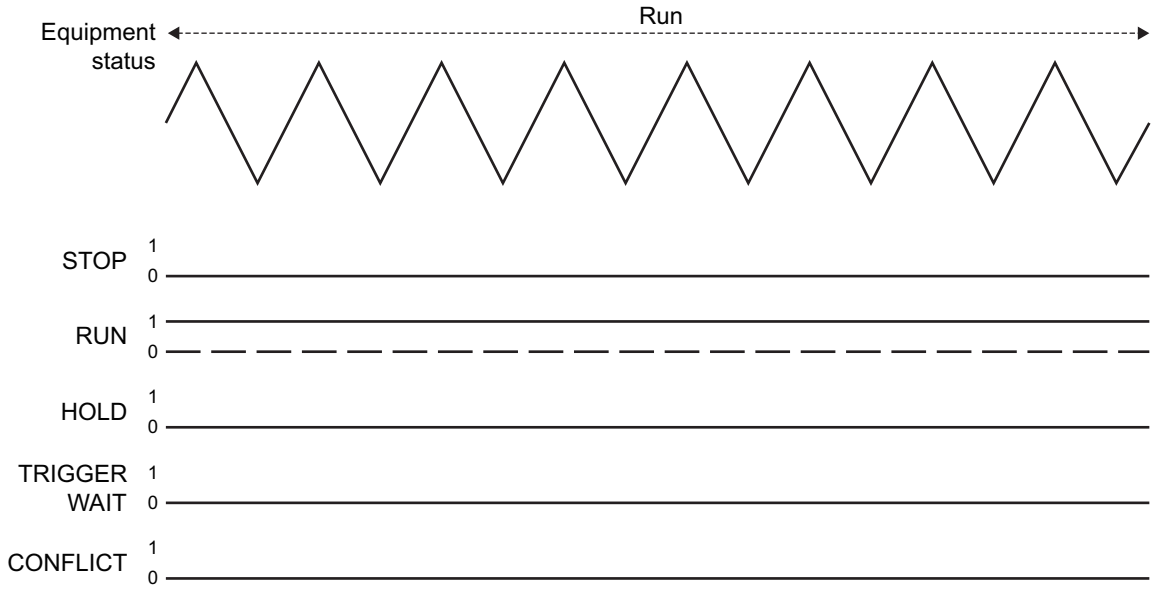


Figure 3.4. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Continuous Oscillation

3.3.2.2 Modulation

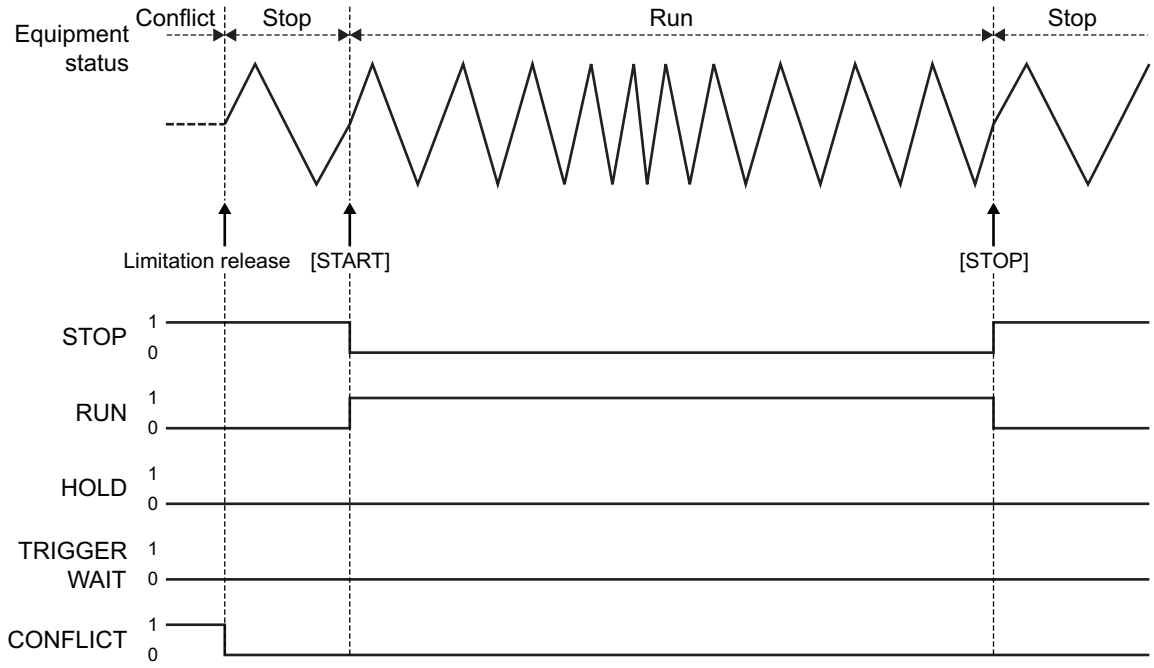


Figure 3.5. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Modulation

3.3.2.3 Sweep

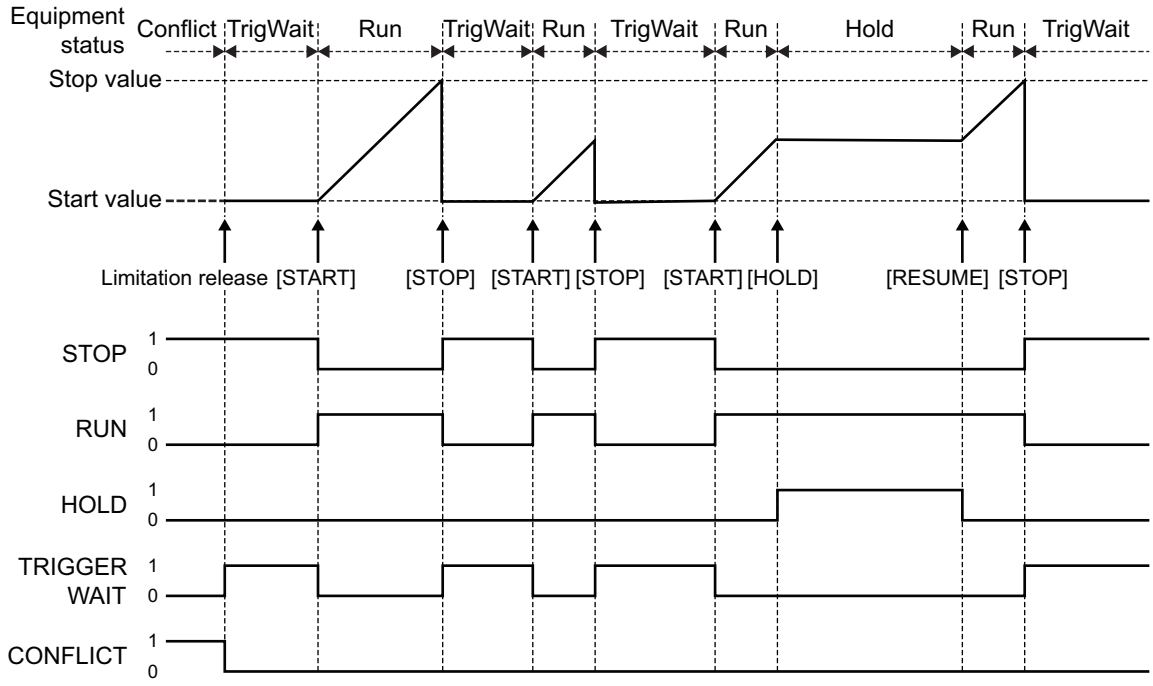


Figure 3.6. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Single-Shot Sweep, Gated Single-Shot Sweep

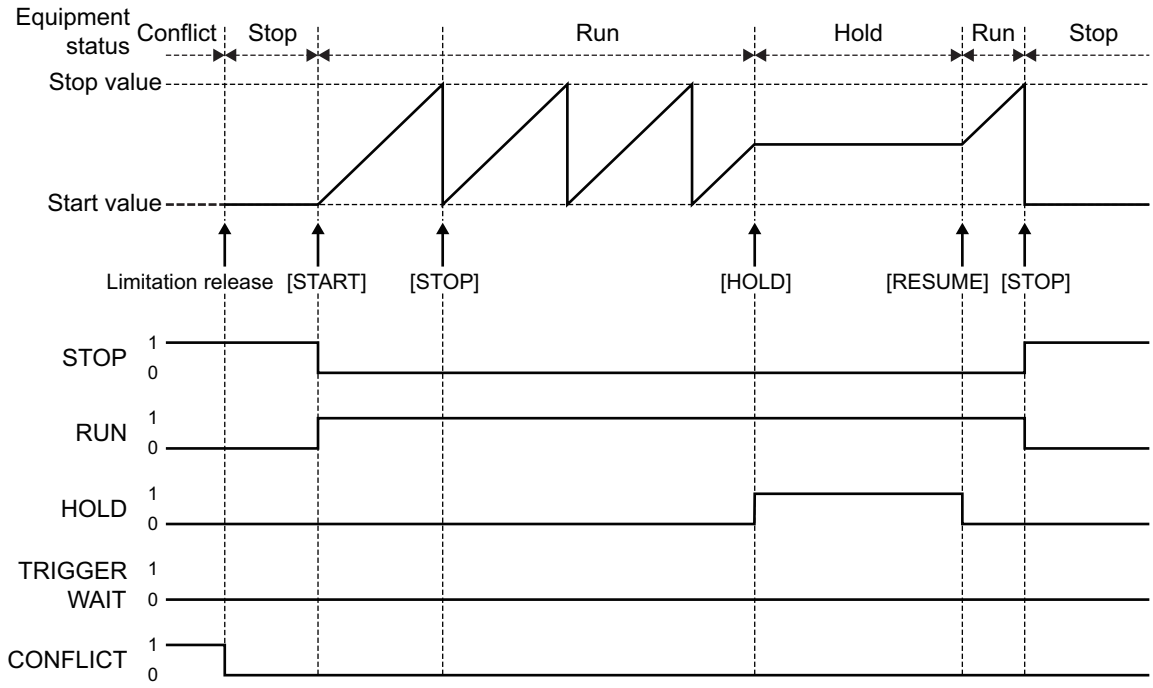


Figure 3.7. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Continuous Sweep

3.3.2.4 Burst

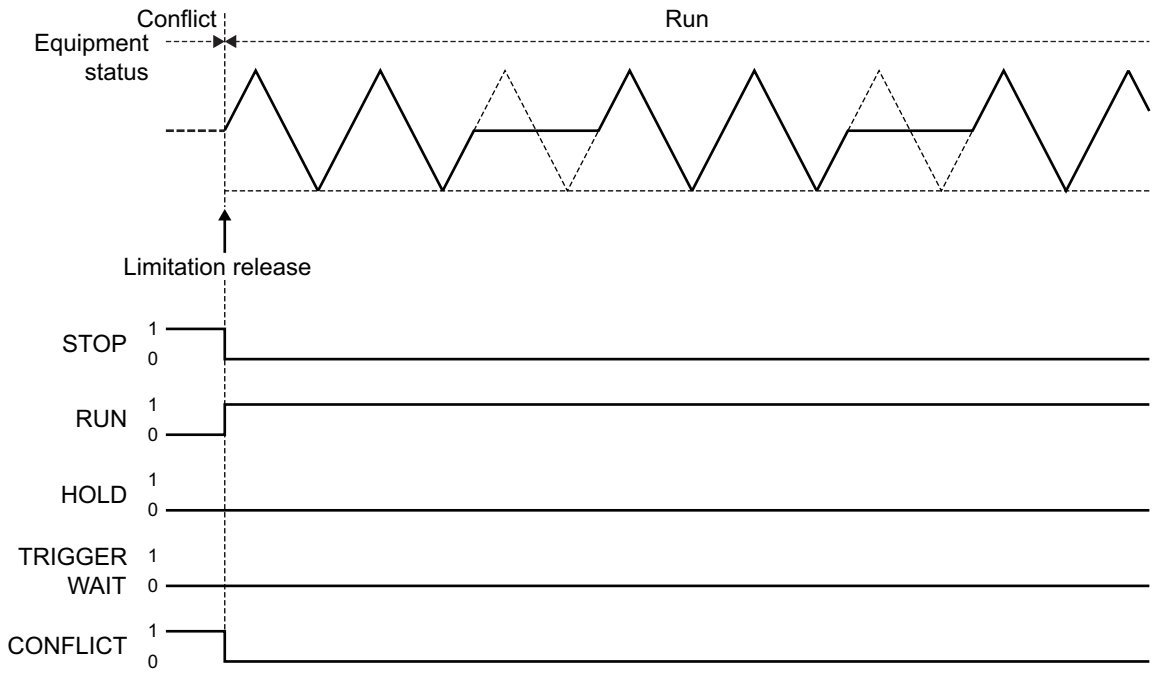


Figure 3.8. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Auto Burst

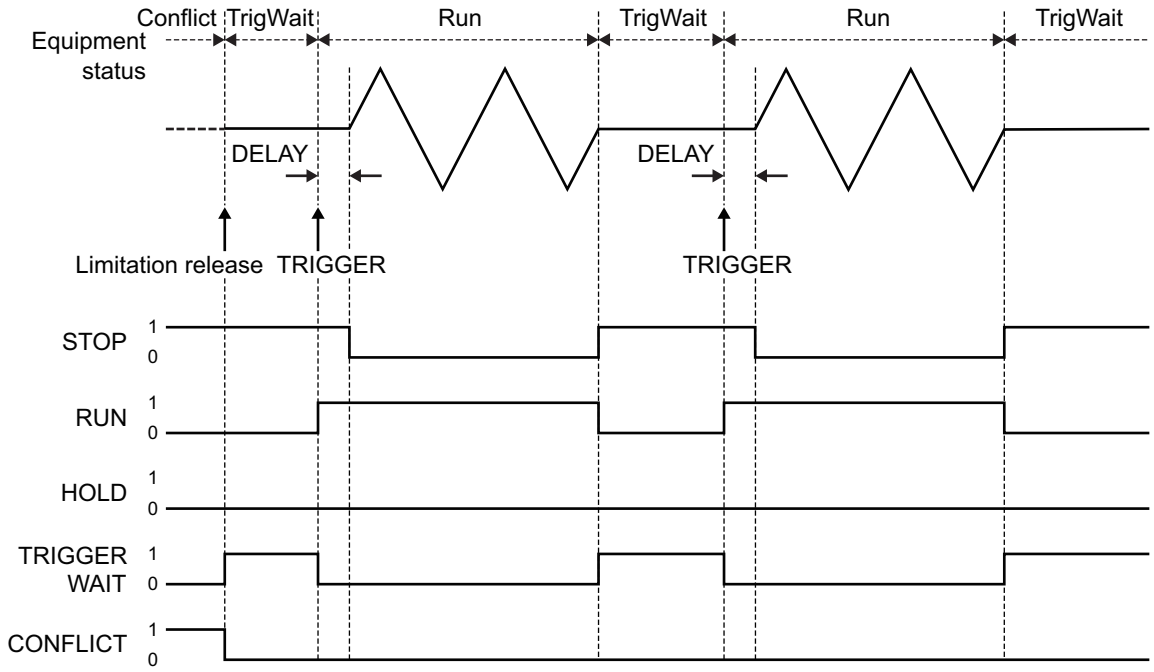


Figure 3.9. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Trigger Burst

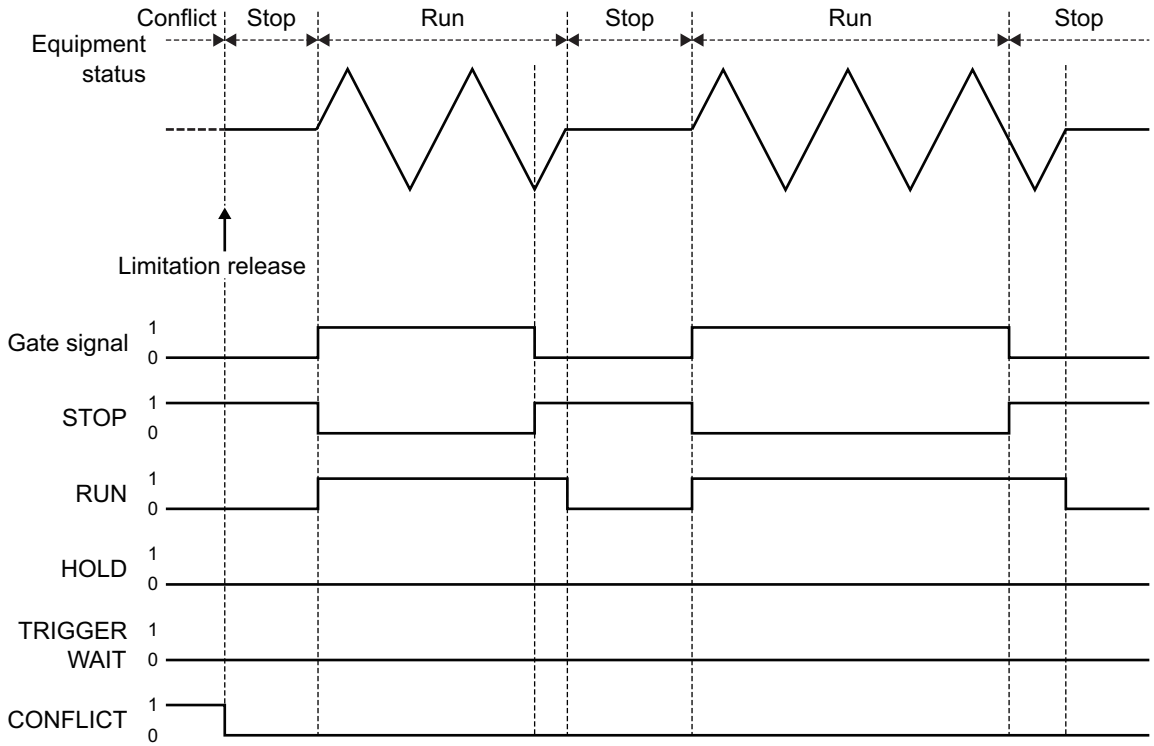


Figure 3.10. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Gate

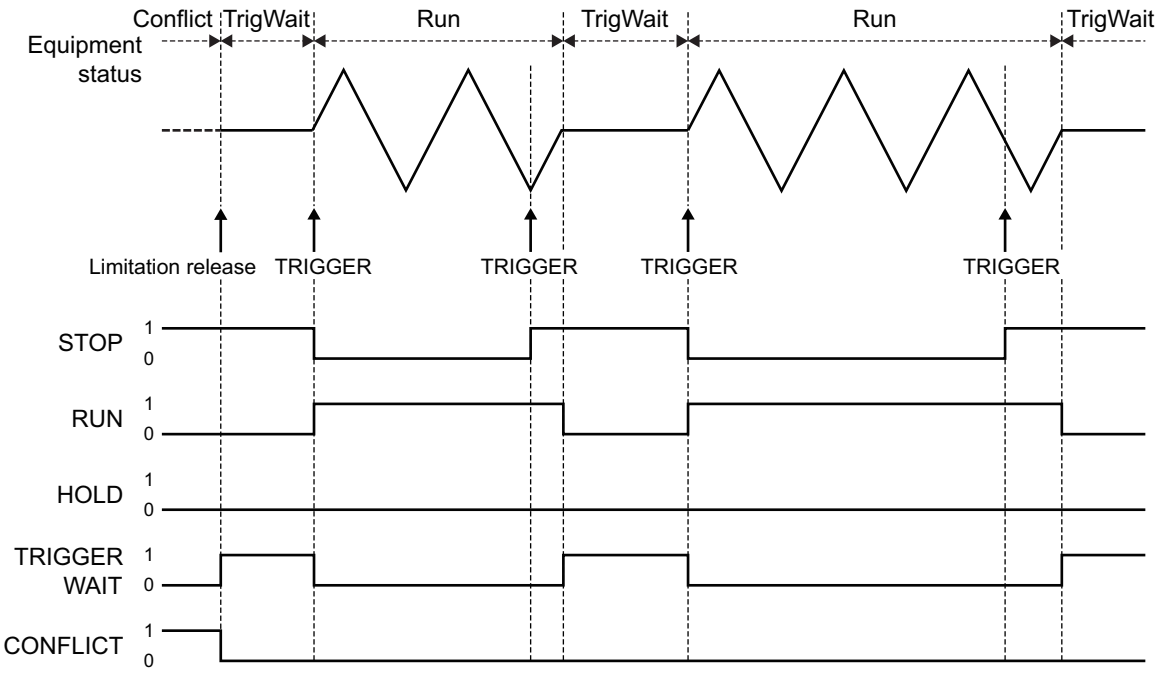


Figure 3.11. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Triggered Gate

3.3.2.5 Sequence

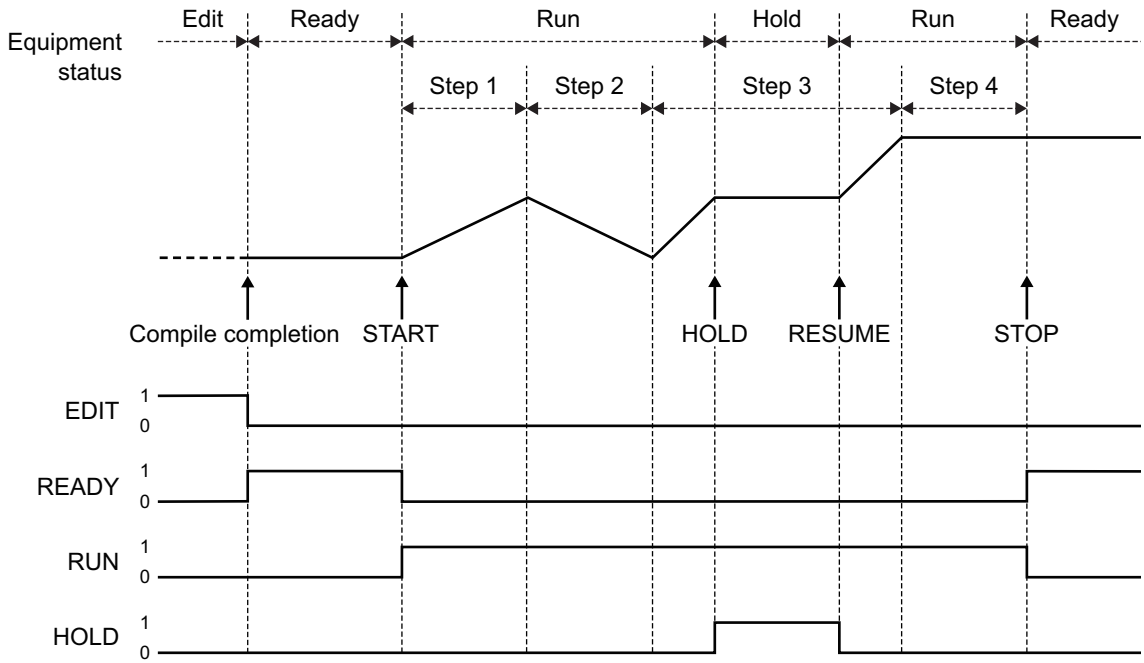


Figure 3.12. Relationship Between Output and Operation Status Register (Bits 0 to 13) During Sequence

3.3.3 Questionable data status register group

Table 3.6 describes the bits of the questionable data status register.

Table 3.6. Questionable Data Status Register

Bit	Weight	Description
0	1	Overload (CH1)
1		(Unused)
2		(Unused)
3		(Unused)
4	16	Overheating detection
5		(Unused)
6	64	No external reference clock
7		(Unused)
8	256	Indicates status in which calibration could not be done
9		(Unused)
10	1024	Overload (CH2)
11		(Unused)
12		(Unused)
13		(Unused)
14		(Unused)
15		Always 0

3.4 Warning Event Register Group

Table 3.7 shows the warning event register group. It comprises three register sets, one register set per channel, and two register sets for summarizing these sets.

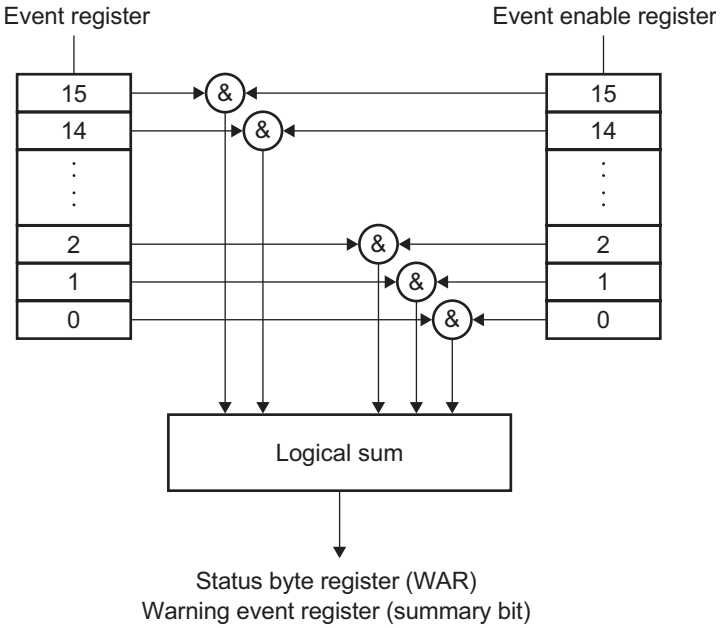


Figure 3.13. Warning Event Status Register Group Model

3.4.1 Event register

Tables 3.7 and 3.8 show the bits of the warning event register and CH1 (CH2) warning event register.

Here, the meanings of the terms used in Table 3.8 are shown below.

Channel mode parameters:
Indicates frequency differences or frequency ratio

Waveform parameters:
Indicates duty variable range, waveform polarity, amplitude range, ramp wave symmetry, and parameters unique to other parameter variable waves

Basic parameters:
Indicates frequency, period, phase, amplitude, DC offset, high level, low level, duty, pulse witdth and leading/trailing time.

Other parameters
Indicates channel mode, channel mode parameter, waveform, waveform parameter, basic parameters and parameters in other than system units.

The warning event register indicates the only status change of the device by the external controls, not the status change of the device by the panel operation.

Table 3.7. Warning Event Register

Bit	Weight	Description
0		(Unused)
1		(Unused)
2		(Unused)
3		(Unused)
4		(Unused)
5		(Unused)
6		(Unused)
7		(Unused)
8		(Unused)
9	512	CH1 warning event register summary
10	1024	CH2 warning event register summary
11		(Unused)
12		(Unused)
13		(Unused)
14		(Unused)
15		Always 0

Table 3.8. CH1 (CH2) Warning Event Register

Bit	Weight	Description
0	1	The waveform or the waveform parameters were changed due to the changes of channel mode or channel mode parameters.
1	2	The basic parameters were changed due to the changes of channel mode or channel mode parameters.
2	4	The oscillation mode was changed due to the changes of channel mode or channel mode parameters.
3	8	Other parameters were changed due to the changes of channel mode or channel mode parameters.
4	16	The channel mode or the channel mode parameters were changed due to the changes of waveform or waveform parameters.
5	32	The basic parameters were changed due to the changes of waveform or waveform parameters.
6	64	The oscillation mode was changed due to the changes or waveform or waveform parameters.
7	128	Other parameters were changed due to the changes of waveform or waveform parameters.
8	256	The other basic parameters were changed due to basic parameter (frequency, period, phase, amplitude, DC offset, high level or low level) change.
9	512	The other basic parameters were changed due to basic parameter (duty or pulse width) change.
10	1024	The other basic parameters were changed due to basic parameter (leading time or trailing time) change.
11	2048	Other parameters were changed due to basic parameter change.
12	4096	The system unit was changed.
13		(Unused)
14	16384	Other parameters were changed.
15		Always 0

The event register is cleared upon reception of a query or *CLS command addressed to this register.

3.4.2 Event enable register

The event enable register is used to select bits in the event register to be summarized.

The event enable register is cleared upon reception of the :STATus:PRESet command or at power-on when the status of the power-on status clear flag (set with *PSC) is True.

3.5 Other

The WF1973/WF1974 provides an error queue and message queue.

4. ERROR MESSAGE

When errors occur during under external control, the error numbers are stored in an error queue.

These error numbers and their corresponding messages, and the error contents are as shown in Table 4.1.

The error numbers and messages can be queried by the “SYSTem:ERRor?” command.

Table 4.1. Error Numbers, Messages, and Contents

Error number	Message	Contents (Figures in parentheses indicate the error codes displayed on the screen)
-102	Syntax error	Received character strings contain syntax errors.
-108	Parameter not allowed	There are too many parameters for the procedure.
-109	Missing parameter	There are missing parameters.
-110	Command header error	There is an error in the command header.
-111	Header separator error	There is an error in the keyword separator in the command header.
-113	Undefined header	Received character strings contain an undefined header.
-120	Numeric data error	Numeric parameters contain a data error.
-130	Suffix error	Numeric parameters contain a suffix error.
-140	Character data error	Discrete parameter contains a character data error.
-150	String data error	Character string parameters contain an error.
-160	Block data error	Block parameters contain a data error.
-200	Execution error	Command cannot be executed. This error occurs in the following cases. • When “*CLS” could not be executed due to the device status • When “*RST” could not be executed due to the device status • When the modification from sequence to other oscillation modes could not be executed due to the device status • In any case of non-execution other than the above
-211	Trigger ignored	GET (Group execution trigger), “*TRG” or other commands regarding trigger are ignored. This error occurs in the following cases. • When compilation instruction was ignored because the device is not in Edit status sequence • When the remote trigger was ignored because the device is not in Ready status sequence • When the control command was ignored due to the device status

Error number	Message	Contents (Figures in parentheses indicate the error codes displayed on the screen)
-220	Parameter error	There is a parameter error. This error occurs in the following cases. • When there was an error in prefix/unit in a numeric parameter • When the specified unit cannot be used due to the device status • When an arbitrary waveform name has exceeded 20 characters • When a double quotation (") was contained in an arbitrary waveform name • When the data points of an arbitrary waveform were not correct • When the compilation of a sequence could not be passed due to the following reasons. — The number of the used waveforms exceeds 128 or the total amount of that exceeds 512 KW. — When the check was not executed because the setting of a sequence is too complicated.
-221	Settings conflict	Parameters with an appropriate syntax are received but cannot be executed due to the device status. This error occurs in the following cases. • When the sweep function could not be set to the log because the frequency sweep was not supported for the device • When the arbitrary waveform data in the array format was to be set to the edit memory of an arbitrary waveform • When the specification of the array format/control point format to an arbitrary waveform data contained an error • When the same values were set to two channels, the setting for the specified channel could not be executed due to a restriction on another channel (22039) • When the compilation of a sequence cannot be completed for the following reasons. — Upon the relationship between two steps, when the frequency exceeded the upper limit of a waveform (23121) — Upon the relationship between two steps, when the amplitude and offset did not satisfy the interdependent restriction (23122) — Upon the relationship between two steps, a square waveform frequency and a duty did not satisfy the interdependent restriction. (23123) • When an external modulation/addition input connector could not be used for the external modulation because it is used for the external addition (23129) • When an external modulation/addition input connector could not be used for the external addition because it is used for the external modulation (23130)
-222	Data out of range	Parameters with an appropriate syntax are received but cannot be executed because the data is out of range. This error occurs in the following cases. • When the data which is out of range was set to each register in a status system • When 0 was set to the frequency ratio of N/M • When the data which was out of range was set to the user definition unit, m/n. • When the standard waveform of channel 2 was copied to the memory in one channel device. • When the data which was out of range was to be set (23045)

Error number	Message	Contents (Figures in parentheses indicate the error codes displayed on the screen)
-225	Out of memory	Memory capacity is insufficient for the execution This error occurs in the following cases. • When the arbitrary waveform data could not be saved due to memory shortage
-290	Memory use error	Cannot be executed due to a memory error This error occurs in the following cases. • When the empty memory was specified by the arbitrary waveform number • When the sequence compilation did not pass because the empty memory was specified by the arbitrary waveform number (23125) • When the arbitrary waveforms which are output or used currently are to be deleted (32004)
-291	Out of memory	There is no specified memory. This error occurs in the following cases. • When an arbitrary waveform number of other than 0 to 128 was specified • When a sequence number of other than 0 to 10 was specified
-310	System error	Malfunction of the main system This error occurs in the following cases. • When an arbitrary waveform could not be read by a sequence compilation (23124) • When an internal error occurred (24135, 24136, 35005)
-350	Queue overflow	An error occurred but was deleted because the error queue overflowed.
-410	Query INTERRUPTED	Old response message was deleted from a message queue due to the interruption of a new message.
-420	Query UNTERMINATED	Talker was specified but there is no response message in a message queue.
-440	Query UNTERMINATED after indefinite response	There was a query after “*IDN?” in received character strings. (“*IDN?” must be the last query in the received character strings.)

5. SPECIFICATIONS

5.1 Interface Functions

Table 5.1. USB Interface Functions

Function	Subset	Description
Source handshake	SH1	All send handshake functions provided
Accepter handshake	AH1	All receive handshake functions provided
Talker	T6	Basic talker function, talker cancellation through MLA provided
Listener	L2	Basic listener function provided
Service request	SR1	All service request functions provided
Remote/local	RL1	All remote/local functions provided
Parallel poll	PP0	No parallel poll function provided
Device clear	DC1	All device clear functions provided
Device trigger	DT1	Device trigger function provided
Controller	C0	No controller function provided

Table 5.2. GPIB Interface Functions

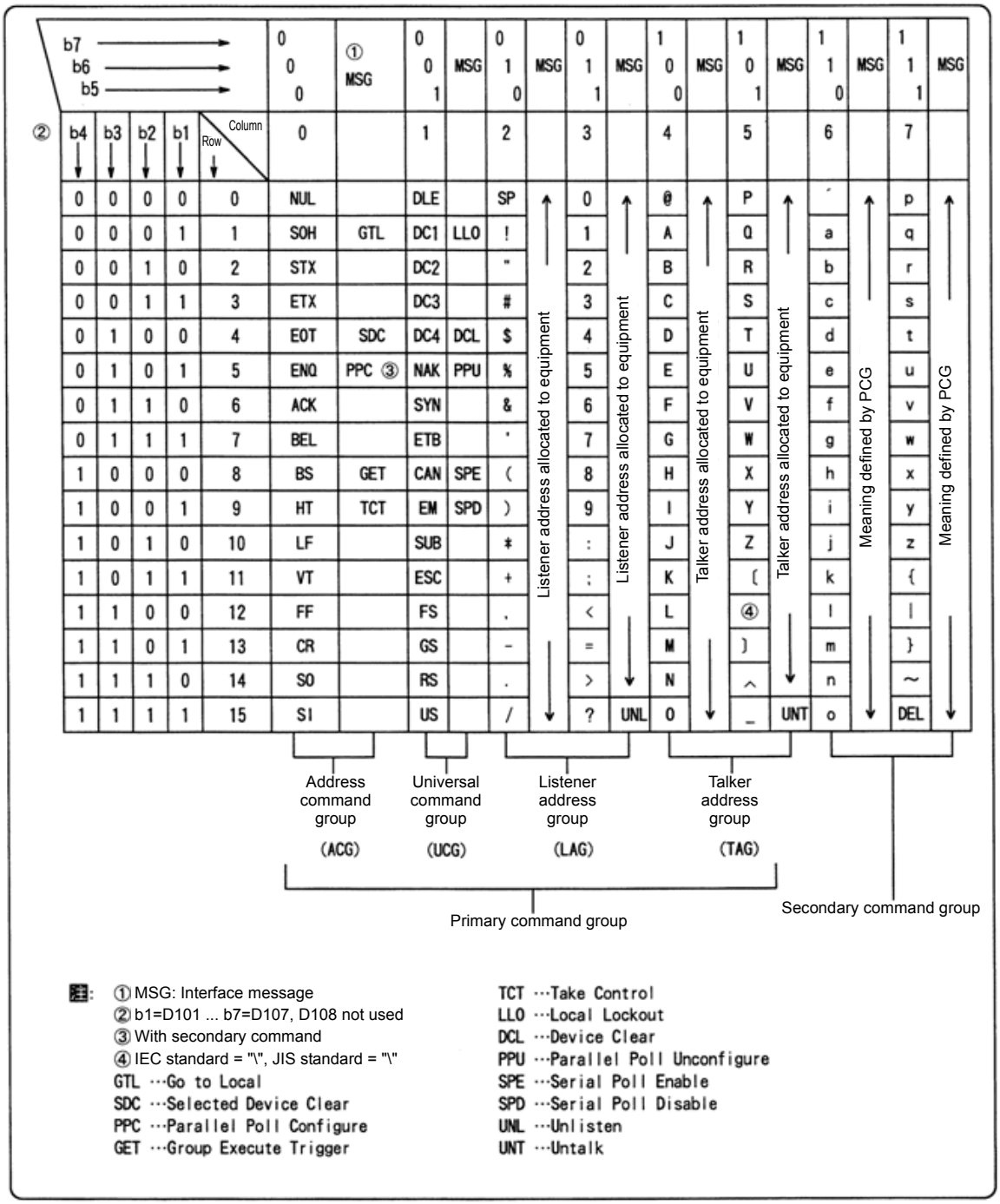
Function	Subset	Description
Source handshake	SH1	All send handshake functions provided
Accepter handshake	AH1	All receive handshake functions provided
Talker	T6	Basic talker function, talker cancellation through MLA provided
Listener	L4	Basic listener function, talker cancellation through MTA provided
Service request	SR1	All service request functions provided
Remote/local	RL1	All remote/local functions provided
Parallel poll	PP0	No parallel poll function provided
Device clear	DC1	All device clear functions provided
Device trigger	DT1	All device trigger functions provided
Controller	C0	No controller function provided

5.2 Response to Interface Messages

Table 5.3. Response to Interface Messages

IFC	・Initializes interface. ・Cancels specified listener, talker
DCL and SDC	・Clears I/O buffer. ・Clears errors. ・Cancels SRQ origination and resets bit that is source in status byte. ・Prohibits SRQ originations.
LLO	・Disables use of LOCAL keys on panel (software keys).
GTL	・Sets local status.

5.3 Multiline Interface Messages



b7 b6 b5 →	000	① MSG	001	MSG	010	MSG	011	MSG	100	MSG	101	MSG	110	MSG	111	MSG
② b4 b3 b2 b1 (Row / Column)	0		1		2		3		4		5		6		7	
0 0 0 0	0	NUL		DLE		SP		0		@		P		´		p
0 0 0 1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q
0 0 1 0	2	STX		DC2		"		2		B		R		b		r
0 0 1 1	3	ETX		DC3		#		3		C		S		c		s
0 1 0 0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t
0 1 0 1	5	ENQ	PPC ③	NAK	PPU	%		5		E		U		e		u
0 1 1 0	6	ACK		SYN		&		6		F		V		f		v
0 1 1 1	7	BEL		ETB		'		7		G		W		g		w
1 0 0 0	8	BS	GET	CAN	SPE	(		8		H		X		h		x
1 0 0 1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y
1 0 1 0	10	LF		SUB		*		:		J		Z		j		z
1 0 1 1	11	VT		ESC		+		;		K		[		k		{
1 1 0 0	12	FF		FS		,		<		L		④		l		|
1 1 0 1	13	CR		GS		-		=		M		]		m		}
1 1 0	14	SO		RS		.		>		N		^		n		~
1 1 1 1	15	SI		US		/		?	UNL	O		_	UNT	o	DEL	

Listener address allocated to equipment

Listener address allocated to equipment

Talker address allocated to equipment

Talker address allocated to equipment

Meaning defined by PCG

Meaning defined by PCG

Address command group (ACG)

Universal command group (UCG)

Listener address group (LAG)

Talker address group (TAG)

Primary command group

Secondary command group

注: ① MSG: Interface message
② b1=D101 ... b7=D107, D108 not used
③ With secondary command
④ IEC standard = "\", JIS standard = "¥"
GTL ···Go to Local
SDC ···Selected Device Clear
PPC ···Parallel Poll Configure
GET ···Group Execute Trigger
TCT ···Take Control
LLO ···Local Lockout
DCL ···Device Clear
PPU ···Parallel Poll Unconfigure
SPE ···Serial Poll Enable
SPD ···Serial Poll Disable
UNL ···Unlisten
UNT ···Untalk

6. COMMAND TREE

NOTES

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- The contents of this manual may be revised without notice.
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WF1973/WF1974 Instruction Manual (Remote Control)

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