MULTIFUNCTION GENERATOR

# WF1973/WF1974

Instruction Manual
(Remote Control)

**NF Corporation**

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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 NI-VISA from National Instruments Corporation . Almost all panel operations can be controlled, and internal statuses, such as setting values and errors, can be read out. Install a NI-VISA 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 NI-VISA page on the website of National Instruments Corporation.

2. Download the version of NI-VISA that supports your OS from the NI-VISA page.

3. Execute the downloaded file and install it.

4. Once the file has installed successfully, the NI-VISA is installed.

For details of NI-VISA, contact National Instruments Corporation or visit the National Instruments Website.

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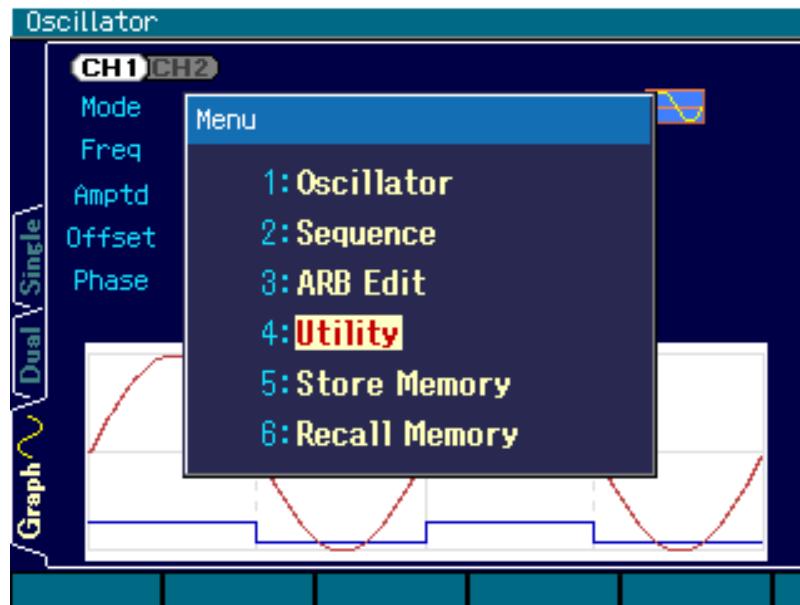
Install a GPIB controller board (card) in the controlling computer and connect it with a commercially available GPIB cable. For details, refer to the user's manual of the GPIB controller board (card) that is used.

# 1.4 Selecting the Interface
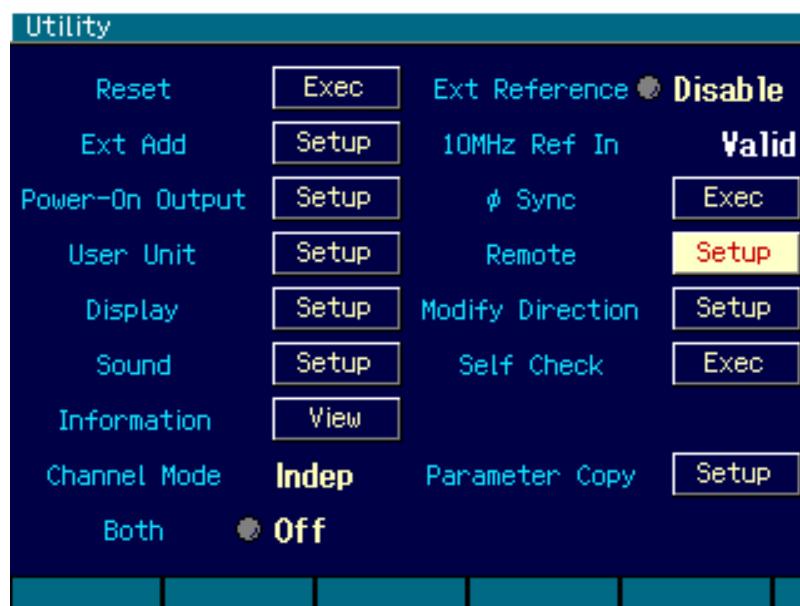
Either GPIB or USB can be used as the interface to be used. The WF1973/WF1974 cannot be controlled from the interface that is not selected. The selected interface is retained even after the power is switched off.

The USB interface is selected at shipping.
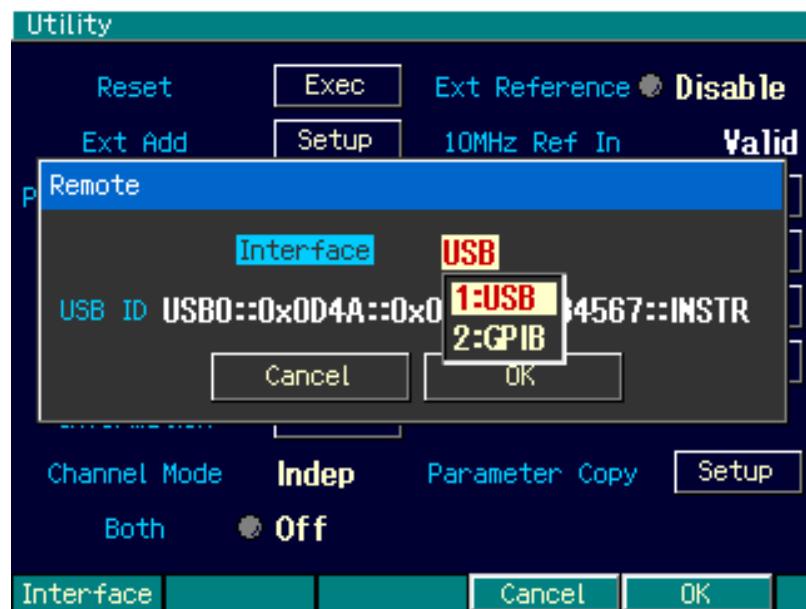
1. From [MENU], select "4:Utility" and then press the [ENTER] key.



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.



4

**⚠CAUTION** When the computer recognizes WF1973/WF1974, if you switch the interface from USB to GPIB or disconnect the USB cable, the computer may exhibit unexpected behavior.
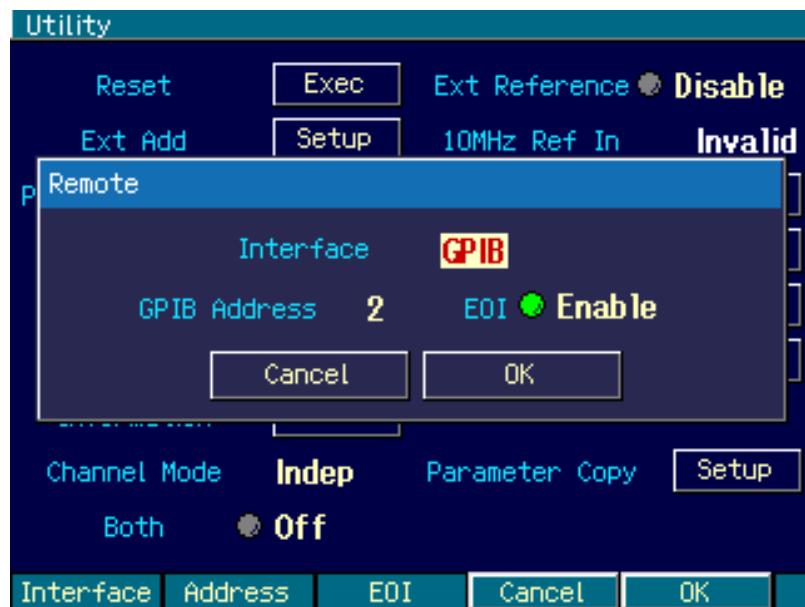
## 1.5 GPIB Address Setting

The GPIB address can be set when the GPIB interface is selected.
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 turned off.
"2" is set at shipping.
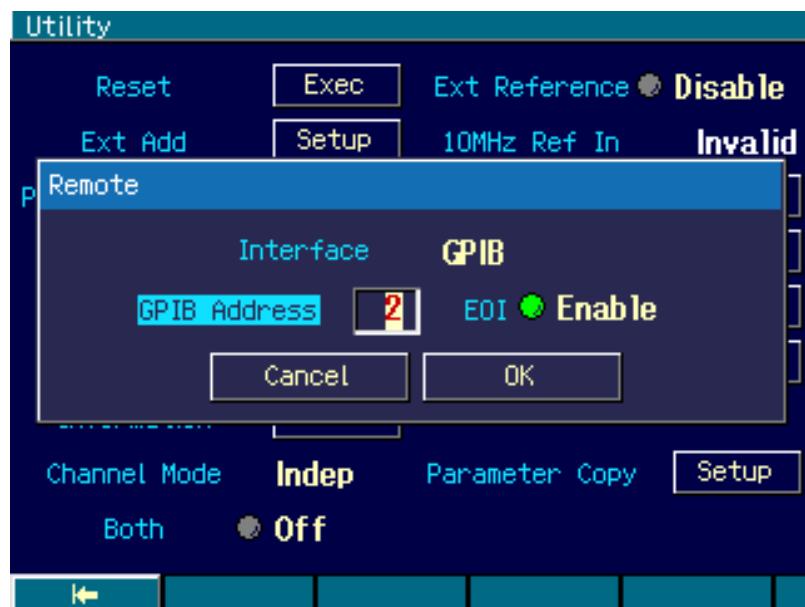
1. Set "Interface" to [GPIB] by performing steps 1 to 3 in "1.4 Selecting the Interface".



2. Select "GPIB Address" and then press the [ENTER] key to display the screen for setting the GPIB address.
   Enter the address by using the numeric keypad on the panel.
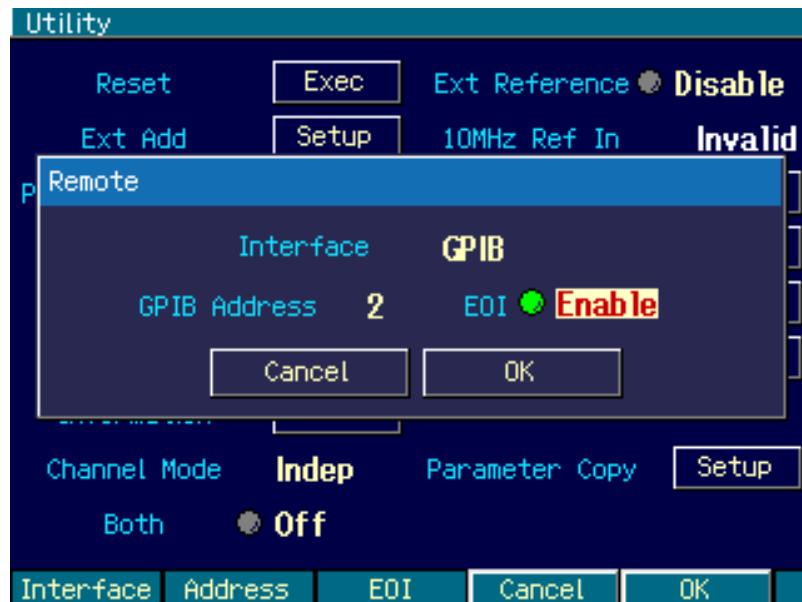
## 1.6     GPIB EOI Setting

When you select the GPIB interface, you can switch the message terminator recognized by WF1973/WF1974.
The set value is retained in the memory even when the power is turned off.
"Enable" is set at shipping.

    1.  Set "Interface" to [GPIB] by performing step 1 to 3 in "1.4 Selecting Interface."



    2.  Select "EOI" and then press the [ENTER] key to display the screen for switching the message terminator recognized.

- Enable: Recognizes the EOI signal, run the command that was entered.
- Disable: Recognizes the EOI signal, LF (without EOI signal) or CR+LF (without EOI signal), run the command that was entered. However, it cannot deal with the binary data transfer.

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⚠**CAUTION**    Please use as the EOI setting usually "Enable."

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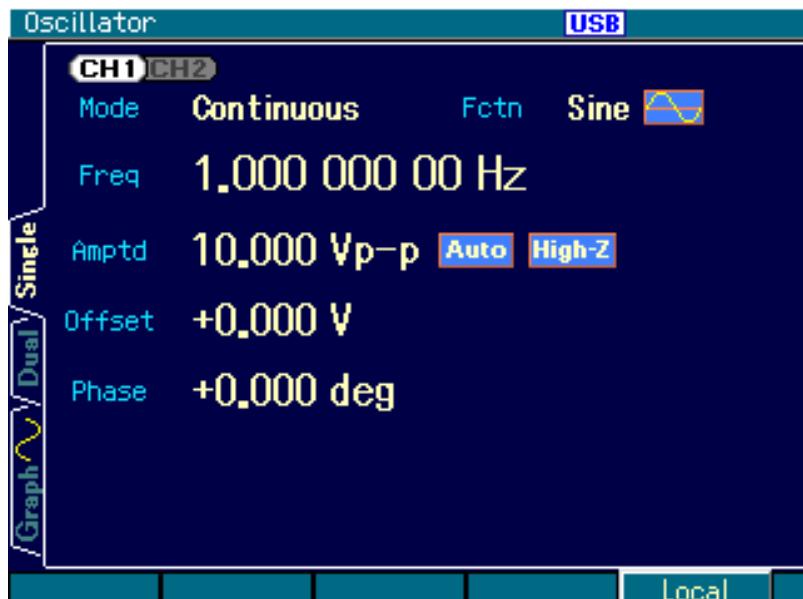
## 1.7　USB ID

If multiple units of WF1973/WF1974are connected within a system via USB, the following numbers are used to enable the application to identify each unit.

- Vendor number : 3402(0x0D4A)
- Product number: 13(0x000D)/WF1973, 14(0x000E)/WF1974
- Serial number　: Product's manufacturing number (serial number)

## 1.8　Releasing Remote State

In the remote control remote state, 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 state 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.

# 1.9    Cautions

- USB and GPIB connectors are located on the rear panel.

- The USB and GPIB interfaces are expected to be used under a relatively stable environment. Avoid using in a place that has power fluctuation or environment with much electrical noise.

- Connect/disconnect the GPIB connector only after powering off all the units connected on the bus.

- When using the GPIB interface, power on all devices connected on the bus.

- The total cable length should be 2 m x (number of units) or 20 m, whichever is the shorter.

- The length of each cable must be 4 m or shorter.

- Check carefully for the GPIB address before setting it. If a duplicate address is set to multiple units within the same system, the equipment may be damaged.

- When using the GPIB interface, set EOI with the controller of the GPIB connected with the equipment.

# 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 other appropriate documents.

## 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.
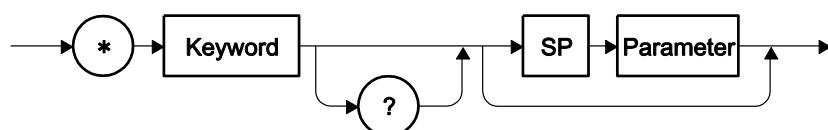


**Figure 2.1. Common Command Syntax**

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.
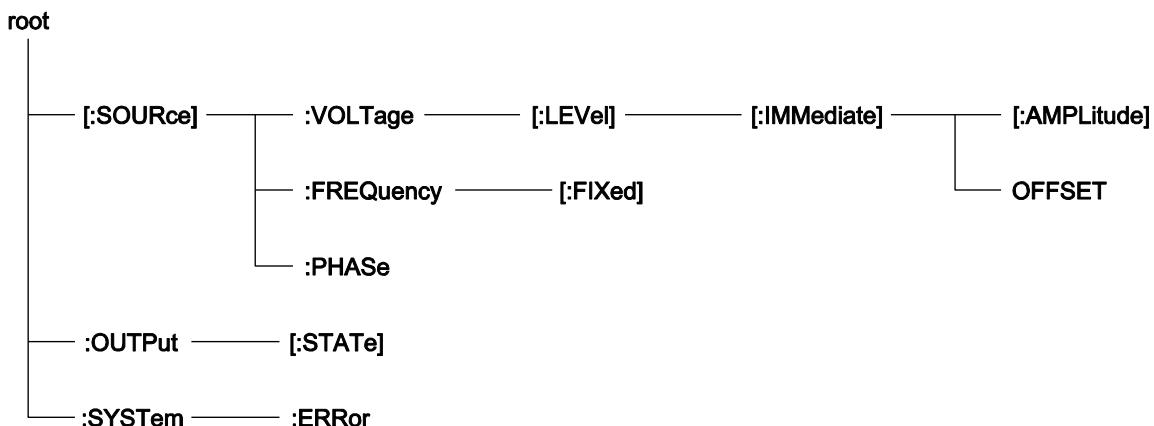

## 2.1.2.3 Command tree of subsystem command

(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

results in an error.
However,

:SOURce:VOLTage 1.0; FREQuency:FIXed 1000.0

does not result in an error.

## 2.1.2.4 Subsystem command syntax

Figure 2.3 shows the syntax of subsystem commands.
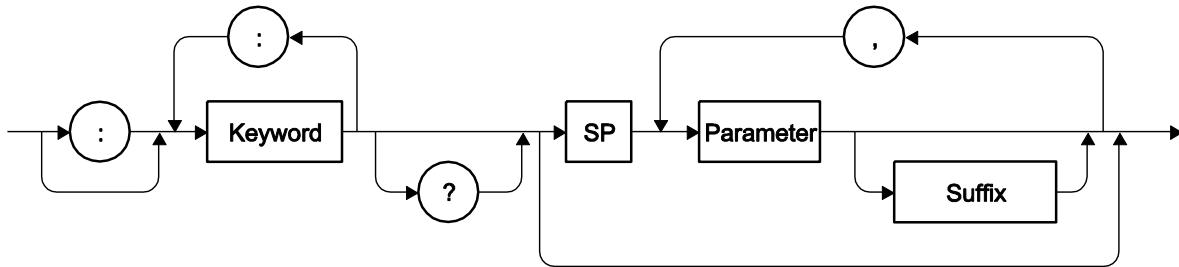


**Figure 2.3. Subsystem Command Syntax**

(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 used 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:
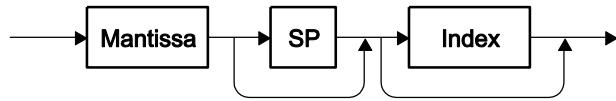
:OUTPut1:STATe ON
:OUTPut:STATe ON

(E) Parameters

The parameter types are as follows.
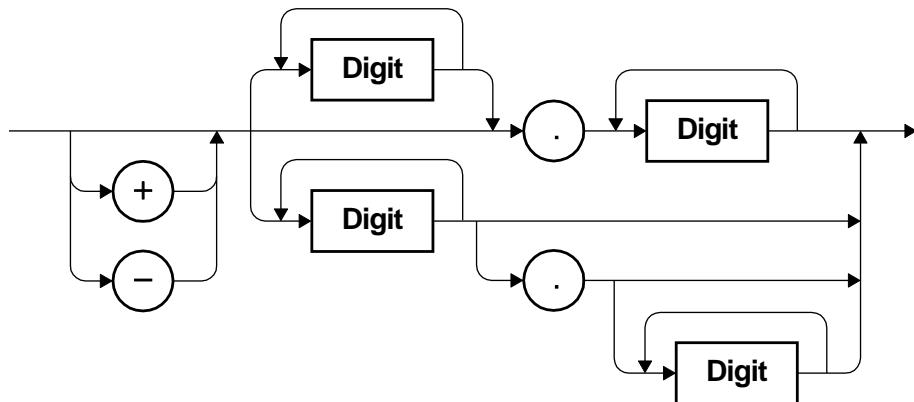
(1) Numeric parameter (<REAL>, <INT>)
The numeric parameter syntax is shown in Figure 2.4.
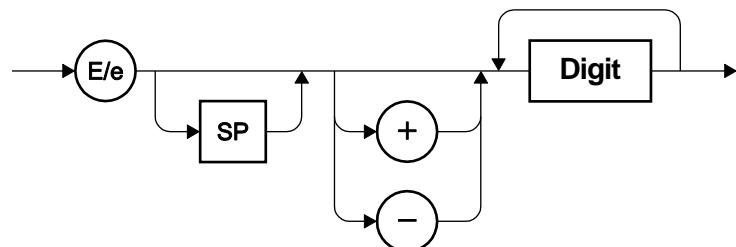


**Figure 2.4. Numeric Parameter (<REAL>, <INT>) Syntax**

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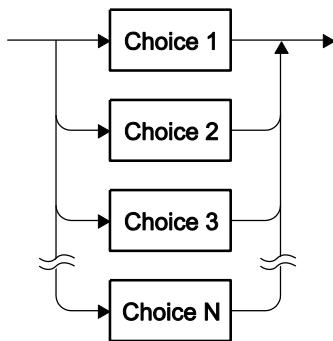


**Figure 2.5. Mantissa Syntax**



**Figure 2.6. Index Syntax**
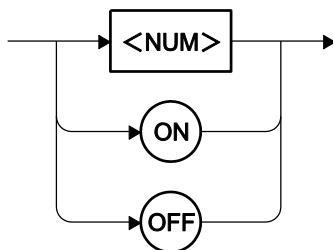
(2) Discrete parameter (<DISC>)
The discrete parameter syntax is shown in Figure 2.7.



**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.
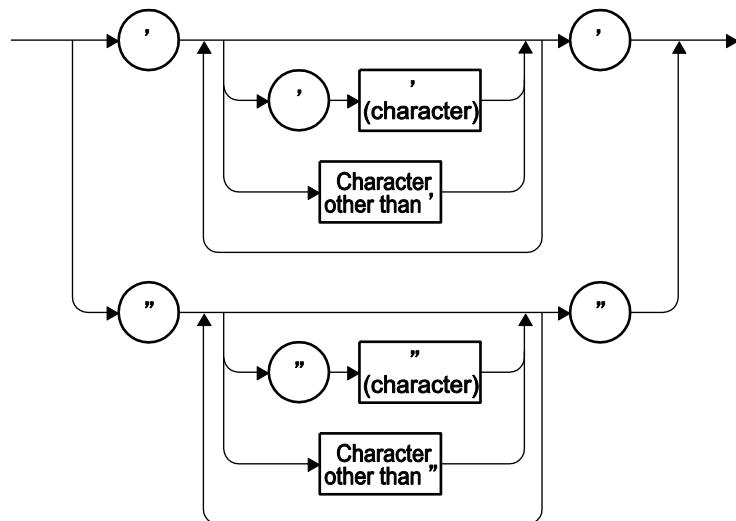


**Figure 2.9. Character String Parameter (<STR>) Syntax**

(5) Block parameter (<BLK>)
The block parameter syntax is shown in Figure 2.10.
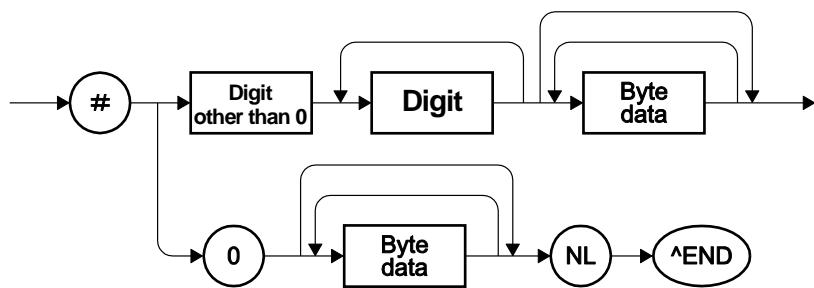


**Figure 2.10. Block Parameter (<BLK>) Syntax**

NL is a line feed (ASCII code 10), and ^END is an EOI asserted at the last byte.
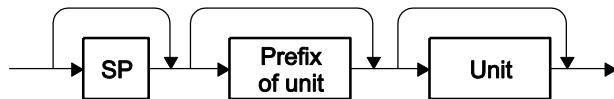
(F) Parameter separator
The parameter separator is used for commands that have two or more parameters, and serves as a separator between parameters.

(G) Query paramter
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 as a query parameter, the settable minimum value or settable maximum value can be queried, respectively.

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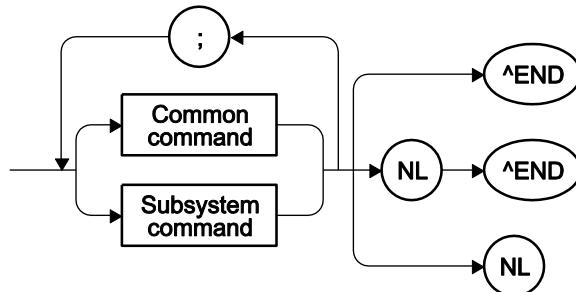
:SOURce1:VOLTage:AMPLitude:UNIT VRMS        Sets amplitude unit to Vrms
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0 Sets amplitude to 2.0 Vrms
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 2.0VPP    Sets amplitude to 2.0 Vp-p


## 2.1.2.5 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 (;).

## 2.1.2.6 Response message syntax

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

(A) Response message syntax

The response message syntax is shown in Figure 2.13.
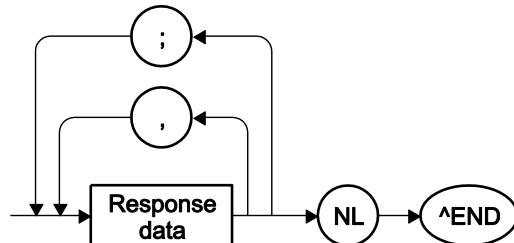


**Figure 2.13. Response Message Syntax**

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) Resoponse 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.
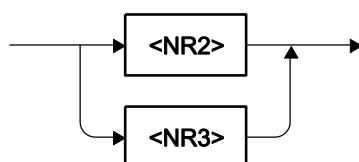


**Figure 2.14. Real Number Response Data (<REAL>) Syntax**

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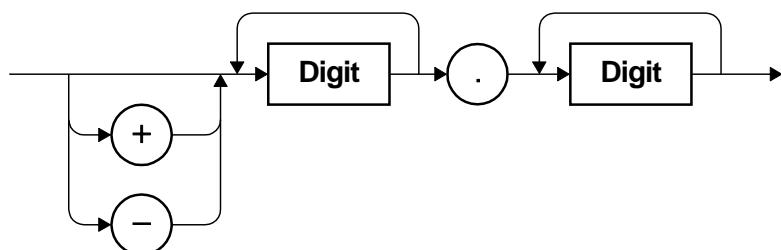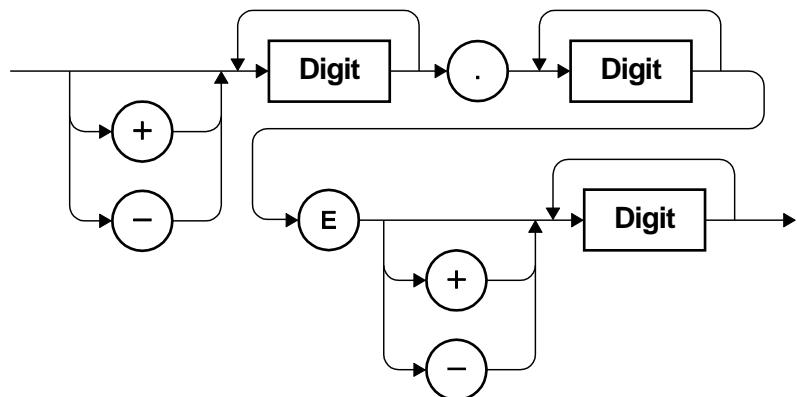


**Figure 2.15. NR2 Real Number Response Data (<NR2>)**
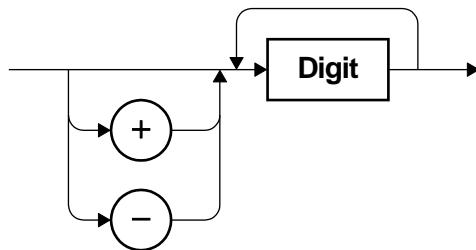
The NR3 real number response data syntax is shown in Figure 2.16.



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

(2) Integer response data (<INT>)
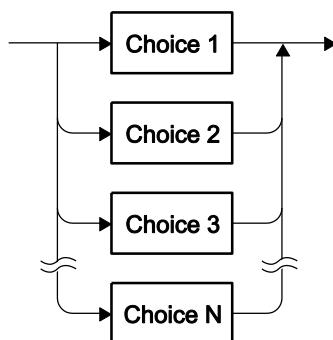
The integer response data syntax is shown in Figure 2.17.



**Figure 2.17. Integer Response Data (<INT>) Syntax**
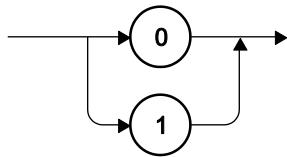
(3) Discrete response data (<DISC>)
The discrete response data syntax is shown in Figure 2.18.



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

(4) Numeric truth value response data (<NBOL>)
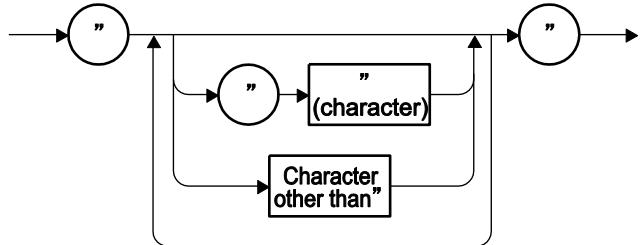
The numeric truth value response data syntax is shown in Figure 2.19.



**Figure 2.19. Numeric Truth Value Response Data (<NBOL>) Syntax**
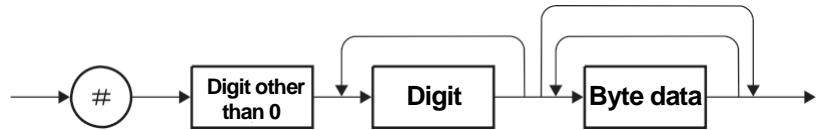
(5) Character string response data (<STR>)
The character string response data syntax is shown in Figure 2.20.



**Figure 2.20. Character String Response Data (<STR>) Syntax**
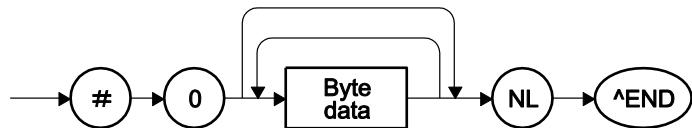
(6) Determined length block response data (<DBLK>)
The determined length block response data syntax is shown in Figure 2.21.



**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 | Refere-nce | Processing Time [ms] Setting/Query USB | GPIB |
|---|---|---|---|---|
| **WF1974** | | | | |
| 2-channel equipment (WF1974) Channel mode setting/query | :CHANnel:MODE | 2.3.1 | 345/10 | 345/10 |
| 2-channel equipment (WF1974) Frequency difference setting/query | :CHANnel:DELTa | 2.3.2 | 250/10 | 250/15 |
| 2-channel equipment (WF1974) Frequency ratio setting/query | :CHANnel:RATio | 2.3.3 | 490/10 | 485/10 |
| 2-channel equipment (WF1974) Same value setting to 2 channels setting/query | :INSTrument:COUPle | 2.3.4 | 20/10 | 20/15 |
| **Output** | | | | |
| Output on/off setting/query | :OUTPut[1\|2][:STATe] | 2.3.5 | 15/10 | 15/15 |
| Output status at power-on setting/query | :OUTPut[1\|2]:PON | 2.3.6 | 220/10 | 335/10 |
| Autorange selection selection/query | [:SOURce[1\|2]]:VOLTage:RANGe:AUTO | 2.3.7 | 70/10 | 70/15 |
| Phase synchronization setting | [:SOURce[1\|2]]:PHASe:INITiate | 2.3.8 | 45/– | 45/– |
| External addition input setting/query | [:SOURce[1\|2]]:COMBine:FEED | 2.3.9 | 65/10 | 65/10 |
| Load impedance setting/query | :OUTPut[1\|2]:LOAD | 2.3.10 | 260/10 | 260/10 |
| **Trigger** | | | | |
| **Sweep** | | | | |
| Trigger operation sweep mode Trigger source selection/query | :TRIGger[1\|2]:SWEep:SOURce | 2.3.11 | 15/10 | 15/15 |
| Trigger operation sweep mode Internal trigger cycle setting/query | :TRIGger[1\|2]:SWEep:TIMer | 2.3.12 | 10/10 | 15/15 |
| Trigger operation sweep mode External trigger signal polarity selection/query | :TRIGger[1\|2]:SWEep:SLOPe | 2.3.13 | 10/10 | 10/10 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
| --- | --- | --- | --- | --- |
| | | | USB | GPIB |
| **Burst** | | | | |
| Trigger operation burst mode Trigger source selection/query | :TRIGger[1\|2]:BURSt:SOURce | 2.3.14 | 10/10 | 10/15 |
| Trigger operation burst mode Internal trigger cycle setting/query | :TRIGger[1\|2]:BURSt:TIMer | 2.3.15 | 10/10 | 15/15 |
| Trigger operation burst mode External trigger signal polarity selection/query | :TRIGger[1\|2]:BURSt:SLOPe | 2.3.16 | 10/10 | 10/10 |
| Manual trigger (TRIG key operation) | *TRG | 2.3.17 | 10/– | 10/– |
| Manual trigger (TRIG key operation) | :TRIGger[1\|2][:SEQuence][:IMMediate] | 2.3.18 | 10/– | 10/– |
| **Control** | | | | |
| Trigger operation execution control setting | :TRIGger[1\|2]:SELected:EXECute | 2.3.19 | 30/- | 30/- |
| **Basic parameter** | | | | |
| **Frequency** | | | | |
| Frequency setting/query | [:SOURce[1\|2]]:FREQuency[:CW\|:FIXed] | 2.3.20 | 45/10 | 45/15 |
| Frequency Unit selection/query | [:SOURce[1\|2]]:FREQuency:UNIT | 2.3.21 | 10/10 | 10/15 |
| Frequency User-defined unit setting/query | [:SOURce[1\|2]]:FREQuency:USER | 2.3.22 | 15/15 | 15/15 |
| **Amplitude** | | | | |
| Amplitude setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] [:AMPLitude] | 2.3.23 | 95/10 | 95/15 |
| Amplitude Unit selection/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] [:AMPLitude]:UNIT | 2.3.24 | 10/10 | 10/15 |
| Amplitude User-defined unit setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] [:AMPLitude]:USER | 2.3.25 | 15/15 | 20/15 |
| **DC offset** | | | | |
| DC offset setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] :OFFSet | 2.3.26 | 95/15 | 95/10 |
| DC offset Unit setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] :OFFSet:UNIT | 2.3.27 | 10/10 | 10/15 |
| DC offset User unit setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate] :OFFSet:USER | 2.3.28 | 15/15 | 20/15 |
| **Phase** | | | | |
| Phase setting/query | [:SOURce[1\|2]]:PHASe[:ADJust] | 2.3.29 | 20/15 | 20/15 |
| Phase Unit selection/query | [:SOURce[1\|2]]:PHASe:UNIT | 2.3.30 | 10/10 | 10/15 |
| Phase User-defined unit setting/query | [:SOURce[1\|2]]:PHASe:USER | 2.3.31 | 15/15 | 15/15 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Output voltage range (Switching setting between amplitude and DC offset)** | | | | |
| Output voltage range<br>High level setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]:HIGH | 2.3.32 | 70/15 | 70/15 |
| Output voltage range<br>High level Unit selection/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT | 2.3.33 | 10/10 | 10/15 |
| Output voltage range<br>Low level setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]:LOW | 2.3.34 | 145/15 | 145/20 |
| Output voltage range<br>Low level Unit selection/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT | 2.3.35 | 10/10 | 10/15 |
| **Square/pulse wave shared commands** | | | | |
| Square/pulse wave shared commands<br>Duty Unit selection/query | [:SOURce[1\|2]]:PULSe:DCYCle:UNIT | 2.3.36 | 10/15 | 10/15 |
| Square/pulse wave shared commands<br>Duty User-defined unit setting/query | [:SOURce[1\|2]]:PULSe:DCYCle:USER | 2.3.37 | 15/20 | 15/15 |
| **Square wave** | | | | |
| Square wave<br>Duty setting/query | [:SOURce[1\|2]]:FUNCtion:SQUare:DCYCle | 2.3.38 | 20/15 | 20/15 |
| **Pulse wave** | | | | |
| Pulse wave<br>Duty setting/query | [:SOURce[1\|2]]:PULSe:DCYCle | 2.3.39 | 65/15 | 45/20 |
| Pulse wave<br>Pulse width setting/query | [:SOURce[1\|2]]:PULSe:WIDTh | 2.3.40 | 65/10 | 45/20 |
| Pulse wave<br>Rising time setting/query | [:SOURce[1\|2]]:PULSe:TRANsition[:LEADing] | 2.3.41 | 35/10 | 30/15 |
| Pulse wave<br>Falling time setting/query | [:SOURce[1\|2]]:PULSe:TRANsition:TRAiling | 2.3.42 | 25/10 | 25/15 |
| Pulse wave<br>Period setting/query | [:SOURce[1\|2]]:PULSe:PERiod | 2.3.43 | 95/15 | 75/20 |
| Pulse wave<br>Period Unit selection/query | [:SOURce[1\|2]]:PULSe:PERiod:UNIT | 2.3.44 | 10/10 | 10/10 |
| Pulse wave<br>Period User-defined unit setting/query | [:SOURce[1\|2]]:PULSe:PERiod:USER | 2.3.45 | 15/15 | 20/15 |
| **Ramp wave** | | | | |
| Ramp wave<br>Symmetry setting/query | [:SOURce[1\|2]]:FUNCtion:RAMP:SYMMetry | 2.3.46 | 30/10 | 30/15 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Waveform** | | | | |
| Waveform selection/query | [:SOURce[1\|2]]:FUNCtion[:SHAPe] | 2.3.47 | 300/10 | 300/15 |
| Waveform polarity selection/query | :OUTPut[1\|2]:POLarity | 2.3.48 | 100/10 | 100/15 |
| Amplitude range selection/query | :OUTPut[1\|2]:SCALe | 2.3.49 | 100/10 | 100/15 |
| Square wave Extension on/off selection/query | [:SOURce[1\|2]]:FUNCtion:SQUare:EXTend | 2.3.50 | 15/10 | 20/15 |
| **Parameter variable waveform** | | | | |
| Unbalanced sine wave: First-half amplitude setting/query | [:SOURce[1\|2]]:FUNCtion:USINe :AMPLitude[1] | 2.3.51 | 65/10 | 65/15 |
| Unbalanced sine wave: Second-half amplitude setting/query | [:SOURce[1\|2]]:FUNCtion:USINe:AMPLitude2 | 2.3.52 | 60/15 | 60/15 |
| Clipped sine wave: Clip rate setting/query | [:SOURce[1\|2]]:FUNCtion:CSINe:CLIP | 2.3.53 | 25/15 | 30/15 |
| CF controlled sine wave: Crest factor setting/query | [:SOURce[1\|2]]:FUNCtion:CFCSine:CFACtor | 2.3.54 | 30/10 | 30/15 |
| Conduction angle controlled sine wave: Conduction angle setting/query | [:SOURce[1\|2]]:FUNCtion:ACSine:ANGLe | 2.3.55 | 25/10 | 30/15 |
| Staircase sine wave: Number of steps setting/query | [:SOURce[1\|2]]:FUNCtion:SSINe:STEPs | 2.3.56 | 90/10 | 90/15 |
| Multi-cycle sine wave: Number of cycles setting/query | [:SOURce[1\|2]]:FUNCtion: MCSine:CYCLes | 2.3.57 | 35/15 | 35/15 |
| Multi-cycle sine wave: Start phase setting/query | [:SOURce[1\|2]]:FUNCtion:MCSine:PHASe | 2.3.58 | 35/15 | 35/15 |
| On-phase controlled sine wave: Complete-on phase setting/query | [:SOURce[1\|2]]:FUNCtion:ONPSine:ONPHase | 2.3.59 | 25/15 | 30/15 |
| On-phase controlled sine wave: On-slope time setting/query | [:SOURce[1\|2]]:FUNCtion:ONPSine:STIMe | 2.3.60 | 25/15 | 30/15 |
| Off-phase controlled sine wave: Off-phase setting/query | [:SOURce[1\|2]]:FUNCtion:OFPSine:OFPHase | 2.3.61 | 25/15 | 25/15 |
| Off-phase controlled sine wave: Off-slope time setting/query | [:SOURce[1\|2]]:FUNCtion:OFPSine:STIMe | 2.3.62 | 20/10 | 20/10 |
| Chattering-on sine wave: On-phase setting/query | [:SOURce[1\|2]]:FUNCtion:CONSine:ONPHase | 2.3.63 | 25/15 | 25/15 |
| Chattering-on sine wave: Number of chattering setting/query | [:SOURce[1\|2]]:FUNCtion:CONSine :NCHattering | 2.3.64 | 25/10 | 25/15 |
| Chattering-on sine wave: On-state time setting/query | [:SOURce[1\|2]]:FUNCtion:CONSine:TON | 2.3.65 | 25/10 | 30/15 |
| Chattering-on sine wave: Off-state time setting/query | [:SOURce[1\|2]]:FUNCtion:CONSine:TOFF | 2.3.66 | 25/10 | 30/15 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Chattering-off sine wave: Off-phase setting/query | [:SOURce[1\|2]]:FUNCtion:COFSine:OFPHase | 2.3.67 | 25/15 | 25/15 |
| Chattering-off sine wave: Number of chattering setting/query | [:SOURce[1\|2]]:FUNCtion:COFSine :NCHattering | 2.3.68 | 20/10 | 20/15 |
| Chattering-off sine wave: On-state time setting/query | [:SOURce[1\|2]]:FUNCtion:COFSine:TON | 2.3.69 | 20/10 | 20/15 |
| Chattering-off sine wave: Off-state time setting/query | [:SOURce[1\|2]]:FUNCtion:COFSine:TOFF | 2.3.70 | 20/10 | 20/15 |
| Gaussian pulse: Standard deviation setting/query | [:SOURce[1\|2]]:FUNCtion:GAUSsian:SIGMa | 2.3.71 | 30/10 | 30/15 |
| Lorentz pulse: Half value of width setting/query | [:SOURce[1\|2]]:FUNCtion:LORentz:HWIDth | 2.3.72 | 30/10 | 30/15 |
| Haversine: Width setting/query | [:SOURce[1\|2]]:FUNCtion:HAVersine:WIDTh | 2.3.73 | 85/10 | 85/15 |
| Half-sine pulse Width setting/query | [:SOURce[1\|2]]:FUNCtion:HSPulse:WIDTh | 2.3.74 | 80/15 | 80/15 |
| Trapezoid pulse: Slope width setting/query | [:SOURce[1\|2]]:FUNCtion:TPULse:RFALl | 2.3.75 | 20/15 | 20/15 |
| Trapezoid pulse: Upper base width setting/query | [:SOURce[1\|2]]:FUNCtion:TPULse:UBASe | 2.3.76 | 25/10 | 20/15 |
| Sin(x)/x: Number of zero crossings setting/query | [:SOURce[1\|2]]:FUNCtion:SINC:ZCRossing | 2.3.77 | 40/10 | 40/15 |
| Exponential rise: Time constant setting/query | [:SOURce[1\|2]]:FUNCtion:ERISe:TCONstant | 2.3.78 | 30/15 | 30/15 |
| Exponential fall: Time constant setting/query | [:SOURce[1\|2]]:FUNCtion:EFALl:TCONstant | 2.3.79 | 15/15 | 15/15 |
| Second order LPF step response: Natural frequency setting/query | [:SOURce[1\|2]]:FUNCtion:SOLStep :NFRequency | 2.3.80 | 35/10 | 35/15 |
| Second order LPF step response: Q setting/query | [:SOURce[1\|2]]:FUNCtion:SOLStep:Q | 2.3.81 | 30/10 | 30/15 |
| Damped oscillation: Oscillation frequency setting/query | [:SOURce[1\|2]]:FUNCtion:DOSCillation :OFRequency | 2.3.82 | 40/15 | 40/15 |
| Damped oscillation: Damping time constant setting/query | [:SOURce[1\|2]]:FUNCtion:DOSCillation :DTConstant | 2.3.83 | 30/15 | 30/15 |
| Oscillation surge: Oscillation frequency setting/query | [:SOURce[1\|2]]:FUNCtion:OSURge :OFRequency | 2.3.84 | 170/15 | 170/15 |
| Oscillation surge: Damping time constant setting/query | [:SOURce[1\|2]]:FUNCtion:OSURge :DTConstant | 2.3.85 | 170/15 | 170/15 |
| Oscillation surge: Trailing time constant setting/query | [:SOURce[1\|2]]:FUNCtion:OSURge:TTConstant | 2.3.86 | 170/15 | 170/15 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Pulse surge: Rising time setting/query | [:SOURce[1\|2]]:FUNCtion:PSURge:TR | 2.3.87 | 30/10 | 30/15 |
| Pulse surge: Duration time setting/query | [:SOURce[1\|2]]:FUNCtion:PSURge:TD | 2.3.88 | 30/15 | 30/15 |
| Trapezoid with offset: Leading delay setting/query | [:SOURce[1\|2]]:FUNCtion:TOFFset:DELay | 2.3.89 | 20/15 | 20/15 |
| Trapezoid with offset: Rising-slope width setting/query | [:SOURce[1\|2]]:FUNCtion:TOFFset:RISe | 2.3.90 | 20/10 | 20/15 |
| Trapezoid with offset: Upper base width setting/query | [:SOURce[1\|2]]:FUNCtion:TOFFset:UBASe | 2.3.91 | 20/10 | 20/15 |
| Trapezoid with offset: Falling-slope width setting/query | [:SOURce[1\|2]]:FUNCtion:TOFFset:FALL | 2.3.92 | 20/15 | 20/15 |
| Trapezoid with offset: Offset setting/query | [:SOURce[1\|2]]:FUNCtion:TOFFset:OFFSet | 2.3.93 | 20/10 | 20/15 |
| Half-sine edge pulse: Leading-edge time setting/query | [:SOURce[1\|2]]:FUNCtion:HSEPulse:LE | 2.3.94 | 25/10 | 25/15 |
| Half-sine edge pulse: Trailing-edge time setting/query | [:SOURce[1\|2]]:FUNCtion:HSEPulse:TE | 2.3.95 | 25/10 | 25/15 |
| Half-sine edge pulse: Duty setting/query | [:SOURce[1\|2]]:FUNCtion:HSEPulse:DCYCle | 2.3.96 | 20/10 | 20/15 |
| Bottom referenced ramp wave: Symmetry setting/query | [:SOURce[1\|2]]:FUNCtion:BRRAMp :SYMMetry | 2.3.97 | 20/10 | 20/15 |
| **Arbitrary waveform** | | | | |
| Arbitrary waveform    selection/query | [:SOURce[1\|2]]:FUNCtion:USER | 2.3.98 | 25/10 | 25/15 |
| **Arbitrary waveform memory** | | | | |
| Arbitrary waveform memory Arbitrary waveform data transfer/read out | {:TRACe\|:DATA}[:DATA]  Array format    (4K-Word)  Array format (512K-Word)  Control point format (10-point)  Control point format (10000-point) | 2.3.99 | 450/50 28000/ 7000 250/20 2200/ 150 | 820/150 41000/ 22000 370/25 3100/ 1200 |
| Arbitrary waveform memory Store | {:TRACe\|:DATA}:STORe | 2.3.100 | 540/– | 660/– |
| Arbitrary waveform memory Recall | {:TRACe\|:DATA}:RECall | 2.3.101 | 50/– | 50/– |
| Arbitrary waveform memory Copy | {:TRACe\|:DATA}:COPY | 2.3.102 | 380/– | 540/– |
| Arbitrary waveform memory Delete | {:TRACe\|:DATA}:DELete | 2.3.103 | 600/– | 620/– |
| Arbitrary waveform memory information acquisition | {:TRACe\|:DATA}:INFormation? | 2.3.104 | –/35 | –/20 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Continuous oscillation** | | | | |
| Continuous oscillation mode selection | [:SOURce[1\|2]]:CONTinuous[:IMMediate] | 2.3.105 | 90/– | 90/– |
| Continuous oscillation mode query | [:SOURce[1\|2]]:CONTinuous:STATe? | 2.3.106 | –/10 | –/15 |
| **Modulation** | | | | |
| **FSK** | | | | |
| Modulated oscillation mode FSK selection/query | [:SOURce[1\|2]]:FSKey:STATe | 2.3.107 | 100/10 | 100/15 |
| Modulated oscillation mode FSK Hop frequency setting/query | [:SOURce[1\|2]]:FSKey[:FREQuency] | 2.3.108 | 10/15 | 10/15 |
| Modulated oscillation mode FSK Modulation source selection/query | [:SOURce[1\|2]]:FSKey:SOURce | 2.3.109 | 10/10 | 15/15 |
| Modulated oscillation mode FSK Moduation frequency setting/query | [:SOURce[1\|2]]:FSKey:INTernal:FREQuency | 2.3.110 | 20/15 | 20/15 |
| Modulated oscillation mode FSK Sync output selection/query | :OUTPut[1\|2]:SYNC:FSKey:TYPE | 2.3.111 | 10/10 | 10/10 |
| **PSK** | | | | |
| Modulated oscillation mode PSK selection/query | [:SOURce[1\|2]]:PSKey:STATe | 2.3.112 | 100/10 | 100/15 |
| Modulated oscillation mode PSK Deviation setting/query | [:SOURce[1\|2]]:PSKey[:DEViation] | 2.3.113 | 10/10 | 10/15 |
| Modulated oscillation mode PSK Modulation source selection/query | [:SOURce[1\|2]]:PSKey:SOURce | 2.3.114 | 20/10 | 20/15 |
| Modulated oscillation mode PSK Modulation frequency setting/query | [:SOURce[1\|2]]:PSKey:INTernal:FREQuency | 2.3.115 | 20/10 | 20/15 |
| Modulated oscillation mode PSK Sync output selection/query | :OUTPut[1\|2]:SYNC:PSKey:TYPE | 2.3.116 | 10/10 | 10/15 |
| **FM** | | | | |
| Modulated oscillation mode FM selection/query | [:SOURce[1\|2]]:FM:STATe | 2.3.117 | 100/10 | 100/10 |
| Modulated oscillation mode FM Peak deviation setting/query | [:SOURce[1\|2]]:FM[:DEViation] | 2.3.118 | 25/15 | 10/15 |
| Modulated oscillation mode FM Modulation source election/query | [:SOURce[1\|2]]:FM:SOURce | 2.3.119 | 15/10 | 15/10 |
| Modulated oscillation mode FM Modulation frequency setting/query | [:SOURce[1\|2]]:FM:INTernal:FREQuency | 2.3.120 | 15/10 | 20/15 |
| Modulated oscillation mode FM Modulation waveform selection/query | [:SOURce[1\|2]]:FM:INTernal:FUNCtion [:SHAPe] | 2.3.121 | 10/10 | 10/15 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Modulated oscillation mode FM Arbitrary waveform of modulation waveform | [:SOURce[1\|2]]:FM:INTernal:FUNCtion:USER | 2.3.122 | 25/10 | 35/15 |
| Modulated oscillation mode FM Sync output selection/query | :OUTPut[1\|2]:SYNC:FM:TYPE | 2.3.123 | 10/10 | 10/15 |
| **PM** | | | | |
| Modulated oscillation mode PM selection/query | [:SOURce[1\|2]]:PM:STATe | 2.3.124 | 100/10 | 100/15 |
| Modulated oscillation mode PM Peak deviation setting/query | [:SOURce[1\|2]]:PM[:DEViation] | 2.3.125 | 20/10 | 20/15 |
| Modulated oscillation mode PM Modulation source selection/query | [:SOURce[1\|2]]:PM:SOURce | 2.3.126 | 10/10 | 20/10 |
| Modulated oscillation mode PM Modulation frequency setting/query | [:SOURce[1\|2]]:PM:INTernal:FREQuency | 2.3.127 | 15/10 | 20/15 |
| Modulated oscillation mode PM Modulation waveform selection/query | [:SOURce[1\|2]]:PM:INTernal:FUNCtion [:SHAPe] | 2.3.128 | 10/10 | 10/15 |
| Modulated oscillation mode PM Arbitrary waveform of modulation waveform selection/query | [:SOURce[1\|2]]:PM:INTernal:FUNCtion:USER | 2.3.129 | 25/10 | 35/15 |
| Modulated oscillation mode PM Sync output selection/query | :OUTPut[1\|2]:SYNC:PM:TYPE | 2.3.130 | 10/10 | 15/15 |
| **AM** | | | | |
| Modulated oscillation mode AM selection/query | [:SOURce[1\|2]]:AM:STATe | 2.3.131 | 100/10 | 100/10 |
| Modulated oscillation mode AM Modulation depth setting/query | [:SOURce[1\|2]]:AM[:DEPTh] | 2.3.132 | 10/10 | 15/15 |
| Modulated oscillation modeAM Modulation source selection/query | [:SOURce[1\|2]]:AM:SOURce | 2.3.133 | 10/10 | 15/15 |
| Modulated oscillation mode AM Modulation frequency setting/query | [:SOURce[1\|2]]:AM:INTernal:FREQuency | 2.3.134 | 20/10 | 20/15 |
| Modulated oscillation mode AM Modulation waveform selection/query | [:SOURce[1\|2]]:AM:INTernal:FUNCtion [:SHAPe] | 2.3.135 | 10/10 | 10/10 |
| Modulated oscillation mode AM Arbitrary waveform of modulation waveform selection/query | [:SOURce[1\|2]]:AM:INTernal:FUNCtion:USER | 2.3.136 | 25/10 | 25/15 |
| Modulated oscillation mode AM Sync output selection/query | :OUTPut[1\|2]:SYNC:AM:TYPE | 2.3.137 | 10/10 | 10/10 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **AM(DSB-SC)** | | | | |
| Modulated oscillation mode AM(DSB-SC) selection/query | [:SOURce[1\|2]]:AMSC:STATe | 2.3.138 | 100/10 | 100/10 |
| Modulated oscillation mode AM (DSB-SC) Modulation depth setting/query | [:SOURce[1\|2]]:AMSC[:DEPTh] | 2.3.139 | 10/10 | 10/15 |
| Modulated oscillation mode AM (DSB-SC) Modulation source selection/query | [:SOURce[1\|2]]:AMSC:SOURce | 2.3.140 | 10/10 | 15/10 |
| Modulated oscillation mode AM (DSB-SC) Modulation frequency setting/query | [:SOURce[1\|2]]:AMSC:INTernal:FREQuency | 2.3.141 | 20/10 | 20/15 |
| Modulated oscillation mode AM (DSB-SC) Modulation waveform selection/query | [:SOURce[1\|2]]:AMSC:INTernal:FUNCtion [:SHAPe] | 2.3.142 | 10/10 | 10/10 |
| Modulated oscillation mode AM (DSB-SC) Arbitrary waveform of modulation waveform selection/query | [:SOURce[1\|2]]:AMSC:INTernal:FUNCtion :USER | 2.3.143 | 25/10 | 30/15 |
| Modulated oscillation mode AM (DSB-SC) Sync output selection/query | :OUTPut[1\|2]:SYNC:AMSC:TYPE | 2.3.144 | 10/10 | 10/10 |
| **DC offset modulation** | | | | |
| Modulated oscillation mode DC offset modulation selection/query | [:SOURce[1\|2]]:OFSM:STATe | 2.3.145 | 100/10 | 100/20 |
| Modulated oscillation mode DC offset modulation Peak deviation setting/query | [:SOURce[1\|2]]:OFSM[:DEViation] | 2.3.146 | 65/15 | 65/15 |
| Modulated oscillation mode DC offset modulation Modulation source selection/query | [:SOURce[1\|2]]:OFSM:SOURce | 2.3.147 | 10/10 | 15/10 |
| Modulated oscillation mode DC offset modulation Modulation frequency setting/query | [:SOURce[1\|2]]:OFSM:INTernal:FREQuency | 2.3.148 | 15/15 | 15/15 |
| Modulated oscillation mode DC offset modulation Modulation waveform selection/query | [:SOURce[1\|2]]:OFSM:INTernal:FUNCtion [:SHAPe] | 2.3.149 | 10/10 | 10/10 |
| Modulated oscillation mode DCoffset modulation Arbitrary waveform of modulation waveform selection/query | [:SOURce[1\|2]]:OFSM:INTernal:FUNCtion :USER | 2.3.150 | 25/10 | 25/15 |
| Modulated oscillation mode DC offset modulation Sync output selection/query | :OUTPut[1\|2]:SYNC:OFSM:TYPE | 2.3.151 | 10/10 | 10/10 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **PWM** | | | | |
| Modulated oscillation mode PWM selection/query | [:SOURce[1\|2]]:PWM:STATe | 2.3.152 | 120/10 | 120/10 |
| Modulated oscillation mode PWM Peak deviation setting/query | [:SOURce[1\|2]]:PWM[:DEViation]:DCYCle | 2.3.153 | 25/15 | 25/15 |
| Modulated oscillation mode PWM Modulation source selection/query | [:SOURce[1\|2]]:PWM:SOURce | 2.3.154 | 10/10 | 15/10 |
| Modulated oscillation mode PWM Modulation frequency setting/query | [:SOURce[1\|2]]:PWM:INTernal:FREQuency | 2.3.155 | 15/15 | 15/15 |
| Modulated oscillation mode PWM Modulation waveform selection/query | [:SOURce[1\|2]]:PWM:INTernal:FUNCtion [:SHAPe] | 2.3.156 | 10/10 | 10/15 |
| Modulated oscillation mode PWM Arbitrary waveform of modulation waveform selection/query | [:SOURce[1\|2]]:PWM:INTernal:FUNCtion :USER | 2.3.157 | 25/10 | 25/15 |
| Modulated oscillation mode PWM Sync output selection/query | :OUTPut[1\|2]:SYNC:PWM:TYPE | 2.3.158 | 10/10 | 10/10 |
| **Sweep** | | | | |
| **Sweep mode selection** | | | | |
| Sweep oscillation mode Sweep selection/query | [:SOURce[1\|2]]:SWEep:MODE | 2.3.159 | 15/10 | 15/15 |
| Basic sweep setting Sweep slope selection/query | [:SOURce[1\|2]]:SWEep:SPACing | 2.3.160 | 10/10 | 10/15 |
| Basic sweep setting Sweep direction selection/query | [:SOURce[1\|2]]:SWEep:INTernal:FUNCtion | 2.3.161 | 10/10 | 10/15 |
| Basic sweep setting Sweep time setting/query | [:SOURce[1\|2]]:SWEep:TIME | 2.3.162 | 15/10 | 10/15 |
| Basic sweep setting Stop level setting/query | [:SOURce[1\|2]]:SWEep:SLEVel | 2.3.163 | 10/10 | 10/15 |
| Basic sweep setting Stop level selection/query | [:SOURce[1\|2]]:SWEep:SLEVel:STATe | 2.3.164 | 10/10 | 10/15 |
| Basic sweep setting oscillation stop unit setting/query | [:SOURce[1\|2]]:SWEep:OSTop | 2.3.165 | 10/10 | 10/15 |
| Basic sweep setting Multiconnector control on/off selection/query | [:SOURce[1\|2]]:SWEep:MCONnector:STATe | 2.3.166 | 10/10 | 10/15 |
| Basic sweep setting Sync output selection/query | :OUTPut[1\|2]:SYNC:SWEep:TYPE | 2.3.167 | 10/10 | 10/15 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Frequency sweep** | | | | |
| Sweep oscillation mode Frequency sweep selection/query | [:SOURce[1|2]]:FREQuency:MODE | 2.3.168 | 180/10 | 180/15 |
| Frequency sweep Start value setting/query | [:SOURce[1|2]]:FREQuency:STARt | 2.3.169 | 20/15 | 20/15 |
| Frequency sweep Stop value setting/query | [:SOURce[1|2]]:FREQuency:STOP | 2.3.170 | 20/15 | 20/15 |
| Frequency sweep Center value setting/query | [:SOURce[1|2]]:FREQuency:CENTer | 2.3.171 | 20/15 | 20/15 |
| Frequency sweep Span value setting/query | [:SOURce[1|2]]:FREQuency:SPAN | 2.3.172 | 20/15 | 20/15 |
| Frequency sweep Marker value setting/query | [:SOURce[1|2]]:MARKer:FREQuency | 2.3.173 | 15/15 | 15/15 |
| Frequency sweep Start/stop value swapping setting | [:SOURce[1|2]]:FREQuency:SWAP | 2.3.174 | 25/– | 15/– |
| Frequency sweep Start/stop value output setting | [:SOURce[1|2]]:FREQuency:STATe | 2.3.175 | 10/– | 15/– |
| **Phase sweep** | | | | |
| Sweep oscillation mode Phase sweep selection/query | [:SOURce[1|2]]:PHASe:MODE | 2.3.176 | 190/10 | 190/15 |
| Phase sweep Start value setting/query | [:SOURce[1|2]]:PHASe:STARt | 2.3.177 | 20/15 | 20/15 |
| Phase sweep Stop value setting/query | [:SOURce[1|2]]:PHASe:STOP | 2.3.178 | 20/15 | 20/15 |
| Phase sweep Center value setting/query | [:SOURce[1|2]]:PHASe:CENTer | 2.3.179 | 20/15 | 20/15 |
| Phase sweep Span value setting/query | [:SOURce[1|2]]:PHASe:SPAN | 2.3.180 | 20/15 | 20/15 |
| Phase sweep Marker value setting/query | [:SOURce[1|2]]:MARKer:PHASe | 2.3.181 | 15/15 | 15/15 |
| Phase sweep Start/stop value swapping setting | [:SOURce[1|2]]:PHASe:SWAP | 2.3.182 | 15/– | 20/– |
| Phase sweep Start/stop value output setting | [:SOURce[1|2]]:PHASe:STATe | 2.3.183 | 10/– | 15/– |
| **Amplitude sweep** | | | | |
| Sweep oscillation mode Amplitude sweep selection/query | [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE | 2.3.184 | 230/15 | 230/20 |
| Amplitude sweep Start value setting/query | [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt | 2.3.185 | 20/15 | 20/20 |

| Function | Command | Refere- nce | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Amplitude sweep<br>Stop value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>[:AMPLitude]:STOP | 2.3.186 | 20/15 | 20/20 |
| Amplitude sweep<br>Center value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>[:AMPLitude]:CENTer | 2.3.187 | 20/15 | 25/20 |
| Amplitude sweep<br>Span value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>[:AMPLitude]:SPAN | 2.3.188 | 20/15 | 20/20 |
| Amplitude sweep<br>Marker value setting/query | [:SOURce[1\|2]]:MARKer:VOLTage[:LEVel]<br>[:IMMediate][:AMPLitude] | 2.3.189 | 20/15 | 20/20 |
| Amplitude sweep<br>Start/stop value swapping setting | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>[:AMPLitude]:SWAP | 2.3.190 | 20/– | 20/– |
| Amplitude sweep<br>Start/stop value output setting | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>[:AMPLitude]:STATe | 2.3.191 | 15/– | 15/– |
| **DC offset sweep** | | | | |
| Sweep oscillation mode<br>DC offset sweep selection/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:MODE | 2.3.192 | 230/15 | 230/20 |
| DC offset sweep<br>Start value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:STARt | 2.3.193 | 20/20 | 20/20 |
| DC offset sweep<br>Stop value | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:STOP | 2.3.194 | 20/15 | 20/20 |
| DC offset sweep<br>Center value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:CENTer | 2.3.195 | 20/15 | 20/20 |
| DC offset sweep<br>Span value setting/query | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:SPAN | 2.3.196 | 20/15 | 20/20 |
| DC offset sweep<br>Marker value setting/query | [:SOURce[1\|2]]:MARKer:VOLTage[:LEVel]<br>[:IMMediate]:OFFSet | 2.3.197 | 15/20 | 15/20 |
| DC offset sweep<br>Start/stop value swapping setting | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:SWAP | 2.3.198 | 20/– | 20/– |
| DC offset sweep<br>Start/stop value output setting | [:SOURce[1\|2]]:VOLTage[:LEVel][:IMMediate]<br>:OFFSet:STATe | 2.3.199 | 15/– | 15/– |
| **Duty sweep** | | | | |
| Sweep oscillation mode<br>Duty sweep<br>selection/query | [:SOURce[1\|2]]:PULSe:DCYCle:MODE | 2.3.200 | 250/15 | 250/15 |
| Duty sweep<br>Start value setting/query | [:SOURce[1\|2]]:PULSe:DCYCle:STARt | 2.3.201 | 20/15 | 20/15 |
| Duty sweep<br>Stop value setting/query | [:SOURce[1\|2]]:PULSe:DCYCle:STOP | 2.3.202 | 20/15 | 20/15 |
| Duty sweep<br>Center value setting/query | [:SOURce[1\|2]]:PULSe:DCYCle:CENTer | 2.3.203 | 20/15 | 20/15 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Duty sweep<br>Span value setting/query | [:SOURce[1\|2]]:PULSe:DCYCle:SPAN | 2.3.204 | 20/15 | 20/15 |
| Duty sweep<br>Marker value setting/query | [:SOURce[1\|2]]:MARKer:PULSe:DCYCle | 2.3.205 | 20/15 | 20/15 |
| Duty sweep<br>Start/stop value swapping setting | [:SOURce[1\|2]]:PULSe:DCYCle:SWAP | 2.3.206 | 20/– | 20/– |
| Duty sweep<br>Start/stop value output settiing | [:SOURce[1\|2]]:PULSe:DCYCle:STATe | 2.3.207 | 10/– | 10/– |
| **Burst** | | | | |
| **Burst oscillation** | | | | |
| Burst oscillation mode<br>Selection/query | [:SOURce[1\|2]]:BURSt:STATe | 2.3.208 | 100/10 | 100/10 |
| Burst oscillation<br>Burst mode selection/query | [:SOURce[1\|2]]:BURSt:MODE | 2.3.209 | 10/10 | 10/10 |
| Burst oscillation<br>Stop level setting/query | [:SOURce[1\|2]]:BURSt:SLEVel | 2.3.210 | 10/10 | 10/15 |
| Burst oscillation<br>Stop level selection/query | [:SOURce[1\|2]]:BURSt:SLEVel:STATe | 2.3.211 | 10/10 | 10/10 |
| Burst oscillation<br>Sync output selection/query | :OUTPut[1\|2]:SYNC:BURSt:TYPE | 2.3.212 | 10/10 | 10/10 |
| Burst oscillation<br>Auto burst mode:mark wave number<br>setting/query | [:SOURce[1\|2]]:BURSt:AUTO:NCYCles | 2.3.213 | 10/10 | 10/15 |
| Burst oscillation<br>Auto burst mode: space wave number<br>setting/query | [:SOURce[1\|2]]:BURSt:AUTO:SPACe | 2.3.214 | 10/10 | 10/10 |
| Burst oscillation<br>Trigger burst mode: mark wave<br>number setting/query | [:SOURce[1\|2]]:BURSt[:TRIGger]:NCYCles | 2.3.215 | 10/10 | 10/15 |
| Burst oscillation<br>Trigger burst mode: trigger delay time<br>setting/query | [:SOURce[1\|2]]:BURSt[:TRIGger]:TDELay | 2.3.216 | 10/10 | 15/15 |
| Burst oscillation<br>Gate burst mode: oscillation stop unit<br>setting/query | [:SOURce[1\|2]]:BURSt:GATE:OSTop | 2.3.217 | 10/10 | 10/15 |
| Burst oscillation<br>Triggered gate mode: oscillation stop<br>unit setting/query | [:SOURce[1\|2]]:BURSt:TGATe:OSTop | 2.3.218 | 10/10 | 10/10 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Sequence** | | | | |
| Sequence selection | [:SOURce[1|2]]:SEQuence:STATe | 2.3.219 | 20/10 | 20/15 |
| Store | :TRACe|DATA:SEQuence:STORe | 2.3.220 | 1600/– | 1800/– |
| Recall | :TRACe|DATA:SEQuence:RECall | 2.3.221 | 90/– | 90/– |
| Sequence data I/O | :TRACe|DATA:SEQuence | 2.3.222 | 2000/160 | 3000/285 |
| Sequence data compilation | :TRIGger[1|2]:COMPile[:IMMediate] | 2.3.223 | 2000/– | 2000/– |
| Current step number acquisition | [:SOURce[1|2]]:SEQuence:CSTep? | 2.3.224 | –/10 | –/10 |
| Sequence data initialization | :TRACe|DATA:SEQuence:CLEar | 2.3.225 | 2000/– | 2000/– |
| **Setting memory** | | | | |
| **Basic setting memory** | | | | |
| Basic setting memory clear | :MEMory:STATe:DELete | 2.3.226 | 700/– | 700/– |
| Basic setting memory store | *SAV | 2.3.227 | 900/– | 900/– |
| Basic setting memory recall | *RCL | 2.3.228 | 250/– | 250/– |
| **Status** | | | | |
| **Status operations** | | | | |
| Status register and related queue clear | *CLS | 2.3.229 | 105/– | 100/– |
| Status reporting related preset setting | :STATus:PRESet | 2.3.230 | 10/– | 10/– |
| Power-on status register clear flag setting/query | *PSC | 2.3.231 | 10/10 | 10/10 |
| Status byte register query | *STB? | 2.3.232 | –/10 | –/10 |
| Service request enable register setting/query | *SRE | 2.3.233 | 10/10 | 10/10 |
| Standard event status register query | *ESR? | 2.3.234 | –/10 | –/10 |
| Standard event enable register setting/query | *ESE | 2.3.235 | 10/10 | 10/10 |
| **Operation status register group (common to CH1/CH2)** | | | | |
| Condition register query | :STATus:OPERation:CONDition? | 2.3.236 | –/10 | –/10 |
| Transition filter register (negative) setting/query | :STATus:OPERation:NTRansition | 2.3.237 | 10/10 | 10/10 |
| Transition filter register (postive) setting/query | :STATus:OPERation:PTRansition | 2.3.238 | 10/10 | 10/10 |
| Event register query | :STATus:OPERation[:EVENt]? | 2.3.239 | –/10 | –/10 |
| Event enable register setting/query | :STATus:OPERation:ENABle | 2.3.240 | 10/10 | 10/10 |

| Function | Command | Refere-nce | Processing Time [ms] Setting/Query | |
| --- | --- | --- | --- | --- |
| | | | USB | GPIB |
| **CH1 operation status register group** | | | | |
| CH1 operation status register group Condition register query | :STATus:OPERation:CH1:CONDition? | 2.3.241 | –/10 | –/10 |
| CH1 operation status register group Transition filter register (negative) setting/query | :STATus:OPERation:CH1:NTRansition | 2.3.242 | 10/10 | 10/10 |
| CH1 operation status register group） Transition filter register (positive) setting/query | :STATus:OPERation:CH1:PTRansition | 2.3.243 | 10/10 | 10/15 |
| CH1 operation status register group Event register query | :STATus:OPERation:CH1[:EVENt]? | 2.3.244 | –/10 | –/10 |
| CH1 operation status register group Event enable register setting/query | :STATus:OPERation:CH1:ENABle | 2.3.245 | 10/10 | 10/10 |
| **CH2 operation status register group** | | | | |
| CH2 operation status register group Condition register query | :STATus:OPERation:CH2:CONDition? | 2.3.246 | –/10 | –/15 |
| CH2 operation status register group Transition filter register (negative) setting/query | :STATus:OPERation:CH2:NTRansition | 2.3.247 | 10/10 | 10/10 |
| CH2 operation status register group Transition filter register (positive) setting/query | :STATus:OPERation:CH2:PTRansition | 2.3.248 | 10/10 | 10/10 |
| CH2 operation status register group Event register query | :STATus:OPERation:CH2[:EVENt]? | 2.3.249 | –/10 | –/15 |
| CH2 operation status register group Event enable register setting/query | :STATus:OPERation:CH2:ENABle | 2.3.250 | 10/10 | 10/15 |
| **Questionable data status register group** | | | | |
| Questionable data status register group Condition register query | :STATus:QUEStionable:CONDition? | 2.3.251 | –/10 | –/10 |
| Questionable data status register group Transition filter register (negative) setting/query | :STATus:QUEStionable:NTRansition | 2.3.252 | 10/10 | 10/15 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| Questionable data status register group Transition filter register (positive) setting/query | :STATus:QUEStionable:PTRansition | 2.3.253 | 10/10 | 10/10 |
| Questionable data status register group Event register query | :STATus:QUEStionable[:EVENt]? | 2.3.254 | –/10 | –/10 |
| Questionable data status register group Event enable register setting/query | :STATus:QUEStionable:ENABle | 2.3.255 | 10/10 | 10/10 |
| **Warning event register group** | | | | |
| Warning event register group Event register query | :STATus:WARNing[:EVENt]? | 2.3.256 | –/10 | –/10 |
| Warning event register group Event enable register setting/query | :STATus:WARNing:ENABle | 2.3.257 | 10/10 | 10/10 |
| **CH1 warning event register group** | | | | |
| CH1 warning event register group Event register query | :STATus:WARNing:CH1[:EVENt]? | 2.3.258 | –/10 | –/10 |
| CH1 warning event register group Event enable register setting/query | :STATus:WARNing:CH1:ENABle | 2.3.259 | 10/10 | 10/15 |
| **CH2 warning event register group** | | | | |
| CH2 warning event register group Event register query | :STATus:WARNing:CH2[:EVENt]? | 2.3.260 | –/10 | –/10 |
| CH2 warning event register group Event enable register setting/query | :STATus:WARNing:CH2:ENABle | 2.3.261 | 10/10 | 10/10 |

| Function | Command | Reference | Processing Time [ms] Setting/Query | |
|---|---|---|---|---|
| | | | USB | GPIB |
| **Other** | | | | |
| Equipment-specific information query | *IDN? | 2.3.262 | –/10 | –/15 |
| Error message query | :SYSTem:ERRor? | 2.3.263 | –/10 | –/15 |
| Setting initialization (status registers, etc. not cleared) | *RST | 2.3.264 | 330/– | 330/– |
| Operation completion event bit setting | *OPC | 2.3.265 | 10/– | 10/– |
| Setting output key to 1 at operation completion | *OPC? | 2.3.266 | –/10 | –/10 |
| Waiting for command/query execution | *WAI | 2.3.267 | 10/– | 10/– |
| Self diagnosis result query | *TST? | 2.3.268 | –/10 | –/10 |
| External reference frequency input setting/query | [:SOURce[1|2]]:ROSCillator:SOURce | 2.3.269 | 15/10 | 15/15 |

# 2.3 Description of Individual Commands

Each command is described in detail below.

## 2.3.1 2-channel equipment (WF1974) channel mode select/query :CHANnel:MODE

■:CHANnel:MODE

□:CHANnel:MODE?

**Description**

Selects/queries channel mode

**Setting parameters**

INDependent|PHASe|TONE|RATio|DIFFerential

INDependent → Indepenent

PHASe → 2-phase

TONE → Constant frequency difference

RATio → Constant frequency ratio

DIFFerential → Differential output

**Query parameters**

None

**Response format**

IND|PHAS|TONE|RAT|DIFF

† For the meaning of the response data, see the setting parameters.

**Setting example**

:CHANnel:MODE INDependent

Sets the channel mode to independent

**Remarks**

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

## 2.3.2 2-channel equipment (WF1974) constant frequency difference mode: frequency difference setting/query :CHANnel:DELTa

■:CHANnel:DELTa

□:CHANnel:DELTa?

**Description**

Sets/queries the frequency difference of the constant frequency difference

**Setting parameters**

<frequency>|MINimum|MAXimum

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

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

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

<units> ::= HZ

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

**Query parameters**

[MINimum|MAXimum]

|  |  |
|---|---|
| MINimum | → Queries the minimum value |
| MAXimum | → Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:CHANnel:DELTa 1KHZ

Sets the frequency difference to 1 kHz

**Remarks**

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

## 2.3.3 2-channel equipment (WF1974) constant frequency ratio mode: frequency ratio setting/query :CHANnel:RATio

■**:CHANnel:RATio**

□**:CHANnel:RATio?**

**Description**

Sets/queries the frequency ratio of the constant frequency ratio

**Setting parameters**

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

|  |  |  |  |
|---|---|---|---|
| <value1> | ::= | <INT> | |
| | | <INT> → | Frequency ratio of CH1: 1 to 9,999,999 |
| <value2> | ::= | <INT> | |
| | | <INT> → | Frequency ratio of CH2: 1 to 9,999,999 |
| MINimum | → | 1 | |
| MAXimum | → | 9,999,999 | |

**Query parameters**

None

**Response format**

<NR1>,<NR1>

**Setting example**

:CHANnel:RATio 2,3

Sets frequency ratio to 2:3

**Remarks**

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

## 2.3.4 2-channel equipment (WF1974) 2-channel same value operation setting/query :INSTrument:COUPle

■**:INSTrument:COUPle**

□**:INSTrument:COUPle?**

**Description**

Selects/queries the 2-channel equivalence setting

**Setting parameters**

ALL|NONE

|  |  |  |
|---|---|---|
| ALL | → | Equivalence setting on |
| NONE | → | Equivalence setting off |

**Query parameters**

None

**Response format**

ALL|NONE

† For the meaning of the response data, see the setting parameters.

**Setting example**

:INSTrument:COUPle ALL

Uses 2-channel equivalence setting

**Remarks**

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

## 2.3.5 Output on/off setting/query :OUTPut[1|2][:STATe]

**■:OUTPut[1|2][:STATe]**

**□:OUTPut[1|2][:STATe]?**

**Description**

Selects/queries the output on/off

**Setting parameters**

&lt;state&gt;  ::=  &lt;BOL&gt;

    &lt;BOL&gt;  → 0/OFF:  Output off

             1/ON:  Output on

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

    &lt;NBOL&gt;  → 0: Output off

           1: Output on

**Setting example**

:OUTPut1:STATe ON

Sets the output of CH1 to on

## 2.3.6 Output-on at power-on setting/query :OUTPut[1|2]:PON

**■:OUTPut[1|2]:PON**

**□:OUTPut[1|2]:PON?**

**Description**

Selects/queries the output on/off of power-on operation

**Setting parameters**

ON|OFF|LAST

    ON  →  Output on

    OFF  →  Output off

    LAST  →  Setting of previous output off operation

**Query parameters**

None

**Response format**

ON|OFF|LAST

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:PON ON

Sets the output of power-on operation of CH1 to on

## 2.3.7 Auto-range operation (output range) selection/query [:SOURce[1|2]]:VOLTage:RANGe:AUTO

■**[:SOURce[1|2]]:VOLTage:RANGe:AUTO**

□**[:SOURce[1|2]]:VOLTage:RANGe:AUTO?**

**Description**

Selects/queries the automatic range on/off

**Setting parameters**

&lt;state&gt;  ::=  &lt;BOL&gt;

    &lt;BOL&gt;  → 0/OFF:  Automatic range off

                1/ON:  Automatic range on

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

    &lt;NBOL&gt;  → 0: Automatic range off

                 1: Automatic range on

**Setting example**

:SOURce1:VOLTage:RANGe:AUTO ON

Sets the automatic range of CH1 to on

## 2.3.8 Phase synchronization setting [:SOURce[1|2]]:PHASe:INITiate

■**[:SOURce[1|2]]:PHASe:INITiate**

**Description**

Executes the phase synchronization

**Setting parameters**

None

## 2.3.9 External addition input setting/query [:SOURce[1|2]]:COMBine:FEED

■**[:SOURce[1|2]]:COMBine:FEED**

□**[:SOURce[1|2]]:COMBine:FEED?**

**Description**

Selects/queries the external addition

**Setting parameters**

OFF|X2|X10

    OFF  →  Disables the external addition

    X2  →  Adds 2 times of external input to the output

    X10  →  Adds 10 times of external input to the output

**Query parameters**

None

**Response format**

OFF|X2|X10

**Setting example**

:SOURce1:COMBine:FEED X2

Adds 2 times of external input to the output of CH1

## 2.3.10 Load impedance setting/query
### :OUTPut[1|2]:LOAD

■**:OUTPut[1|2]:LOAD**

□**:OUTPut[1|2]:LOAD?**

**Description**

Sets/queries the load impedance

**Setting parameters**

<load>|MINimum|MAXimum|INFinity

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

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

<eunits> ::= K

<units> ::= OHM

MINimum → 1Ω

MAXimum → 10kΩ

INFinity → High-Z

**Query parameterss**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

<NR1>

**Setting example**

:OUTPut1:LOAD 50OHM

Sets the load impedance of CH1 to 50Ω

## 2.3.11 Trigger operation sweep mode trigger source selection/query
### :TRIGger[1|2]:SWEep:SOURce

■**:TRIGger[1|2]:SWEep:SOURce**

□**:TRIGger[1|2]:SWEep:SOURce?**

**Description**

Selects/queries the sweep trigger source

**Setting parameters**

TIMer|EXTernal|CH1

TIMer → Trigger with the internal trigger period

EXTernal → External trigger

CH1 → External trigger of CH1 (Only CH2 can be selected)

**Query parameters**

None

**Response format**

TIM|EXT|CH1

† For the meaning of each response data, see the setting parameters.

**Setting example**

:TRIGger2:SWEep:SOURce EXT

Sets the sweep trigger source of CH2 to external

## 2.3.12 Trigger operation sweep mode internal trigger cycle setting/query :TRIGger[1|2]:SWEep:TIMer

■:TRIGger[1|2]:SWEep:TIMer

□:TRIGger[1|2]:SWEep:TIMer?

**Description**

Sets/queries the internal sweep trigger period

**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 → Queries the minimum value

        MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:TRIGger1:SWEep:TIMer 1MS

Sets the internal sweep trigger period of CH1 to 1 ms

## 2.3.13 Trigger operation sweep mode external trigger signal polarity selection/query :TRIGger[1|2]:SWEep:SLOPe

■:TRIGger[1|2]:SWEep:SLOPe

□:TRIGger[1|2]:SWEep:SLOPe?

**Description**

Selects/queries the external sweep trigger polarity

**Setting parameters**

POSitive|NEGative|OFF

        POSitive → Rising

        NEGative → Falling

        OFF → Disabled

**Query parameters**

None

**Response format**

POS|NEG|OFF

† For the meaning of each response data, see the setting parameters.

**Setting example**

:TRIGger:SWEep:SLOPe NEGative

Sets the external sweep trigger polarity to falling

## 2.3.14 Trigger operation burst mode trigger source selection/query :TRIGger[1|2]:BURSt:SOURce

■ :TRIGger[1|2]:BURSt:SOURce

□ :TRIGger[1|2]:BURSt:SOURce?

**Description**

Selects/queries the burst trigger source

**Setting parameters**

TIMer|EXTernal|CH1

| | | |
|---|---|---|
| TIMer | → | Trigger with the internal trigger period |
| EXTernal | → | External trigger |
| CH1 | → | External trigger of CH1 (Only CH2 can be selected) |

**Query parameters**

None

**Response format**

TIM|EXT|CH1

† For the meaning of each response data, see the setting parameters.

**Setting example**

:TRIGger2:BURSt:SOURce EXT

Sets the burst trigger source of CH2 to external

## 2.3.15 Trigger operation burst mode internal trigger cycle setting/query :TRIGger[1|2]:BURSt:TIMer

■ :TRIGger[1|2]:BURSt:TIMer

□ :TRIGger[1|2]:BURSt:TIMer?

**Description**

Sets/queries the internal burst trigger period

**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 | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:TRIGger1:BURSt:TIMer 1MS

Sets the internal burst trigger period of CH1 to 1 ms

## 2.3.16 Trigger operation burst mode external trigger signal polarity selection/query :TRIGger[1|2]:BURSt:SLOPe

**■:TRIGger[1|2]:BURSt:SLOPe**

**□:TRIGger[1|2]:BURSt:SLOPe?**

**Description**

Selects/queries the external burst trigger polarity

**Setting parameters**

POSitive|NEGative|OFF

POSitive    →    Rising

NEGative    →    Falling

OFF    →    Disabled

**Query parameters**

None

**Response format**

POS|NEG|OFF

† For the meaning of each response data, see the setting parameters.

**Setting example**

:TRIGger:BURSt:SLOPe NEGative

Sets the external burst trigger polarity to falling

## 2.3.17 Trigger operation manual trigger (MAN TRIG key operation) *TRG

**■*TRG**

**Description**

Corresponds to [MANUAL TRIGGER] button

**Setting parameters**

None

**Remarks**

† Cannot specify channels. It becomes trigger to CH1.

† May not be used depending on the oscillation mode (see Table 2.3).

## 2.3.18 Trigger operation manual trigger (MAN TRIG key operation) :TRIGger[1|2][:SEQuence][:IMMediate]

**■:TRIGger[1|2][:SEQuence][:IMMediate]**

**Description**

Corresponds to [MANUAL TRIGGER] button

**Setting parameters**

None

**Remarks**

† May not be used depending on the oscillation mode (see Table 2.3).

## 2.3.19 Trigger operation execution control setting :TRIGger[1|2]:SELected:EXECute

■:TRIGger[1|2]:SELected:EXECute

**Description**

Controls each oscillation mode

**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|EBRanch

| STARt | → | Start |
|---|---|---|
| STOP | → | Stop |
| ISTop | → | Forced stop |
| HOLD | → | Hold |
| RESume | → | Resume |
| EBRanch | → | Event branch |

**Remarks**

† Whether "[1|2]" exists in sequence has no influence on the operation.

† Cannot be used in the burst oscillation mode.

## 2.3.20 Frequency setting/query [:SOURce[1|2]]:FREQuency[:CW|:FIXed]

■[:SOURce[1|2]]:FREQuency[:CW|:FIXed]

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

**Description**

Sets/queries the frequency of oscillator

**Setting parameters**

<frequency>|MINimum|MAXimum

| <frequency> | ::= | <REAL>[<eunits>][<units>] |
|---|---|---|
| | <REAL> | → Frequency: 0.01μHz to 30MHz, |
| | | Resolution: 0.01μHz |

† The setting range varies depending on the waveform or oscillation mode.

| | <eunits> | ::= M|K|U|N |
|---|---|---|
| | <units> | ::= HZ|USER |
| MINimum | → | Sets the maximum value |
| MAXimum | → | Sets the minimum value |

**Query parameters**

[MINimum|MAXimum]

| MINimum | → | Queries the minimum value |
|---|---|---|
| MAXimum | → | Queries the maximum value |

**Response format**

        &lt;NR3&gt;

**Setting example**

        :SOURce1:FREQuency:CW 1MHZ

        Sets the frequency of CH1 to 1 MHz

**Remarks**

        † Sequence frequency setting/query is not possible with this command.

## 2.3.21 Frequency unit selection/query [:SOURce[1|2]]:FREQuency:UNIT

■**[:SOURce[1|2]]:FREQuency:UNIT**

□**[:SOURce[1|2]]:FREQuency:UNIT?**

**Description**

        Selects/queries the frequency unit

**Setting parameters**

        HZ|USER

                HZ        → Hz

                USER  → User-defined unit

**Query parameters：**

        None

**Response format**

        HZ|USER

        † For the meaning of each response data, see the setting parameters.

**Setting example**

        :SOURce1:FREQuency:UNIT HZ

        Sets the frequency unit of CH1 to Hz

**Remarks**

        † This command is system unit setting command, it is not reflected on this device screen.

        † For system unit, see the Chapter 2.6.

## 2.3.22 Frequency user-defined unit setting/query [:SOURce[1|2]]:FREQuency:USER

■**[:SOURce[1|2]]:FREQuency:USER**

□**[:SOURce[1|2]]:FREQuency:USER?**

**Description**

        Sets/queries the user-defined unit of frequency

**Setting parameters**

        [&lt;name&gt;],[&lt;form&gt;],[&lt;m&gt;],[&lt;n&gt;]

                &lt;name&gt;  ::= &lt;STR&gt;

                        &lt;STR&gt;      →    User-defined unit name (up to 4 characters)

                        † Optional (If omitted, nothing is changed)

                &lt;form&gt;  ::= LINear|LOGarithmic

                        LINear      →    Linear

                        LOGarithmic →    Logarithmic

                        † Optional (If omitted, nothing is changed)

                &lt;m&gt; ::= &lt;REAL&gt;|MINimum|MAXimum

                        &lt;REAL&gt;     →    m (scale)

                        MINimum  →    Sets the minimum value

                        MAXimum  →    Sets the maximum value

† Optional (If omitted, nothing is changed)
             <n> ::= <REAL>|MINimum|MAXimum
                    <REAL>      →    n (offset)
                    MINimum    →    Sets the minimum value
                    MAXimum    →    Sets the maximum value
                    † Optional (If omitted, nothing is changed)

**Query parameters**
        None

**Response format**
        <name>,<form>,<m>,<n>
                <name>::=   <STR>
                <form> ::=   LIN|LOG
                <m>    ::=   <NR3>
                <n>    ::=   <NR2>
        † For the meaning of each response data, see the setting parameter

**Setting example**
        :SOURce1:FREQuency:USER "kHz",LINear,1000,0
        Sets the user-defined unit of frequency of CH1 to "kHz"

## 2.3.23  Amplitude setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

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

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

**Description**
        Sets/queries the 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/50Ω,
                                      Resolution:(999.9mVp-p or less) 4 digits or 0.1 mVp-p
                                                (1Vp-p or more) 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/50Ω

**Query parameters**
        [MINimum|MAXimum]
                MINimum    →   Queries the minimum value
                MAXimum    →   Queries the maximum value

**Response format**
        <NR3>

**Setting example**
        :SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 10VPP
        Sets the amplitude of CH1 to 10 Vp-p

**Remarks**
        † Sequence amplitude setting/query is not possible with this command.

### 2.3.24 Amplitude unit selection/query
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:UNIT

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

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

**Description**

Selects/queries the amplitude unit

**Setting parameters**

VPP|VPK|VRMS|DBV|DBM|USER

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

**Query parameters**

None

**Response format**

VPP|VPK|VRMS|DBV|DBM|USER

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:UNIT VPP

Sets the amplitude unit of CH1 to Vp-p

**Remarks**

† This command is system unit setting command, it is not reflected on this device screen.

† For system unit, see the Chapter 2.6.

### 2.3.25 Amplitude user-defined unit setting/query
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:USER

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

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

**Description**

Sets/queries the user-defined unit of amplitude

**Setting parameters**

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

  <name>::= <STR>

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

    † Optional (If omitted, nothing is changed)

  <form> ::= LINear|LOGarithmic

    LINear → Linear

    LOGarithmic → Logarithmic

    † Optional (If omitted, nothing is changed)

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

    <REAL> → m (scale)

    MINimum → Sets the minimum value

    MAXimum → Sets the maximum value

    † Optional (If omitted, nothing is changed)

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

    <REAL> → n (offset)

    MINimum → Sets the minimum value

MAXimum → Sets the maximum value

† Optional (If omitted, nothing is changed)

**Query parameters**

None

**Response format**

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

<name>::= <STR>

<form> ::= LIN|LOG

<m> ::= <NR3>

<n> ::= <NR2>

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:USER "mVpk",LINear,0.001,0

Sets the user-defined unit of amplitude of CH1 to "mVpk"

## 2.3.26 DC offset setting/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet

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

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

**Description**

Sets/queries the DC offset of oscillator

**Setting parameters**

<offset>|MINimum|MAXimum

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

<REAL> → DC offset: $\pm$ 10V/open, $\pm$ 5 V/50Ω,

Resolution:($\pm$ 499.9 mV or less) 4 digits or 0.1 mV,

($\pm$ 0.5 V or more) 5 digits or 1 mV

<eunits> ::= M

<units> ::= V|USER

MINimum → -10 V/open, -5 V/50Ω

MAXimum → 10 V/open, 5 V/50Ω

**Query parameters**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet 2.5V

Sets the DC offset of CH1 to 2.5 V

## 2.3.27 DC offset unit setting/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT

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

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

**Description**

Selects/queries the DC offset unit

**Setting parameters**

V|USER

V        → V
                    USER   → User-defined unit

**Query parameters**
           None

**Response format**
           V|USER
           † For the meaning of each response data, see the setting parameters.

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

**Remarks**
           † This command is system unit setting command, it is not reflected on this device screen.
           † For system unit, see the Chapter 2.6.

## 2.3.28  DC offset user-defined unit setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:USER

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

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

**Description**
           Sets/queries the user-defined unit of DC

**Setting parameters**
           [<name>],[<form>],[<m>],[<n>]
                    <name>  ::= <STR>
                           <STR>        →   User-defined unit name (up to 4 characters)
                           † Optional (If omitted, nothing is changed)
                    <form>   ::= LINear|LOGarithmic
                           LINear          →   Linear
                           LOGarithmic →   Logarithmic
                           † Optional (If omitted, nothing is changed)
                    <m> ::= <REAL>|MINimum|MAXimum
                           <REAL>        →   m (scale)
                           MINimum     →   Sets the minimum value
                           MAXimum     →   Sets the maximum value
                           † Optional (If omitted, nothing is changed)
                    <n>  ::= <REAL>|MINimum|MAXimum
                           <REAL>        →   n (offset)
                           MINimum     →   Sets the minimum value
                           MAXimum     →   Sets the maximum value
                           † Optional (If omitted, nothing is changed)

**Query parameters**
           None

**Response format**
           <name>,<form>,<m>,<n>
                    <name>::=   <STR>
                    <form> ::=   LIN|LOG
                    <m>    ::=   <NR3>
                    <n>     ::=   <NR2>
           † For the meaning of each response data, see the setting parameters.

**Setting example**
           :SOURce1:VOLTage:LEVel:IMMediate:OFFSet:USER "mV",LINear,0.001,0

Sets the user-defined unit of DC offset of CH1 to "mV"

## 2.3.29 Phase setting/query
## [:SOURce[1|2]]:PHASe[:ADJust]

■**[:SOURce[1|2]]:PHASe[:ADJust]**

□**[:SOURce[1|2]]:PHASe[:ADJust]?**

**Description**

Sets/queries the phase of oscillator

**Setting parameters**

&lt;phase&gt;|MINimum|MAXimum

&lt;phase&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

&lt;REAL&gt;  → Phase: -1800.000° to 1800.000°,

Resolution: 0.001°

&lt;units&gt;  ::= DEG|USER

MINimum  →  -1800.000°

MAXimum  →  1800.000°

**Query parameters**

[MINimum|MAXimum]

MINimum  →  Queries the minimum value

MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:PHASe:ADJust 90DEG

Sets the phase of CH1 to 90°

## 2.3.30 Phase unit selection/query
## [:SOURce[1|2]]:PHASe:UNIT

■**[:SOURce[1|2]]:PHASe:UNIT**

□**[:SOURce[1|2]]:PHASe:UNIT?**

**Description**

Selects/queries the phase unit

**Setting parameters**

DEG|USER

DEG  → °

USER  → User-defined unit

**Query parameters**

None

**Response format**

DEG|USER

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:PHASe:UNIT DEG

Sets the unit of phase of CH1 to °

**Remarks**

† This command is system unit setting command, it is not reflected on this device screen.

† For system unit, see the Chapter 2.6.

## 2.3.31 Phase user-defined unit setting/query
### [:SOURce[1|2]]:PHASe:USER

■**[:SOURce[1|2]]:PHASe:USER**

□**[:SOURce[1|2]]:PHASe:USER?**

**Description**

Sets/queries the user-defined unit of phase

**Setting parameters**

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

<name> ::= <STR>

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

† Optional (If omitted, nothing is changed)

<form> ::= LINear|LOGarithmic

LINear　　　→　Linear

LOGarithmic →　Logarithmic

† Optional (If omitted, nothing is changed)

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

<REAL>　　　→　m (scale)

MINimum　　→　Sets the minimum value

MAXimum　→　Sets the maximum value

† Optional (If omitted, nothing is changed)

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

<REAL>　　　→　n (offset)

MINimum　　→　Sets the minimum value

MAXimum　→　Sets the maximum value

† Optional (If omitted, nothing is changed)

**Query parameters**

None

**Response format**

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

<name>::=　<STR>

<form> ::=　LIN|LOG

<m>　　::=　<NR3>

<n>　　::=　<NR2>

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:PHASe:USER "rad",LINear,57.32,0

Sets the user-defined unit of phase of CH1 to "rad"

## 2.3.32 Output voltage range high level setting/query
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH

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

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

**Description**

Sets/queries the high level

**Setting parameters**

<high>|MINimum|MAXimum

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

<REAL>　→　High level

† The setting range varies depending on the state.

<eunits> ::= M

$$\text{<units>} \quad ::= V|USER$$

MINimum $\rightarrow$ Sets the minimum value

MAXimum $\rightarrow$ Sets the maximum value

**Query parameters**

[MINimum|MAXimum]

MINimum $\rightarrow$ Queries the minimum value

MAXimum $\rightarrow$ Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:HIGH 5V

Sets the high level of CH1 to 5 V

## 2.3.33 Output voltage range high level unit selection/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT

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

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

**Description**

Selects/queries the high level unit

**Setting parameters**

V|USER

V $\rightarrow$ V

USER $\rightarrow$ User-defined unit

**Query parameters**

None

**Response format**

V|USER

† For the meaning of each response data, see the setting parameter

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:HIGH:UNIT V

Sets the unit of high level of CH1 to V

**Remarks**

† The user-defined unit is the same as that of DC offset.

† This command is system unit setting command, it is not reflected on this device screen.

† For system unit, see the Chapter 2.6.

## 2.3.34 Output voltage range low level setting/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW

■**[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW**

□**[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW?**

**Description**

Sets/queries the low level

**Setting parameters**

<low>|MINimum|MAXimum

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

<REAL> $\rightarrow$ Low level

† The setting range varies depending on the state.

<eunits> ::= M

<units> ::= V|USER

|  | MINimum | → | Sets the minimum value |
|  | MAXimum | → | Sets the maximum value |

**Query parameters**

[MINimum|MAXimum]

|  | MINimum | → | Sets the minimum value |
|  | MAXimum | → | Sets the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:LOW 0V

Sets the low level of CH1 to 0 V

## 2.3.35 Output voltage range low level unit selection/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT

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

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

**Description**

Selects/queries the low level unit

**Setting parameters**

V|USER

|  | V | → | V |
|  | USER | → | User-defined unit |

**Query parameters**

None

**Response format**

V|USER

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:LOW:UNIT V

Sets the unit of low level of CH1 to V

**Remarks**

† The user-defined unit is the same as that of DC offset.

† This command is system unit setting command, it is not reflected on this device screen.

† For system unit, see the Chapter 2.6.

## 2.3.36 Square/pulse wave shared duty unit selection/query [:SOURce[1|2]]:PULSe:DCYCle:UNIT

■**[:SOURce[1|2]]:PULSe:DCYCle:UNIT**

□**[:SOURce[1|2]]:PULSe:DCYCle:UNIT?**

**Description**

Selects/queries the phase unit

**Setting parameters**

PCT|USER

|  | PCT | → | % |
|  | USER | → | User-defined unit |

**Query parameters**

None

**Response format**

PCT|USER

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:PULSe:DCYCle:UNIT PCT

Sets the duty of CH1 to %

**Remarks**

† This command is system unit setting command, it is not reflected on this device screen.

† For system unit, see the Chapter 2.6.

## 2.3.37 Square/pulse wave shared duty user-defined unit setting/query [:SOURce[1|2]]:PULSe:DCYCle:USER

■**[:SOURce[1|2]]:PULSe:DCYCle:USER**

□**[:SOURce[1|2]]:PULSe:DCYCle:USER?**

**Description**

Sets/queries the user-defined unit of duty

**Setting parameters**

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

  <name> ::= <STR>

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

    † Optional (If omitted, nothing is changed)

  <form> ::= LINear|LOGarithmic

    LINear  → Linear

    LOGarithmic → Logarithmic

    † Optional (If omitted, nothing is changed)

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

    <REAL> → m (scale)

    MINimum → Sets the minimum value

    MAXimum → Sets the maximum value

    † Optional (If omitted, nothing is changed)

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

    <REAL> → n (offset)

    MINimum → Sets the minimum value

    MAXimum → Sets the maximum value

    † Optional (If omitted, nothing is changed)

**Query parameters**

None

**Response format**

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

  <name>::= <STR>

  <form> ::= LIN|LOG

  <m> ::= <NR3>

  <n> ::= <NR2>

† For the meaning of each response data, see the setting parameters.

**Setting example**

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

Sets the user-defined unit of duty of CH1 to "INTN"

## 2.3.38 Square wave duty value setting/query [:SOURce[1|2]]:FUNCtion:SQUare:DCYCle

**■[:SOURce[1|2]]:FUNCtion:SQUare:DCYCle**

**□[:SOURce[1|2]]:FUNCtion:SQUare:DCYCle?**

**Description**

Sets/queries the duty of oscillator (square wave)

† The setting range of duty varies depending on the oscillator frequency.

**Setting parameters**

&lt;duty&gt;|MINimum|MAXimum

    &lt;duty&gt;::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;   →  Duty (square wave):

                (Standard range) 0.0100% to 99.9900%,

                (Extended range) 0.0000% to 100.0000%,

                Resolution: 0.0001%

        &lt;units&gt;    ::= PCT|USER

    MINimum    →  (Standard range) 0.0100%,

                (Extended range) 0.0000%

    MAXimum   →  (Standard range) 99.9900%,

                (Extended range) 100.0000%

**Query parameters**

[MINimum|MAXimum]

    MINimum    →  Queries the minimum value

    MAXimum   →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:SQUare:DCYCle 20PCT

Sets the duty of CH1 (square wave) to 20%

**Remarks**

† To enable the duty extended range of square wave, set the square wave extension to on at "[:SOURce[1|2]]:FUNCtion:SQUare:EXTend" in "2.3.50 Square wave extension on/off selection."

† Sequence duty setting/query is not possible with this command.

## 2.3.39 Pulse wave duty value setting/query [:SOURce[1|2]]:PULSe:DCYCle

**■[:SOURce[1|2]]:PULSe:DCYCle**

**□[:SOURce[1|2]]:PULSe:DCYCle?**

**Description**

Sets/queries the duty (pulse wave)

† The setting range of duty varies depending on the oscillator frequency.

**Setting parameters**

&lt;duty&gt;|MINimum|MAXimum

    &lt;duty&gt;   ::= &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;   →  Duty (pulse wave): 0.0170% to 99.9830%,

                Resolution: 0.0001

        &lt;units&gt;    ::= PCT|USER

|  | MINimum | $\rightarrow$ | 0.0170% |
| | MAXimum | $\rightarrow$ | 99.9830% |

**Query parameters**

[MINimum|MAXimum]

|  | MINimum | $\rightarrow$ | Queries the minimum value |
| | MAXimum | $\rightarrow$ | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:PULSe:DCYCle 20PCT

Sets the duty of CH1 (pulse wave) to 20%

## 2.3.40 Pulse wave
## pulse width setting/query
## [:SOURce[1|2]]:PULSe:WIDTh

■**[:SOURce[1|2]]:PULSe:WIDTh**

□**[:SOURce[1|2]]:PULSe:WIDTh?**

**Description**

Sets/queries the pulse width

**Setting parameters**

<width>|MINimum|MAXimum

|  | <width> | ::= | <REAL>[<eunits>][<units>] |
| | | <REAL> | $\rightarrow$ Pulse width: 25.50 ns to 99.9830 Ms, |
| | | | Resolution: 0.001% or less of period or 0.01 ns |
| | | <eunits> | ::= MA|K|M|U|N |
| | | <units> | ::= S |
| | MINimum | $\rightarrow$ | Sets the minimum value |
| | MAXimum | $\rightarrow$ | Sets the maximum value |

**Query parameters**

[MINimum|MAXimum]

|  | MINimum | $\rightarrow$ | Queries the minimum value |
| | MAXimum | $\rightarrow$ | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:WIDTh 1ms

Sets the pulse width of CH1 to 1 ms

## 2.3.41 Pulse wave
## rising time setting/query
## [:SOURce[1|2]]:PULSe:TRANsition[:LEADing]

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

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

**Description**

Sets/queries the pulse wave rising time

**Setting parameters**

<seconds>|MINimum|MAXimum

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

|  | <REAL> | → | Rising 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 | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:TRANsition:LEADing 1ms

Sets the rising time of pulse wave of CH1 to 1 ms

## 2.3.42 Pulse falling time setting/query [:SOURce[1|2]]:PULSe:TRANsition:TRAiling

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

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

**Description**

Sets/queries the pulse wave falling time

**Setting parameters**

<seconds>|MINimum|MAXimum

|  | <seconds> | ::= | <REAL>[<eunits>][<units>] |
|  |  | <REAL> | → Falling 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 | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:TRANsition:TRAiling 1ms

Sets the falling time of pulse wave of CH1 to 1 ms

## 2.3.43 Pulse wave period setting/query [:SOURce[1|2]]:PULSe:PERiod

**■[:SOURce[1|2]]:PULSe:PERiod**

**□[:SOURce[1|2]]:PULSe:PERiod?**

**Description**

Sets/queries the period

**Setting parameters**

    &lt;period&gt;|MINimum|MAXimum

        &lt;period&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

            &lt;REAL&gt;  →  Period: 33.33 ns to 100 Ms

            † The setting range varies depending on the waveform or oscillation mode.

            &lt;eunits&gt;  ::= MA|K|M|U|N

            &lt;units&gt;   ::= S|USER

    MINimum   →   Sets the minimum value

    MAXimum  →   Sets the maximum value

**Query parameters**

    [MINimum|MAXimum]

    MINimum   →   Queries the minimum value

    MAXimum  →   Queries the maximum value

**Response format**

    &lt;NR3&gt;

**Setting example**

    :SOURce1:PULSe:PERiod 1US

    Sets the period of CH1 to 1 µs

## 2.3.44 Pulse wave period unit selection/query [:SOURce[1|2]]:PULSe:PERiod:UNIT

■[:SOURce[1|2]]:PULSe:PERiod:UNIT

□[:SOURce[1|2]]:PULSe:PERiod:UNIT?

**Description**

    Selects/queries the period unit

**Setting parameters**

    S|USER

        S      →   s

        USER  →   User-defined unit

**Query parameters**

    None

**Response format**

    S|USER

    † For the meaning of each response data, see the setting parameter

**Setting example**

    :SOURce1:PULSe:PERiod:UNIT S

    Sets the period unit of CH1 to s

**Remarks**

    † This command is system unit setting command, it is not reflected on this device screen.

    † For system unit, see the Chapter 2.6.

## 2.3.45 Pulse wave period user-defined unit setting/query [:SOURce[1|2]]:PULSe:PERiod:USER

■[:SOURce[1|2]]:PULSe:PERiod:USER

□[:SOURce[1|2]]:PULSe:PERiod:USER?

**Description**

    Sets/queries the user-defined unit of period

**Setting parameters**

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

    <name> ::= <STR>

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

        † Optional (If omitted, nothing is changed)

    <form> ::= LINear|LOGarithmic

        LINear → Linear

        LOGarithmic → Logarithmic

        † Optional (If omitted, nothing is changed)

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

        <REAL> → m (scale)

        MINimum → Sets the minimum value

        MAXimum → Sets the maximum value

        † Optional (If omitted, nothing is changed)

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

        <REAL> → n (offset)

        MINimum → Sets the minimum value

        MAXimum → Sets the maximum value

        † Optional (If omitted, nothing is changed)

**Query parameters**

None

**Response format**

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

    <name> ::= <STR>

    <form> ::= LIN|LOG

    <m> ::= <NR3>

    <n> ::= <NR2>

† For the meaning of each response data, see the setting parameter

**Setting example**

:SOURce1:PULSe:PERiod:USER "ms",LINear,0.001,0

Sets the user-defined unit of period of CH1 to "ms"

## 2.3.46 Ramp wave
## symmetry setting/query
## [:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry

**■[:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry**

**□[:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry?**

**Description**

Sets/queries the 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 → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:FUNCtion:RAMP:SYMMetry 20PCT

    Sets the symmetry of ramp wave of CH1 to 20%

## 2.3.47 Waveform selection/query [:SOURce[1|2]]:FUNCtion[:SHAPe]

■**[:SOURce[1|2]]:FUNCtion[:SHAPe]**

□**[:SOURce[1|2]]:FUNCtion[:SHAPe]?**

**Description**

    Sets/queries the 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 format**

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 each response data, see the setting parameters.

**Setting example**

:SOURce1:FUNCtion:SHAPe RAMP

Sets the waveform of CH1 to ramp wave

## 2.3.48 Waveform polarity selection/query :OUTPut[1|2]:POLarity

■:OUTPut[1|2]:POLarity

□:OUTPut[1|2]:POLarity?

**Description**

Selects/queries the polarity of waveform

**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 |
| 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 |

&lt;polarity&gt; ::= NORMal|INVerted

| | | |
|---|---|---|
| NORMal | → | Normal |
| INVerted | → | Invert |

**Query parameters**

&lt;shape&gt; ::= 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, see the setting parameters.

**Response format**

NORM|INV

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:POLarity SINusoid,NORMal

Sets the polarity of sine wave of CH1 to normal

## 2.3.49 Amplitude range selection/query
## :OUTPut[1|2]:SCALe

■:OUTPut[1|2]:SCALe

□:OUTPut[1|2]:SCALe?

**Description**

Selects/queries the amplitude range of waveform

**Setting parameters**

&lt;shape&gt;,&lt;scale&gt;

&lt;shape&gt; ::= 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 |
| 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 |

&lt;scale&gt;　　::=　MFS|FS|PFS

| | | |
|---|---|---|
| MFS | → | -FS/0 |
| FS | → | ± FS |
| PFS | → | 0/+FS |

**Query parameters**

&lt;shape&gt;　::=　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, see the setting parameters.

**Response format**

MFS|FS|PFS

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SCALe SINusoid,FS

Sets the amplitude range of sine wave of CH1 to ± FS

## 2.3.50 Square wave extension on/off selection/query [:SOURce[1|2]]:FUNCtion:SQUare:EXTend

■[:SOURce[1|2]]:FUNCtion:SQUare:EXTend

□**[:SOURce[1|2]]:FUNCtion:SQUare:EXTend?**

**Description**

Selects/queries on/off of the square wave extension

**Setting parameters**

&lt;state&gt;   ::=   &lt;BOL&gt;

&lt;BOL&gt;        →    0/OFF: Square wave extension off

1/ON:  Square wave extension on

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

&lt;NBOL&gt;        →    0: Square wave extension off

1: Square wave extension on

**Setting example**

:SOURce1:FUNCtion:SQUare:EXTend ON

Sets the square wave extension of CH1 to on

## 2.3.51  Unbalanced sine wave former amplitude setting/query [:SOURce[1|2]]:FUNCtion:USINe:AMPLitude[1]

■**[: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**

&lt;amplitude&gt;|MINimum|MAXimum

&lt;amplitude&gt;   ::=   &lt;REAL&gt;[&lt;units&gt;]

&lt;REAL&gt;   →  Former amplitude: -100.00% to 100.00%,

Resolution: 0.01%

&lt;units&gt;      ::= PCT

MINimum    →    -100.00%

MAXimum    →    100.00%

**Query parameters**

[MINimum|MAXimum]

MINimum    →    Queries the minimum value

MAXimum    →    Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:USINe:AMPLitude1 20PCT

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

### 2.3.52 Unbalanced sine wave latter amplitude setting/query [:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2

■**[: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

$\quad$ <amplitude> $\quad$ ::= $\quad$ <REAL>[<units>]

$\qquad$ <REAL> $\quad \rightarrow$ Latter amplitude: -100.00% to 100.00%,

$\qquad\qquad$ Resolution: 0.01%

$\qquad$ <units> $\quad$ ::= PCT

$\quad$ MINimum $\quad \rightarrow \quad$ -100.00%

$\quad$ MAXimum $\quad \rightarrow \quad$ 100.00%

**Query parameters**

[MINimum|MAXimum]

$\quad$ MINimum $\quad \rightarrow \quad$ Queries the minimum value

$\quad$ MAXimum $\quad \rightarrow \quad$ Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:USINe:AMPLitude2 20PCT

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

### 2.3.53 Clipped sine wave clip rate setting/query [:SOURce[1|2]]:FUNCtion:CSINe:CLIP

■**[: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

$\quad$ <clip> $\quad$ ::= $\quad$ <REAL>[<units>]

$\qquad$ <REAL> $\quad \rightarrow$ Clip rate: 0.00% to 99.99%,

$\qquad\qquad$ Resolution: 0.01%

$\qquad$ <units> $\quad$ ::= PCT

$\quad$ MINimum $\quad \rightarrow \quad$ 0.00%

$\quad$ MAXimum $\quad \rightarrow \quad$ 99.99%

**Query parameters**

[MINimum|MAXimum]

$\quad$ MINimum $\quad \rightarrow \quad$ Queries the minimum value

$\quad$ MAXimum $\quad \rightarrow \quad$ Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:CSINe:CLIP 20PCT

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

## 2.3.54 CF controlled sine wave crest factor setting/query [:SOURce[1|2]]:FUNCtion:CFCSine:CFACtor

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

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

**Description**

Sets/queries crest factor of CF controlled sine wave

**Setting parameters**

&lt;cf&gt;|MINimum|MAXimum

&lt;cf&gt; ::= &lt;REAL&gt;

    &lt;REAL&gt; → Crest factor: 1.41 to 10.00,

        Resolution: 0.01

  MINimum → 1.41

  MAXimum → 10.00

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:CFCSine:CFACtor 5.00

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

## 2.3.55 Conduction angle controlled sine wave conduction angle setting/query [:SOURce[1|2]]:FUNCtion:ACSine:ANGLe

■**[: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**

&lt;angle&gt;|MINimum|MAXimum

&lt;angle&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

    &lt;REAL&gt; → Conduction angle: -180.00° to 180.00°,

        Resolution: 0.01°

    &lt;units&gt; ::= DEG

  MINimum → -180.00°

  MAXimum → 180.00°

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:ACSine:ANGLe 30DEG

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

## 2.3.56 Staircase sine wave number of steps setting/query [:SOURce[1|2]]:FUNCtion:SSINe:STEPs

■[: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　→　Queries the minimum value

MAXimum　→　Queries the maximum value

**Response format**

<NR1>

**Setting example**

:SOURce1:FUNCtion:SSINe:STEPs 10

Sets number of steps of staircase sine wave of CH1 to 10

## 2.3.57 Multi-cycle sine wave number of cycles setting/query [:SOURce[1|2]]:FUNCtion:MCSine:CYCLes

■[: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　→　Queries the minimum value

MAXimum　→　Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:MCSine:CYCLes 0.2

Sets the number of cycles of multi-cycle sine wave of CH1 to 0.2

## 2.3.58 Multi-cycle sine wave start phase setting/query [:SOURce[1|2]]:FUNCtion:MCSine:PHASe

■**[:SOURce[1|2]]:FUNCtion:MCSine:PHASe**

□**[:SOURce[1|2]]:FUNCtion:MCSine:PHASe?**

**Description**

Sets/queries start phase of multi-cycle sine wave

**Setting parameters**

&lt;clip&gt;|MINimum|MAXimum

    &lt;clip&gt;   ::=   &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;   →   Start phase: -360.00° to 360.00°,

                      Resolution: 0.01°

        &lt;units&gt;   ::= DEG

    MINimum   →   -360.00°

    MAXimum   →   360.00°

**Query parameters**

[MINimum|MAXimum]

    MINimum   →   Queries the minimum value

    MAXimum   →   Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:MCSine:PHASe 30DEG

Sets start phase of multi-cycle sine wave of CH1 to 30°

## 2.3.59 On-phase controlled sine wave complete-on phase setting/query [:SOURce[1|2]]:FUNCtion:ONPSine:ONPHase

■**[: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**

&lt;phase&gt;|MINimum|MAXimum

    &lt;phase&gt;   ::=   &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;   →   Complete-on phase: 0.00° to 360.00°,

                      Resolution: 0.01°

        &lt;units&gt;   ::= DEG

    MINimum   →   0.00°

    MAXimum   →   360.00°

**Query parameters**

[MINimum|MAXimum]

    MINimum   →   Queries the minimum value

    MAXimum   →   Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:ONPSine:ONPHase 30DEG

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

## 2.3.60 On-phase controlled sine wave on-slope time setting/query [:SOURce[1|2]]:FUNCtion:ONPSine:STIMe

**■[: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 → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:ONPSine:STIMe 20PCT

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

## 2.3.61 Off-phase controlled sine wave off-phase setting/query [:SOURce[1|2]]:FUNCtion:OFPSine:OFPHase

**■[: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 → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:OFPSine:OFPHase 30DEG

Sets off-phase of off-phase controlled sine wave of CH1 to 30°

## 2.3.62 Off-phase controlled sine wave off-slope setting/query [:SOURce[1|2]]:FUNCtion:OFPSine:STIMe

■[: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: 0.00% to 50.00%,

                  Resolution: 0.01%

        <units>   ::= PCT

    MINimum   →   0.00%

    MAXimum  →   50.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum   →   Queries the minimum value

    MAXimum  →   Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:OFPSine:STIMe 20PCT

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

## 2.3.63 Chattering-on sine wave on-phase setting/query [:SOURce[1|2]]:FUNCtion:CONSine:ONPHase

■[: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   →   Queries the minimum value

    MAXimum  →   Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:CONSine:ONPHase 30DEG

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

## 2.3.64 Chattering-on sine wave number of chatterings setting/query [:SOURce[1|2]]:FUNCtion:CONSine:NCHattering

**■[: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**

&lt;chattering&gt;|MINimum|MAXimum

    &lt;chattering&gt;  ::=  &lt;INT&gt;

        &lt;INT&gt;    → Number of chatterings: 0 to 3,

    MINimum    →    0

    MAXimum    →    3

**Query parameters**

[MINimum|MAXimum]

    MINimum    →    Queries the minimum value

    MAXimum    →    Queries the maximum value

**Response format**

&lt;NR1&gt;

**Setting example**

:SOURce1:FUNCtion:CONSine:NCHattering 2

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

## 2.3.65 Chattering-on sine wave on-time setting/query [:SOURce[1|2]]:FUNCtion:CONSine:TON

**■[:SOURce[1|2]]:FUNCtion:CONSine:TON**

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

**Description**

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

**Setting parameters**

&lt;time&gt;|MINimum|MAXimum

    &lt;time&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → On-time: 0.00% to 20.00%,

                Resolution: 0.01%

        &lt;units&gt;    ::= PCT

    MINimum    →    0.00%

    MAXimum    →    20.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum    →    Queries the minimum value

    MAXimum    →    Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:CONSine:TON 20PCT

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

## 2.3.66 Chattering-on sine wave off time setting/query [:SOURce[1|2]]:FUNCtion:CONSine:TOFF

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

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

**Description**

Sets/queries off time of chattering-on sine wave

**Setting parameters**

&lt;time&gt;|MINimum|MAXimum

    &lt;time&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt; → Off time: 0.00% to 20.00%,

                Resolution: 0.01%

        &lt;units&gt; ::= PCT

    MINimum → 0.00%

    MAXimum → 20.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:CSINe:CLIP 20PCT

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

## 2.3.67 Chattering-off sine wave off-phase setting/query [:SOURce[1|2]]:FUNCtion:COFSine:OFPHase

■**[:SOURce[1|2]]:FUNCtion:COFSine:OFPHase**

□**[:SOURce[1|2]]:FUNCtion:COFSine:OFPHase?**

**Description**

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

**Setting parameters**

&lt;phase&gt;|MINimum|MAXimum

    &lt;phase&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt; → Off-phase: 0.00° to 360.00°,

                Resolution: 0.01°

        &lt;units&gt; ::= DEG

    MINimum → 0.00°

    MAXimum → 360.00°

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:COFSine:OFPHase 30DEG

Sets off-phase of chattering-off sine wave of CH1 to 30°

## 2.3.68 Chattering-off sine wave number of chatterings setting/query [:SOURce[1|2]]:FUNCtion:COFSine:NCHattering

■**[: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**

&lt;chattering&gt;|MINimum|MAXimum

&lt;chattering&gt; ::= &lt;INT&gt;

&lt;INT&gt; → Number of chatterings: 0 to 3

MINimum → 0

MAXimum → 3

**Query parameters**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

&lt;NR1&gt;

**Setting example**

:SOURce1:FUNCtion:COFSine:NCHattering 2

Sets number of chatterings of chattering-off sine wave of CH1 to 2

## 2.3.69 Chattering-off sine wave on-time setting/query [:SOURce[1|2]]:FUNCtion:COFSine:TON

■**[:SOURce[1|2]]:FUNCtion:COFSine:TON**

□**[:SOURce[1|2]]:FUNCtion:COFSine:TON?**

**Description**

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

**Setting parameters**

&lt;time&gt;|MINimum|MAXimum

&lt;time&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

&lt;REAL&gt; → On-time: 0.00% to 20.00%,

Resolution: 0.01%

&lt;units&gt; ::= PCT

MINimum → 0.00%

MAXimum → 20.00%

**Query parameters**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:COFSine:TON 20PCT

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

## 2.3.70 Chattering-off sine wave off time setting/query [:SOURce[1|2]]:FUNCtion:COFSine:TOFF

**■[:SOURce[1|2]]:FUNCtion:COFSine:TOFF**

**□[:SOURce[1|2]]:FUNCtion:COFSine:TOFF?**

**Description**

Sets/queries off time of chattering-off sine wave

**Setting parameters**

&lt;time&gt;|MINimum|MAXimum

    &lt;time&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Off time: 0.00% to 20.00%,

                Resolution: 0.01%

        &lt;units&gt;   ::= PCT

    MINimum   →  0.00%

    MAXimum  →  20.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum   →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:COFSine:TOFF 20PCT

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

## 2.3.71 Gaussian pulse standard deviation setting/query [:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa

**■[:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa**

**□[:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa?**

**Description**

Sets/queries standard deviation of Gaussian pulse

**Setting parameters**

&lt;sigma&gt;|MINimum|MAXimum

    &lt;sigma&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Standard deviation: 0.00% to 100.00%,

                Resolution: 0.01%

        &lt;units&gt;   ::= PCT

    MINimum   →  0.00%

    MAXimum  →  100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum   →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:GAUSsian:SIGMa 20PCT

Sets standard deviation of Gaussian pulse of CH1 to 20%

## 2.3.72 Lorentz pulse
## half value of width setting/query
## [:SOURce[1|2]]:FUNCtion:LORentz:HWIDth

■[: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  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:LORentz:HWIDth 20PCT

Sets half value of width of Lorentz pulse of CH1 to 20%

## 2.3.73 Haversine
## width setting/query
## [:SOURce[1|2]]:FUNCtion:HAVersine:WIDTh

■[: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  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:HAVersine:WIDTh 20PCT

Sets haversine width of CH1 to 20%

## 2.3.74 Half-sine pulse width setting/query [:SOURce[1|2]]:FUNCtion:HSPulse:WIDTh

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

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

**Description**

Sets/queries half-sine pulse width

**Setting parameters**

&lt;width&gt;|MINimum|MAXimum

    &lt;width&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Width: 0.01% to 100.00%,

                 Resolution: 0.01%

        &lt;units&gt;  ::= PCT

    MINimum  →  0.01%

    MAXimum  →  100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:HSPulse:WIDTh 20PCT

Sets half-sine pulse width of CH1 to 20%

## 2.3.75 Trapezoid pulse slope width setting/query [:SOURce[1|2]]:FUNCtion:TPULse:RFALl

■[:SOURce[1|2]]:FUNCtion:TPULse:RFALl

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

**Description**

Sets/queries slope width of trapezoid pulse

**Setting parameters**

&lt;width&gt;|MINimum|MAXimum

    &lt;width&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Slope width: 0.00% to 50.00%,

                 Resolution: 0.01%

        &lt;units&gt;  ::= PCT

    MINimum  →  0.00%

    MAXimum  →  50.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

    :SOURce1:FUNCtion:TPULse:RFALl 20PCT

    Sets slope width of trapezoid pulse of CH1 to 20%

## 2.3.76 Trapezoid pulse upper base width setting/query [:SOURce[1|2]]:FUNCtion:TPULse:UBASe

■**[: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    →   Queries the minimum value

        MAXimum   →   Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:FUNCtion:TPULse:UBASe 20PCT

    Sets upper base width of trapezoid pulse of CH1 to 20%

## 2.3.77 Sin(x)/x number of zero crossing setting/query [:SOURce[1|2]]:FUNCtion:SINC:ZCRossing

■**[: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>

                <REAL>  →  Number of zero crossing: 1 to 50

        MINimum    →   1

        MAXimum   →   50

**Query parameters**

    [MINimum|MAXimum]

        MINimum    →   Queries the minimum value

        MAXimum   →   Queries the maximum value

**Response format**

    <NR1>

**Setting example**

:SOURce1:FUNCtion:SINC:ZCRossing 10

Sets number of zero crossings of Sin(x)/x of CH1 to 10

## 2.3.78 Exponential rise time constant setting/query [:SOURce[1|2]]:FUNCtion:ERISe:TCONstant

■**[:SOURce[1|2]]:FUNCtion:ERISe:TCONstant**

□**[:SOURce[1|2]]:FUNCtion:ERISe:TCONstant?**

**Description**

Sets/queries time constant of exponential rise

**Setting parameters**

&lt;tc&gt;|MINimum|MAXimum

    &lt;tc&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt; → Time constant: 0.01% to 100.00%,

            Resolution: 0.01%

        &lt;units&gt; ::= PCT

    MINimum → 0.01%

    MAXimum → 100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:ERISe:TCONstant 20PCT

Sets time constant of exponential rise of CH1 to 20%

## 2.3.79 Exponential fall time constant setting/query [:SOURce[1|2]]:FUNCtion:EFALl:TCONstant

■**[:SOURce[1|2]]:FUNCtion:EFALl:TCONstant**

□**[:SOURce[1|2]]:FUNCtion:EFALl:TCONstant?**

**Description**

Sets/queries time constant of exponential fall

**Setting parameters**

&lt;tc&gt;|MINimum|MAXimum

    &lt;tc&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt; → Time constant: 0.01% to 100.00%,

            Resolution: 0.01%

        &lt;units&gt; ::= PCT

    MINimum → 0.01%

    MAXimum → 100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:EFALl:TCONstant 20PCT

Sets time constant of exponential fall of CH1 to 20%

## 2.3.80 Second order LPF step response natural frequency setting/query [:SOURce[1|2]]:FUNCtion:SOLStep:NFRequency

■**[: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**

&lt;frequency&gt;|MINimum|MAXimum

  &lt;frequency&gt; ::= &lt;REAL&gt;

     &lt;REAL&gt; → Natural frequency: 1.00 to 50.00,

         Resolution: 0.01

  MINimum → 1.00

  MAXimum → 50.00

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:SOLStep:NFRequency 10

Sets natural frequency of second order LPF step response of CH1 to 10

## 2.3.81 Second order LPF step response Q setting/query [:SOURce[1|2]]:FUNCtion:SOLStep:Q

■**[: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**

&lt;q&gt;|MINimum|MAXimum

  &lt;q&gt; ::= &lt;REAL&gt;

    &lt;REAL&gt; → Q of LPF: 0.50 to 50.00,

        Resolution: 0.01

  MINimum → 0.50

  MAXimum → 50.00

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:SOLStep:Q 10

Sets Q of second order LPF step response of CH1 to 10

## 2.3.82 Damped oscillation
## oscillation frequency setting/query
## [:SOURce[1|2]]:FUNCtion:DOSCillation:OFRequency

■[: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 frequency: 0.01 to 50.00,

Resolution: 0.01

MINimum   →   0.01

MAXimum   →   50.00

**Query parameters**

[MINimum|MAXimum]

MINimum   →   Queries the minimum value

MAXimum   →   Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:DOSCillation:OFRequency 10

Sets oscillation frequency of damped oscillation of CH1 to 10

## 2.3.83 Damped oscillation
## damping time constant setting/query
## [:SOURce[1|2]]:FUNCtion:DOSCillation:DTConstant

■[: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   →   Queries the minimum value

MAXimum   →   Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion: DOSCillation:DTConstant 20PCT

Sets damping time constant of damped oscillation of CH1 to 20%

## 2.3.84 Oscillation surge
## oscillation frequency setting/query
## [:SOURce[1|2]]:FUNCtion:OSURge:OFRequency

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

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

**Description**

Sets/queries oscillation frequency of oscillation surge

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

    &lt;frequency&gt;  ::=  &lt;REAL&gt;

            &lt;REAL&gt;  → Oscillation frequency: 0.01 to 50.00,

                            Resolution: 0.01

    MINimum     →    0.01

    MAXimum    →    50.00

**Query parameters**

[MINimum|MAXimum]

    MINimum     →    Queries the minimum value

    MAXimum    →    Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:OSURge:OFRequency 10

Sets oscillation frequency of oscillation surge of CH1 to 10

## 2.3.85 Oscillation surge
## damping time constant setting/query
## [:SOURce[1|2]]:FUNCtion:OSURge:DTConstant

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

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

**Description**

Sets/queries damping time constant of oscillation surge

**Setting parameters**

&lt;tc&gt;|MINimum|MAXimum

    &lt;tc&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

            &lt;REAL&gt;  → Damping time constant: 0.01% to 100.00%,

                            Resolution: 0.01%

            &lt;units&gt;    ::= PCT

    MINimum     →    0.01%

    MAXimum    →    100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum     →    Queries the minimum value

    MAXimum    →    Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:OSURge:DTConstant 20PCT

Sets damping time constant of oscillation surge of CH1 to 20%

## 2.3.86 Oscillation surge trailing time constant setting/query [:SOURce[1|2]]:FUNCtion:OSURge:TTConstant

■**[: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    →    Queries the minimum value

MAXimum    →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:FUNCtion:OSURge:TTConstant 20PCT

Sets trailing time constant of oscillation surge of CH1 to 20%

## 2.3.87 Pulse surge rising time setting/query [:SOURce[1|2]]:FUNCtion:PSURge:TR

■**[: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    →    Queries the minimum value

MAXimum    →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

> :SOURce1:FUNCtion:PSURge:TR 20PCT
>
> Sets rising time of pulse surge of CH1 to 20%

## 2.3.88 Pulse surge
## duration time setting/query
## [:SOURce[1|2]]:FUNCtion:PSURge:TD

■**[: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   →   Queries the minimum value
>>
>> MAXimum   →   Queries the maximum value

**Response format**

> <NR3>

**Setting example**

> :SOURce1:FUNCtion:PSURge:TD 20PCT
>
> Sets duration time of pulse surge of CH1 to 20%

## 2.3.89 Trapezoid with offset
## leading delay setting/query
## [:SOURce[1|2]]:FUNCtion:TOFFset:DELay

■**[: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   →   Queries the minimum value
>>
>> MAXimum   →   Queries the maximum value

**Response format**

> <NR3>

**Setting example**

:SOURce1:FUNCtion:TOFFset:DELay 20PCT

Sets leading delay of trapezoid with offset of CH1 to 20%

## 2.3.90 Trapezoid with offset rising-slope width setting/query [:SOURce[1|2]]:FUNCtion:TOFFset:RISe

■**[:SOURce[1|2]]:FUNCtion:TOFFset:RISe**

□**[:SOURce[1|2]]:FUNCtion:TOFFset:RISe?**

**Description**

Sets/queries rising-slope width of trapezoid with offset

**Setting parameters**

&lt;width&gt;|MINimum|MAXimum

  &lt;width&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

     &lt;REAL&gt; → Rising-slope width: 0.00% to 100.00%,

         Resolution: 0.01%

     &lt;units&gt; ::= PCT

  MINimum → 0.00%

  MAXimum → 100.00%

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:TOFFset:RISe 20PCT

Sets rising-slope width of trapezoid with offset of CH1 to 20%

## 2.3.91 Trapezoid with offset upper base width setting/query [:SOURce[1|2]]:FUNCtion:TOFFset:UBASe

■**[:SOURce[1|2]]:FUNCtion:TOFFset:UBASe**

□**[:SOURce[1|2]]:FUNCtion:TOFFset:UBASe?**

**Description**

Sets/queries upper base width of trapezoid with offset

**Setting parameters**

&lt;width&gt;|MINimum|MAXimum

  &lt;width&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

     &lt;REAL&gt; → Upper base width: 0.00% to 100.00%,

         Resolution: 0.01%

     &lt;units&gt; ::= PCT

  MINimum → 0.00%

  MAXimum → 100.00%

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

> :SOURce1:FUNCtion:TOFFset:UBASe 20PCT
>
> Sets upper base width of trapezoid with offset of CH1 to 20%

## 2.3.92 Trapezoid with offset falling-slope setting/query [:SOURce[1|2]]:FUNCtion:TOFFset:FALL

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

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

**Description**

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

**Setting parameters**

> &lt;width&gt;|MINimum|MAXimum
>
> > &lt;width&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]
> >
> > > &lt;REAL&gt;  → Falling-slope width: 0.00% to 100.00%,
> > > Resolution: 0.01%
> > >
> > > &lt;units&gt;  ::= PCT
> >
> > MINimum  →  0.00%
> >
> > MAXimum  →  100.00%

**Query parameters**

> [MINimum|MAXimum]
>
> > MINimum  →  Queries the minimum value
> >
> > MAXimum  →  Queries the maximum value

**Response format**

> &lt;NR3&gt;

**Setting example**

> :SOURce1:FUNCtion:TOFFset:FALL 20PCT
>
> Sets falling-slope width of trapezoid with offset of CH1 to 20%

## 2.3.93 Trapezoid with offset offset setting/query [:SOURce[1|2]]:FUNCtion:TOFFset:OFFSet

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

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

**Description**

> Sets/queries offset of trapezoid with offset

**Setting parameters**

> &lt;offset&gt;|MINimum|MAXimum
>
> > &lt;offset&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]
> >
> > > &lt;REAL&gt;  → Offset: 0.00% to 100.00%,
> > > Resolution: 0.01%
> > >
> > > &lt;units&gt;  ::= PCT
> >
> > MINimum  →  0.00%
> >
> > MAXimum  →  100.00%

**Query parameters**

> [MINimum|MAXimum]
>
> > MINimum  →  Queries the minimum value
> >
> > MAXimum  →  Queries the maximum value

**Response format**

> &lt;NR3&gt;

**Setting example**

    :SOURce1:FUNCtion:TOFFset:OFFSet 20PCT

    Sets offset of trapezoid with offset of CH1 to 20%

## 2.3.94 Half-sine edge pulse leading-edge time setting/query [:SOURce[1|2]]:FUNCtion:HSEPulse:LE

■**[: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 → Queries the minimum value

        MAXimum → Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:FUNCtion:HSEPulse:LE 20PCT

    Sets leading-edge time of half-sine edge pulse of CH1 to 20%

## 2.3.95 Half-sine edge pulse trailing-edge time setting/query [:SOURce[1|2]]:FUNCtion:HSEPulse:TE

■**[: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 → Queries the minimum value

        MAXimum → Queries the maximum value

**Response format**

    <NR3>

**Setting example**

:SOURce1:FUNCtion:HSEPulse:TE 20PCT

Sets trailing-edge time of half-sine edge pulse of CH1 to 20%

## 2.3.96 Half-sine edge pulse duty setting/query [:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle

■[:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle

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

**Description**

Sets/queries duty of half-sine edge pulse

**Setting parameters**

&lt;duty&gt;|MINimum|MAXimum

    &lt;duty&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Duty: 0.00% to 100.00%,

                Resolution: 0.01%

        &lt;units&gt;  ::= PCT

    MINimum  →  0.00%

    MAXimum  →   100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:HSEPulse:DCYCle 20PCT

Sets duty of half-sine edge pulse of CH1 to 20%

## 2.3.97 Bottom referenced ramp wave symmetry setting/query [:SOURce[1|2]]:FUNCtion:BRRAMp:SYMMetry

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

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

**Description**

Sets/queries bottom referenced ramp wave symmetry

**Setting parameters**

&lt;symmetry&gt;|MINimum|MAXimum

    &lt;symmetry&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Symmetry: 0.00% to 100.00%,

                Resolution: 0.01%

        &lt;units&gt;  ::= PCT

    MINimum  →  0.00%

    MAXimum  →  100.00%

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FUNCtion:BRRAMp:SYMMetry 20PCT

Sets symmetry of bottom referenced ramp wave of CH1 to 20%

## 2.3.98 Arbitrary waveform selection/query
## [:SOURce[1|2]]:FUNCtion:USER

■[:SOURce[1|2]]:FUNCtion:USER

□[:SOURce[1|2]]:FUNCtion:USER?

**Description**

Sets/queries the arbitrary waveform

**Setting parameters**

&lt;memory&gt;    ::= &lt;INT&gt;

&lt;INT&gt; →   Memory number: 0 to 128

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:SOURce1:FUNCtion:USER 3

Sets the arbitrary waveform of CH1 to the data of the memory number 3

**Remarks**

† Memory number 0 is the edit memory

## 2.3.99 Arbitrary waveform memory
## arbitrary waveform data transfer/read-out
## {:TRACe|:DATA}[:DATA]

■{:TRACe|:DATA}[:DATA]

□{:TRACe|:DATA}[:DATA]?

**Description**

Transfers/reads out the arbitrary wave data

**Setting parameters**

&lt;memory&gt;,[&lt;name&gt;],&lt;data&gt;

&lt;memory&gt;    ::=   &lt;INT&gt;

&lt;INT&gt;        →  Memory number: 0 to 128

&lt;name&gt;        ::=   &lt;STR&gt;

&lt;STR&gt;        →  Arbitrary wave name (20 characters or less)

† Optional (If omitted, nothing is changed)

† If the arbitrary wave name is less than 20 characters, the remaining

characters are filled with spaces (with the ASCII code 32).

&lt;data&gt;        ::=   &lt;BLK&gt;

&lt;BLK&gt; →   Arbitrary wave data

(Data formats)

Array format

#&lt;digit&gt;&lt;byte&gt;&lt;format&gt;&lt;number&gt;&lt;data[0]&gt;…&lt;data[n-1]&gt;

\#        →   Start of the binary data

&lt;digit&gt;    →   The number of digits of subsequent &lt;byte&gt;

&lt;byte&gt;    →   The number of bytes of subsequent data

&lt;format&gt;  →   Data format (4 bytes)

† Specify 0 for the array format

&lt;number&gt; →   The number of data points (4 bytes)

<data[i]> → i-th value (2 bytes)

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

     # → Start of the binary data

     <digit> → The number of digits of subsequent <byte>

     <byte> → The number of bytes of subsequent data

     <format> → Data format (4 bytes)

     † Specify 1 for the control point format

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

     <x[i]> → x value of i-th control point (4 bytes)

     <y[i]> → y value of i-th control point (2 bytes)

† Save the arbitrary data of <data> as the arbitrary wave name of <name> to the memory number of <memory>.

**Query parameters**

<memory>

     <memory> ::= <INT>

          <INT> → Memory number: 0 to 128

**Response format**

<name>,<data>

     <name> ::= <STR>

          <STR> → Arbitrary wave name (20 characters)

     <data> ::= <BLK>

          † For <BLK>, see the setting parameters.

**Remarks**

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

② is the two's complement form and from -32767 (H'8001) to 32767 (H'7FFF).
If a value is -32768 (H'8000), set it as -32767 (H'8001).

③ The control point <x[i]> is treated as a numeric value of X axis from 0 up to 31th power of two. The numeric range is expressed as a range from H'00000000 to H'7FFFFFFF in hexadecimal. If data exceeds the setting range, it is treated as an error and no command is executed.

④ The control point <x[i]> must be sorted in ascending order from the beginning of data. If it is not sorted, an error occurs.

⑤ The control point <y[i]> is treated as a numeric value of Y axis from -32767 to 32767. The numeric range is expressed as a range from H'8001 to H'7FFF in hexadecimal.

The value 0 is expressed as H'0000.
-32768 (H'8000) is set as -32767 (H'8001).

If the amplitude width of actual signal output is ±1.0 Vp-p, 1 LSB 1/32767 V is used.
† All of the logical signal output values are not guaranteed.

⑥ Arbitrary wave memory number 0 is the edit memory.
⑦ The arbitrary wave name of the memory number 0 is "<Edit Memory>       "(20 characters).
⑧ Array format data cannot be set for the arbitrary wave memory number 0.

⑨ Arbitrary wave name cannot be set for the arbitrary wave memory number 0. If it is specified, it is ignored.

## 2.3.100 Arbitrary waveform memory store {:TRACe|:DATA}:STORe

■ {:TRACe|:DATA}:STORe

**Description**

Saves the contents of edit memory (memory number 0) as an arbitrary wave file to the memory

**Setting parameters**

&lt;memory&gt;,&lt;name&gt;

    &lt;memory   ::=  &lt;INT&gt;

        &lt;INT&gt;   → Memory number of location to save: 1 to 128

    &lt;name&gt;    ::=  &lt;STR&gt;

        &lt;STR&gt;   → Arbitrary wave name (20 characters or less)

        † Optional (If omitted, nothing is changed)

        † If the arbitrary wave name is less than 20 characters, the remaining characters are filled with spaces (with the ASCII code 32).

**Setting example**

:TRACe:STORe 2,"name"

Saves the contents of edit memory as the arbitrary wave name "name" to the memory number 2

## 2.3.101 Arbitrary waveform memory recall {:TRACe|:DATA}:RECall

■ {:TRACe|:DATA}:RECall

**Description**

Reads the arbitrary wave file of the specified memory number into the edit memory (memory number 0)

**Setting parameters**

&lt;memory&gt;

    &lt;memory&gt; ::=  &lt;INT&gt;

        &lt;INT&gt;   →   Memory number of calling source: 1 to 128

**Setting example**

:TRACe:STORe:RECall 2

Reads the contents of memory number 2 into the edit memory.

## 2.3.102 Arbitrary waveform memory copy {:TRACe|:DATA}:COPY

■{:TRACe|:DATA}:COPY

**Description**

Copies the arbitrary wave data

**Setting parameters**

&lt;memory&gt;,[&lt;name&gt;],&lt;chan&gt;,&lt;wave&gt;

    &lt;memory&gt;  ::=  &lt;INT&gt;

        &lt;INT&gt;   →  Memory number: 0 to 128

    &lt;name&gt;   ::=  &lt;STR&gt;

<STR> → Arbitrary wave name (20 characters)

† Optional (If omitted, the destination name is assumed.)

† If the arbitrary wave name is less than 20 characters, the remaining characters are filled with spaces (with the ASCII code 32).

<chan>   ::=  <INT>

<INT>   →   Channel number: 1 to 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
            |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 |
| HSEPulse | → | Half-sine edge pulse |
| BRRamp | → | Bottom referenced ramp wave |
| USER | → | Arbitrary waveform |

† Copy the waveform <wave> of the channel number <chan> as the arbitrary wave name <name> to the memory number <memory>.

**Setting example**

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

Copies the waveform memory of sine wave of CH1 as the arbitrary wave name "name" to the arbitrary wave memory 1

**Remarks**

① Memory number 0 is the edit memory.

② The arbitrary wave name of the memory number 0 is "&lt;Edit Memory&gt;  "(20 characters).

③ The arbitrary wave data of the memory selected in "[:SOURce[1|2]]:FUNCtion:USER" is copied as a copy of arbitrary wave.

## 2.3.103 Arbitrary waveform memory delete {:TRACe|:DATA}:DELete

■ **{:TRACe|:DATA}:DELete**

**Description**

Deletes the arbitrary wave memory

**Setting parameters**

&lt;memory&gt;

&lt;memory&gt;  ::=  &lt;INT&gt;

&lt;INT&gt;  → Memory number: 0 to 128

**Setting example**

:TRACe:DELete 1

Deletes the memory number 1

**Remarks**

① Memory number 0 is the edit memory.

② Specifying the memory number 0 gives the same effect as the case of operating the [New] soft-key in the Edit arbitrary waveform screen on the main unit.

## 2.3.104 Arbitrary waveform memory information acquisition {:TRACe|:DATA}:INFormation?

□**{:TRACe|:DATA}:INFormation?**

**Description**

Acquires the information of arbitrary wave memory

**Query parameters**

&lt;memory&gt;  ::= &lt;INT&gt;

&lt;INT&gt;→ Memory number: 1 to 128

**Response format**

&lt;name&gt;,&lt;format&gt;,&lt;number&gt;

&lt;name&gt;  ::=  &lt;STR&gt;

&lt;STR&gt;  → Arbitrary wave name (20 characters)

&lt;format&gt;  ::=  &lt;INT&gt;

&lt;INT&gt;  → Data format

0  → Array format

1  → Control point format

&lt;number&gt; ::= &lt;INT&gt;

&lt;INT&gt;  → The number of data points

## 2.3.105 Continuous oscillation mode selection [:SOURce[1|2]]:CONTinuous[:IMMediate]

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

**Description**

Sets the oscillation mode to the continuous oscillation

**Setting parameters**

None

**Setting example**

    :SOURce1:CONTinuous:IMMediate

    Sets the oscillation mode of CH1 to the continuous oscillation

## 2.3.106 Continuous oscillation mode query [:SOURce[1|2]]:CONTinuous:STATe?

□**[:SOURce[1|2]]:CONTinuous:STATe?**

**Description**

    Queries whether or not the oscillation mode is the continuous oscillation

**Query parameters**

    None

**Response format**

    <NBOL>

        <NBOL>  → 0: The oscillation mode is not the continuous oscillation mode

                           1: The oscillation mode is the continuous oscillation mode

**Remarks**

    † If you want to switch to the continuous oscillation without being affected by the oscillation mode set at that time, use this command to switch to the continuous oscillation mode.

## 2.3.107 Modulated oscillation mode FSK selection/query [:SOURce[1|2]]:FSKey:STATe

■**[:SOURce[1|2]]:FSKey:STATe**

□**[:SOURce[1|2]]:FSKey:STATe?**

**Description**

    Switches the oscillation mode to the modulated oscillation mode FSK

    Queries whether or not the oscillation mode is the modulated oscillation mode FSK

**Setting parameters**

    <state>   ::=   <BOL>

        <BOL>  → 0/OFF:  Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode FSK

                    1/ON:    Switches the oscillation mode to the modulation (FSK)

**Query parameters**

    None

**Response format**

    <NBOL>

        <NBOL>  → 0: The oscillation mode is not the modulated oscillation mode FSK

                           1: The oscillation mode is the modulated oscillation mode FSK

**Setting example**

    :SOURce1:FSKey:STATe ON

    Switches the oscillation mode of CH1 to FSK

### 2.3.108 Modulated oscillation mode FSK hop frequency setting/query [:SOURce[1|2]]:FSKey[:FREQuency]

**■[:SOURce[1|2]]:FSKey[:FREQuency]**

**□[:SOURce[1|2]]:FSKey[:FREQuency]?**

**Description**

Selects/queries the FSK hop frequency

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

&lt;frequency&gt;　::=　&lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

&lt;REAL&gt;　→ Hop frequency

† The setting range is within the allowed frequency setting range for each carrier waveform.

&lt;eunits&gt;　::= M|K|U|N

&lt;units&gt;　::= HZ

MINimum　→　Sets the maximum value

MAXimum　→　Sets the minimum value

**Query parameters**

[MINimum|MAXimum]

MINimum　→　Queries the minimum value

MAXimum　→　Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FSKey:FREQuency 1KHZ

Sets the FSK hop frequency of CH1 to 1 kHz

### 2.3.109 Modulated oscillation mode FSK modulation source selection/query [:SOURce[1|2]]:FSKey:SOURce

**■[:SOURce[1|2]]:FSKey:SOURce**

**□[:SOURce[1|2]]:FSKey:SOURce?**

**Description**

Selects/queries the FSK modulation source

**Setting parameters**

INTernal|EXTernal|CH1

INTernal　→　Internal

EXTernal　→　External

CH1　→　External of CH1 (Only CH2 can be selected)

**Query parameters**

None

**Response format**

INT|EXT|CH1

† For the meaning of each response data, see the setting parameter

**Setting example**

:SOURce1:FSKey:SOURce INTernal

Sets the FSK modulation source of CH1 to internal

## 2.3.110 Modulated oscillation mode FSK modulation frequency setting/query [:SOURce[1|2]]:FSKey:INTernal:FREQuency

■**[:SOURce[1|2]]:FSKey:INTernal:FREQuency**

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

**Description**

Sets/queries the FSK internal modulation frequency

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

    &lt;frequency&gt; ::= &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

        &lt;REAL&gt; → Internal modulation frequency: 0.1 mHz to 1 MHz

                Resolution: 5 digits or 0.1 mHz

        &lt;eunits&gt; ::= M|K|U|N

        &lt;units&gt; ::= HZ

    MINimum → 0.1 mHz

    MAXimum → 1 MHz

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FSKey:INTernal:FREQuency 1KHZ

Sets the FSK internal modulation frequency of CH1 to 1 kHz

## 2.3.111 Modulated oscillation mode FSK synchronization signal output selection/query :OUTPut[1|2]:SYNC:FSKey:TYPE

■**:OUTPut[1|2]:SYNC:FSKey:TYPE**

□**:OUTPut[1|2]:SYNC:FSKey:TYPE?**

**Description**

Selects/queries the FSK synchronization output

**Setting parameters**

SYNC|MSYNc

    SYNC → Waveform synchronization

    MSYN → Internal modulation synchronization

**Query parameters**

None

**Response format**

SYNC|MSYN

† For the meaning of each response data, see the setting parameter

**Setting example**

:OUTPut1:SYNC:FSKey:TYPE SYNC

Sets the FSK synchronization output of CH1 to waveform synchronization

## 2.3.112 Modulated oscillation mode PSK selection/query [:SOURce[1|2]]:PSKey:STATe

■**[:SOURce[1|2]]:PSKey:STATe**

□**[:SOURce[1|2]]:PSKey:STATe?**

**Description**

Switches the oscillation mode to the modulated oscillation mode PSK

Queries whether or not the oscillation mode is the modulated oscillation mode PSK

**Setting parameters**

&lt;state&gt;    ::=    &lt;BOL&gt;

          &lt;BOL&gt;    → 0/OFF: Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode PSK

                    1/ON:    Switches the oscillation mode to the modulation (PSK)

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

          &lt;NBOL&gt;    → 0: The oscillation mode is not the modulated oscillation mode PSK

                    1: The oscillation mode is the modulated oscillation mode PSK

**Setting example**

:SOURce1:FSKey:STATe ON

Switches the oscillation mode of CH1 to PSK

## 2.3.113 Modulated oscillation mode PSK deviation setting/query [:SOURce[1|2]]:PSKey[:DEViation]

■**[:SOURce[1|2]]:PSKey[:DEViation]**

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

**Description**

Sets/queries the PSK deviation

**Setting parameters**

&lt;deviation&gt;|MINimun|MAXimum

          &lt;deviation&gt;    ::=    &lt;REAL&gt;[&lt;units&gt;]

                &lt;REAL&gt;    → Deviation: -1800.000° to 1800.000°, Resolution: 0.001°

                &lt;units&gt;    ::= DEG

        MINimum    →    -1800.000°

        MAXimum    →    1800.000°

**Query parameters**

[MINimum|MAXimum]

        MINimum    →    Queries the minimum value

        MAXimum    →    Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:PSKey:DEViation 30DEG

Sets the PSK deviation of CH1 to 30°

## 2.3.114 Modulated oscillation mode PSK modulation source selection/query [:SOURce[1|2]]:PSKey:SOURce

■[:SOURce[1|2]]:PSKey:SOURce

□[:SOURce[1|2]]:PSKey:SOURce?

**Description**

Selects/queries the PSK modulation source

**Setting parameters**

INTernal|EXTernal|CH1

| | | |
|---|---|---|
| INTernal | → | Internal |
| EXTernal | → | External |
| CH1 | → | External of CH1 (Only CH2 can be selected) |

**Query parameters**

None

**Response format**

INT|EXT|CH1

† For the meaning of each response data, see the setting parameter

**Setting example**

:SOURce1:PSKey:SOURce INTernal

Sets the PSK modulation source of CH1 to internal

## 2.3.115 Modulated oscillation mode PSK modulation frequency setting/query [:SOURce[1|2]]:PSKey:INTernal:FREQuency

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

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

**Description**

Sets/queries the PSK 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|K|U|N |
| | <units> | ::= HZ |
| MINimum | → | 0.1 mHz |
| MAXimum | → | 1 MHz |

**Query parameters**

[MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:PSKey:INTernal:FREQuency 1kHz

Sets the PSK internal modulation frequency of CH1 to 1 kHz

## 2.3.116 Modulated oscillation mode PSK
synchronization signal output selection/query
:OUTPut[1|2]:SYNC:PSKey:TYPE

■:OUTPut[1|2]:SYNC:PSKey:TYPE

□:OUTPut[1|2]:SYNC:PSKey:TYPE?

**Description**

Selects/queries the PSK synchronization output

**Setting parameters**

SYNC|MSYNc

SYNC   → Waveform synchronization

MSYN   → Internal modulation synchronization

**Query parameters**

None

**Response format**

SYNC|MSYN

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:PSKey:TYPE SYNC

Sets the PSK synchronization output of CH1 to waveform synchronization

## 2.3.117 Modulated oscillation mode
FM selection/query
[:SOURce[1|2]]:FM:STATe

■[:SOURce[1|2]]:FM:STATe

□[:SOURce[1|2]]:FM:STATe?

**Description**

Switches the oscillation mode to the modulated oscillation mode FM

Queries whether or not the oscillation mode is the modulated oscillation mode FM

**Setting parameters**

<state> ::= <BOL>

 <BOL> → 0/OFF: Switches to the continuous oscillation mode if the oscillation
mode is the modulated oscillation mode FM

     1/ON: Switches the oscillation mode to the modulation (FM)

**Query parameters**

None

**Response format**

<NBOL>

 <NBOL> → 0: The oscillation mode is not the modulated oscillation mode FM

     1: The oscillation mode is the modulated oscillation mode FM

**Setting example**

:SOURce1:FM:STATe ON

Switches the oscillation mode of CH1 to the modulation (FM)

## 2.3.118 Modulated oscillation mode FM peak deviation setting/query [:SOURce[1|2]]:FM[:DEViation]

■[:SOURce[1|2]]:FM[:DEViation]

□[:SOURce[1|2]]:FM[:DEViation]?

**Description**

Sets/queries the FM peak deviation

**Setting parameters**

&lt;deviation&gt;|MINimum|MAXimum

    &lt;deviation&gt; ::= &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

        &lt;REAL&gt; → Peak deviation: 0.00 μHz to less than 15 MHz,

                 Resolution: 8 digits or 0.01 μHz

        &lt;eunits&gt; ::= M|K|U|N

        &lt;units&gt; ::= HZ

    MINimum → Sets the minimum value

    MAXimum → Sets the maximum value

**Query parameters**

[MINimum|MAXimum]

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FM:DEViation 1KHZ

Sets the FM peak deviation of CH1 to 1 kHz

## 2.3.119 Modulated oscillation mode FM modulation source selection/query [:SOURce[1|2]]:FM:SOURce

■[:SOURce[1|2]]:FM:SOURce

□[:SOURce[1|2]]:FM:SOURce?

**Description**

Selects/queries the FM modulation source

**Setting parameters**

INTernal|EXTernal

    INTernal → Internal

    EXTernal → External

**Query parameters**

None

**Response format**

INT|EXT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:FM:SOURce INTernal

Sets the FM modulation source of CH1 to internal

## 2.3.120 Modulated oscillation mode FM modulation frequency setting/query [:SOURce[1|2]]:FM:INTernal:FREQuency

■**[:SOURce[1|2]]:FM:INTernal:FREQuency**

□**[:SOURce[1|2]]:FM:INTernal:FREQuency?**

**Description**

Sets/queries the FM internal modulation frequency

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

| | | |
|---|---|---|
| &lt;frequency&gt; | ::= | &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;] |
| | &lt;REAL&gt; | → Internal modulation frequency: 0.1 mHz to 100 kHz, Resolution: 5 digits or 0.1 mHz |
| | &lt;eunits&gt; | ::= M|K|U|N |
| | &lt;units&gt; | ::= HZ |
| MINimum | → | 0.1 mHz |
| MAXimum | → | 100 kHz |

**Query parameters**

[MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FM:INTernal:FREQuency 1KHZ

Sets the FM internal modulation frequency of CH1 to 1 kHz

## 2.3.121 Modulated oscillation mode FM modulation waveform selection/query [:SOURce[1|2]]:FM:INTernal:FUNCtion[:SHAPe]

■**[:SOURce[1|2]]:FM:INTernal:FUNCtion[:SHAPe]**

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

**Description**

Selects/queries the FM internal modulation waveform

**Setting parameters**

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

| | | |
|---|---|---|
| SINusoid | → | Sine wave |
| SQUare | → | Square wave |
| TRIangle | → | Triangle wave |
| PRAMp | → | Rising ramp wave |
| NRAMp | → | Falling ramp wave |
| NOISe | → | Noise |
| USER | → | Arbitrary waveform |

**Query parameters**

None

**Response format**

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

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid

Sets the FM internal modulation waveform of CH1 to sine wave

## 2.3.122 Modulated oscillation mode FM arbitrary waveform of modulation waveform selection/query [:SOURce[1|2]]:FM:INTernal:FUNCtion:USER

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

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

**Description**

Selects/queries the arbitrary waveform of FM internal modulation waveform

**Setting parameters**

<memory>   ::= <INT>

<INT> →   Memory number: 0 to 128

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:SOURce1:FM:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

## 2.3.123 Modulated oscillation mode FM synchronization signal output selection/query :OUTPut[1|2]:SYNC:FM:TYPE

■ **:OUTPut[1|2]:SYNC:FM:TYPE**

□ **:OUTPut[1|2]:SYNC:FM:TYPE?**

**Description**

Selects/queries the FM synchronization output

**Setting parameters**

SYNC|MSYNc|MFCTn

SYNC        →   Waveform synchronization

MSYNc       →   Internal modulation synchronization

FCTn        →   Internal modulation signal

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:FM:TYPE SYNC

Sets the FM synchronization output of CH1 to waveform synchronization

### 2.3.124 Modulated oscillation mode PM selection/query [:SOURce[1|2]]:PM:STATe

■**[:SOURce[1|2]]:PM:STATe**

□**[:SOURce[1|2]]:PM:STATe?**

**Description**

Switches the oscillation mode to the modulated oscillation mode PM

Queries whether or not the oscillation mode is the modulated oscillation mode PM

**Setting parameters**

<state>  ::=  <BOL>

<BOL>  → 0/OFF:  Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode PM

1/ON:  Switches the oscillation mode to the modulation (PM)

**Query parameters**

None

**Response format**

<NBOL>

<NBOL>  → 0: The oscillation mode is not the modulated oscillation mode PM

1: The oscillation mode is the modulated oscillation mode PM

**Setting example**

:SOURce1:PM:STATe ON

Switches the oscillation mode of CH1 to PM

### 2.3.125 Modulated oscillation mode PM peak deviation setting/query [:SOURce[1|2]]:PM[:DEViation]

■**[:SOURce[1|2]]:PM[:DEViation]**

□**[:SOURce[1|2]]:PM[:DEViation]?**

**Description**

Sets/queries the 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  →  Queries the minimum value

MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PM:DEViation 30DEG

Sets the PM peak deviation of CH1 to 30°

## 2.3.126 Modulated oscillation mode PM modulation source selection/query [:SOURce[1|2]]:PM:SOURce

■**[:SOURce[1|2]]:PM:SOURce**

□**[:SOURce[1|2]]:PM:SOURce?**

**Description**

Selects/queries the PM modulation source

**Setting parameters**

INTernal|EXTernal

    INTernal    →    Internal

    EXTernal    →    External

**Query parameters**

None

**Response format**

INT|EXT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:PM:SOURce INTernal

Sets the PM modulation source of CH1 to internal

## 2.3.127 Modulated oscillation mode PM modulation frequency setting/query [:SOURce[1|2]]:PM:INTernal:FREQuency

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

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

**Description**

Sets/queries the PM 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|K|U|N

        <units>  ::= HZ

    MINimum  →  0.1mHz

    MAXimum  →  100kHz

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PM:INTernal:FREQuency 1KHZ

Sets the PM internal modulation frequency of CH1 to 1 kHz

## 2.3.128 Modulated oscillation mode PM modulation waveform selection/query [:SOURce[1|2]]:PM:INTernal:FUNCtion[:SHAPe]

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

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

**Description**

Selects/queries the PM internal modulation waveform

**Setting parameters**

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

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

**Query parameters**

None

**Response format**

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

† For the meaning of each response data, see the setting parameter

**Setting example**

:SOURce1:PM:INTernal:FUNCtion:SHAPe SINusoid

Sets the PM internal modulation waveform of CH1 to sine wave

## 2.3.129 Modulated oscillation mode PM arbitrary waveform of modulation waveform selection/query [:SOURce[1|2]]:PM:INTernal:FUNCtion:USER

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

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

**Description**

Selects/queries the arbitrary waveform of PM internal modulation waveform

**Setting parameters**

<memory>   ::= <INT>

<INT> →   Memory number: 0 to 128

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:SOURce1:PM:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

## 2.3.130 Modulated oscillation mode PM synchronization signal output selection/query :OUTPut[1|2]:SYNC:PM:TYPE

■:OUTPut[1|2]:SYNC:PM:TYPE

□:OUTPut[1|2]:SYNC:PM:TYPE?

**Description**

Selects/queries the PM synchronization output

**Setting parameters**

SYNC|MSYNc|MFCTn

| | | |
|---|---|---|
| SYNC | → | Waveform synchronization |
| MSYNc | → | Internal modulation synchronization |
| MFCTn | → | Internal modulation signal |

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameter

**Setting example**

:OUTPut1:SYNC:PM:TYPE SYNC

Sets the PM synchronization output of CH1 to waveform synchronization

## 2.3.131 Modulated oscillation mode AM selection/query [:SOURce[1|2]]:AM:STATe

■[:SOURce[1|2]]:AM:STATe

□[:SOURce[1|2]]:AM:STATe?

**Description**

Switches the oscillation mode to the modulated oscillation mode AM

Queries whether or not the oscillation mode is the modulated oscillation mode AM

**Setting parameters**

<state>  ::=  <BOL>

<BOL>  → 0/OFF: Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode AM

1/ON:  Switches the oscillation mode to the modulation (AM)

**Query parameters**

None

**Response format**

<NBOL>

<NBOL>  → 0: The oscillation mode is not the modulated oscillation mode AM

1: The oscillation mode is the modulated oscillation mode AM

**Setting example**

:SOURce1:AM:STATe ON

Switches the oscillation mode of CH1 to AM

## 2.3.132 Modulated oscillation mode AM modulation depth setting/query [:SOURce[1|2]]:AM[:DEPTh]

■**[:SOURce[1|2]]:AM[:DEPTh]**

□**[:SOURce[1|2]]:AM[:DEPTh]?**

**Description**

Sets/queries the AM modulation depth

**Setting parameters**

<depth>|MINimum|MAXimum

$< depth > \ ::= \ <REAL>[<units>]$

$<REAL> \quad \rightarrow$ Modulation depth: 0.0% to 100.0%,

Resolution: 0.1%

$<units> \quad ::= PCT$

MINimum $\quad \rightarrow \quad$ 0.0%

MAXimum $\quad \rightarrow \quad$ 100.0%

**Query parameters**

[MINimum|MAXimum]

MINimum $\quad \rightarrow \quad$ Queries the minimum value

MAXimum $\quad \rightarrow \quad$ Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:AM:DEPTh 30PCT

Sets the AM modulation depth of CH1 to 30%

## 2.3.133 Modulated oscillation mode AM modulation source selection/query [:SOURce[1|2]]:AM:SOURce

■**[:SOURce[1|2]]:AM:SOURce**

□**[:SOURce[1|2]]:AM:SOURce?**

**Description**

Selects/queries the AM modulation source

**Setting parameters**

INTernal|EXTernal

INTernal $\quad \rightarrow \quad$ Internal

EXTernal $\quad \rightarrow \quad$ External

**Query parameters**

None

**Response format**

INT|EXT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:AM:SOURce INTernal

Sets the AM modulation source of CH1 to internal

## 2.3.134 Modulated oscillation mode AM modulation frequency setting/query [:SOURce[1|2]]:AM:INTernal:FREQuency

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

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

**Description**

Sets/queries the 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\|K\|U\|N |
|  | <units> | ::= HZ |
| MINimum | → | 0.1 mHz |
| MAXimum | → | 100 kHz |

**Query parameters**

[MINimum|MAXimum]

|  |  |  |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:AM:INTernal:FREQuency 1KHZ

Sets the AM internal modulation frequency of CH1 to 1 kHz

## 2.3.135 Modulated oscillation mode AM modulation waveform selection/query [:SOURce[1|2]]:AM:INTernal:FUNCtion[:SHAPe]

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

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

**Description**

Selects/queries the AM internal modulation waveform

**Setting parameters**

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

|  |  |  |
|---|---|---|
| SINusoid | → | Sine wave |
| SQUare | → | Square wave |
| TRIangle | → | Triangle wave |
| PRAMp | → | Rising ramp wave |
| NRAMp | → | Falling ramp wave |
| NOISe | → | Noise |
| USER | → | Arbitrary waveform |

**Query parameters**

None

**Response format**

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

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:AM:INTernal:FUNCtion:SHAPe SINusoid

Sets the AM internal modulation waveform of CH1 to sine wave

## 2.3.136 Modulated oscillation mode AM
### arbitrary waveform of modulation waveform selection/query
### [:SOURce[1|2]]:AM:INTernal:FUNCtion:USER

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

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

**Description**

Selects/queries the arbitrary waveform of AM internal modulation waveform

**Setting parameters**

&lt;memory&gt;   ::= &lt;INT&gt;

&lt;INT&gt; →   Memory number: 0 to 128

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:SOURce1:AM:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

## 2.3.137 Modulated oscillation mode AM
### synchronization signal output selection/query
### :OUTPut[1|2]:SYNC:AM:TYPE

■ **:OUTPut[1|2]:SYNC:AM:TYPE**

□ **:OUTPut[1|2]:SYNC:AM:TYPE?**

**Description**

Selects/queries the AM synchronization output

**Setting parameters**

SYNC|MSYNc|MFCTn

SYNC        →   Waveform synchronization

MSYNc       →   Internal modulation synchronization

MFCTn       →   Internal modulation signal

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:AM:TYPE SYNC

Sets the AM synchronization output of CH1 to waveform synchronization

## 2.3.138 Modulated oscillation mode AM (DSB-SC) selection/query [:SOURce[1|2]]:AMSC:STATe

■**[:SOURce[1|2]]:AMSC:STATe**

□**[:SOURce[1|2]]:AMSC:STATe?**

**Description**

    Switches the oscillation mode to the modulated oscillation mode AM (DSB-SC)

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

**Setting parameters**

    <state>  ::=  <BOL>

            <BOL>  → 0/OFF:  Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode AM (DSB-SC)

                        1/ON:   Switches the oscillation mode to the modulation AM (DSB-SC)

**Query parameters**

    None

**Response format**

    <NBOL>

            <NBOL>  → 0: The oscillation mode is not the modulated oscillation mode AM (DSB-SC)

                      1: The oscillation mode is the modulated oscillation mode AM (DSB-SC)

**Setting example**

    :SOURce1:AMSC:STATe ON

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

## 2.3.139 Modulated oscillation mode AM (DSB-SC) modulation depth setting/query [:SOURce[1|2]]:AMSC[:DEPTh]

■**[:SOURce[1|2]]:AMSC[:DEPTh]**

□**[:SOURce[1|2]]:AMSC[:DEPTh]?**

**Description**

    Sets/queries the 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   →  Queries the minimum value

        MAXimum   →  Queries the maximum value

**Response format**

    <NR3>

**Setting example**

:SOURce1:AMSC:DEPTh 30PCT

Sets the AM (DSB-SC) modulation depth of CH1 to 30%

## 2.3.140 Modulated oscillation mode AM (DSB-SC) modulation source selection/query [:SOURce[1|2]]:AMSC:SOURce

■**[:SOURce[1|2]]:AMSC:SOURce**

□**[:SOURce[1|2]]:AMSC:SOURce?**

**Description**

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

**Setting parameters**

INTernal|EXTernal

    INTernal    →    Internal modulation source

    EXTernal    →    External modulation source

**Query parameters**

None

**Response format**

INT|EXT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:AMSC:SOURce INTernal

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

## 2.3.141 Modulated oscillation mode AM (DSB-SC) modulation frequency setting/query [:SOURce[1|2]]:AMSC:INTernal:FREQuency

■**[:SOURce[1|2]]:AMSC:INTernal:FREQuency**

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

**Description**

Sets/queries the 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|K|U|N

        <units>    ::= HZ

    MINimum  →  0.1 mHz

    MAXimum  →  100 kHz

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:AMSC:INTernal:FREQuency 1KHZ

Sets the AM (DSB-SC) internal modulation frequency of CH1 to 1 kHz

## 2.3.142 Modulated oscillation mode AM (DSB-SC) modulation waveform selection/query [:SOURce[1|2]]:AMSC:INTernal:FUNCtion[:SHAPe]

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

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

**Description**

Selects/queries the AM (DSB-SC) internal modulation waveform

**Setting parameters**

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

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

**Query parameters**

None

**Response format**

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

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:AMSC:INTernal:FUNCtion:SHAPe SINusoid

Sets the AM (DSB-SC) internal modulation waveform of CH1 to sine wave

## 2.3.143 Modulated oscillation mode AM (DSB-SC) arbitrary waveform modulation waveform selection/query [:SOURce[1|2]]:AMSC:INTernal:FUNCtion:USER

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

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

**Description**

Selects/queries the arbitrary waveform of AM (DSB-SC) internal modulation waveform

**Setting parameters**

<memory> ::= <INT>

<INT> → Memory number: 0 to 128

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:SOURce1:AMSC:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

### 2.3.144 Modulated oscillation mode AM (DSB-SC) synchronization signal output selection/query :OUTPut[1|2]:SYNC:AMSC:TYPE

■:OUTPut[1|2]:SYNC:AMSC:TYPE

□:OUTPut[1|2]:SYNC:AMSC:TYPE?

**Description**

Selects/queries the AM (DSB-SC) synchronization output

**Setting parameters**

SYNC|MSYNc|MFCTn

| SYNC | → | Waveform synchronization |
|------|---|--------------------------|
| MSYNc | → | Internal modulation synchronization |
| MFCTn | → | Internal modulation signal |

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:AMSC:TYPE SYNC

Sets the AM (DSB-SC) synchronization output of CH1 to waveform synchronization

### 2.3.145 Modulated oscillation mode DC offset modulation selection/query [:SOURce[1|2]]:OFSM:STATe

■[:SOURce[1|2]]:OFSM:STATe

□[:SOURce[1|2]]:OFSM:STATe?

**Description**

Switches the oscillation mode to the modulated oscillation mode DC offset modulation

Queries whether or not the oscillation mode is the modulated oscillation mode DC offset modulation

**Setting parameters**

<state> ::= <BOL>

<BOL> → 0/OFF: Switches to the continuous oscillation mode if the oscillation mode is the modulated oscillation mode DC offset modulation

1/ON: Switches the oscillation mode to the modulation (DC offset modulation)

**Query parameters**

None

**Response format**

<NBOL>

<NBOL> → 0: The oscillation mode is not the modulated oscillation mode DC offset modulation

1: The oscillation mode is the modulated oscillation mode DC offset modulation

**Setting example**

:SOURce1:OFSM:STATe ON

Switches the oscillation mode of CH1 to the DC offset modulation

### 2.3.146 Modulated oscillation mode DC offset modulation peak deviation setting/query [:SOURce[1|2]]:OFSM[:DEViation]

**■[:SOURce[1|2]]:OFSM[:DEViation]**

**□[:SOURce[1|2]]:OFSM[:DEViation]?**

**Description**

Sets/queries the peak deviation of DC offset modulation

**Setting parameters**

&lt;deviation&gt;|MINimum|MAXimum

    &lt;deviation&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

        &lt;REAL&gt;  → Peak deviation: 0 V to 10 V/open,

                Resolution: (499.9 mV or less) 4 digits or 0.1 mV,

                    (0.5 V or more) 5 digits or 1 mV

        &lt;eunits&gt;  ::= M

        &lt;units&gt;  ::= V

    MINimum  →  0 V/open

    MAXimum  →  10 V/open

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:OFSM:DEViation 3V

CSets the peak deviation of DC offset modulation of CH1 to 3 V

### 2.3.147 Modulated oscillation mode DC offset modulation modulation source selection/query [:SOURce[1|2]]:OFSM:SOURce

**■[:SOURce[1|2]]:OFSM:SOURce**

**□[:SOURce[1|2]]:OFSM:SOURce?**

**Description**

Selects/queries the modulation source of DC offset modulation

**Setting parameters**

INTernal|EXTernal

    INTernal  →  Internal

    EXTernal  →  External

**Query parameters**

None

**Response format**

INT|EXT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:OFSM:SOURce INTernal

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

### 2.3.148 Modulated oscillation mode DC offset modulation modulation frequency setting/query [:SOURce[1|2]]:OFSM:INTernal:FREQuency

■**[:SOURce[1|2]]:OFSM:INTernal:FREQuency**

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

**Description**

Sets/queries the 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\|K\|U\|N |
| | <units> | ::= HZ |
| MINimum | → | 0.1 mHz |
| MAXimum | → | 100 kHz |

**Query parameters**

[MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:OFSM:INTernal:FREQuency 1KHZ

Sets the internal modulation frequency of DC offset modulation of CH1 to 1 kHz

### 2.3.149 Modulated oscillation mode DC offset modulation modulation waveform selection/query [:SOURce[1|2]]:OFSM:INTernal:FUNCtion[:SHAPe]

■**[:SOURce[1|2]]:OFSM:INTernal:FUNCtion[:SHAPe]**

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

**Description**

Selects/queries the internal modulation waveform of DC offset modulation

**Setting parameters**

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

| | | |
|---|---|---|
| SINusoid | → | Sine wave |
| SQUare | → | Square wave |
| TRIangle | → | Triangle wave |
| PRAMp | → | Rising ramp wave |
| NRAMp | → | Falling ramp wave |
| NOISe | → | Noise |
| USER | → | Arbitrary waveform |

**Response format**

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

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid

Sets the internal modulation waveform of DC offset modulation of CH1 to sine wave

### 2.3.150 Modulated oscillation mode DC offset modulation arbitrary waveform of modulation waveform selection/query [:SOURce[1|2]]:OFSM:INTernal:FUNCtion:USER

■ **[:SOURce[1|2]]:OFSM:INTernal:FUNCtion:USER**

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

**Description**

Selects/queries the arbitrary waveform of internal modulation waveform of DC offset modulation

**Setting parameters**

&lt;memory&gt; ::= &lt;INT&gt;

    &lt;INT&gt; → Memory number: 0 to 128

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:SOURce1:OFSM:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

### 2.3.151 Modulated oscillation mode DC offset modulation synchronization signal output selection/query :OUTPut[1|2]:SYNC:OFSM:TYPE

■ **:OUTPut[1|2]:SYNC:OFSM:TYPE**

□ **:OUTPut[1|2]:SYNC:OFSM:TYPE?**

**Description**

Selects/queries the synchronization output of DC offset modulation

**Setting parameters**

SYNC|MSYNc|MFCTn

    SYNC → Waveform synchronization

    MSYNc → Internal modulation synchronization

    MFCTn → Internal modulation signal

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:OFSM:TYPE SYNC

Sets the DC offset modulation synchronization output of CH1 to waveform synchronization

## 2.3.152 Modulated oscillation mode
### PWM selection/query
### [:SOURce[1|2]]:PWM:STATe

■**[:SOURce[1|2]]:PWM:STATe**

□**[:SOURce[1|2]]:PWM:STATe?**

**Description**

　　Switches the oscillation mode to the modulated oscillation mode PWM

　　Queries whether or not the oscillation mode is the modulated oscillation mode PWM

**Setting parameters**

　　<state>　::=　<BOL>

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

　　　　　　　　　　　　　　mode is the modulated oscillation mode PWM

　　　　　　　1/ON:　Switches the oscillation mode to the modulation (PWM)

**Query parameters**

　　None

**Response format**

　　<NBOL>

　　　　<NBOL>　→ 0: The oscillation mode is not the modulated oscillation mode PWM

　　　　　　　　　　1: The oscillation mode is the modulated oscillation mode PWM

**Setting example**

　　:SOURce1:PWM:STATe　ON

　　Switches the oscillation mode of CH1 to PWM

## 2.3.153 Modulated oscillation mode PWM
### peak deviation setting/query
### [:SOURce[1|2]]:PWM[:DEViation]:DCYCle

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

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

**Description**

　　Sets/queries the PWM peak deviation

**Setting parameters**

　　<deviation>|MINimum|MAXimum

　　　　<deviation>　::=　<REAL>[<units>]

　　　　　　<REAL>　→ (Square (duty variable range standard))

　　　　　　　　　　　　Peak deviation :0.0000% to 49.9900%,

　　　　　　　　　　　　Resolution :0.0001%,

　　　　　　　　　　　　(Square (duty variable range extend))

　　　　　　　　　　　　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 (duty variable range standard)) 49.9900%,

　　　　　　　　　　　(Square (duty variable range extend)) 50.0000%,

　　　　　　　　　　　(Pulse wave) 49.9000%

**Query parameters**

　　[MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

    &lt;NR3&gt;

**Setting example**

    :SOURce1:PWM:DEViation:DCYCle 30PCT

    Sets the PWM peak deviation of CH1 to 30%

## 2.3.154 Modulated oscillation mode PWM modulation source selection/query [:SOURce[1|2]]:PWM:SOURce

■**[:SOURce[1|2]]:PWM:SOURce**

□**[:SOURce[1|2]]:PWM:SOURce?**

**Description**

    Selects/queries the PWM modulation source

**Setting parameters**

    INTernal|EXTernal

| | | |
|---|---|---|
| INTernal | → | Internal |
| EXTernal | → | External |

**Query parameters**

    None

**Response format**

    INT|EXT

    † For the meaning of each response data, see the setting parameters.

**Setting example**

    :SOURce1:PWM:SOURce INTernal

    Sets the PWM modulation source of CH1 to internal

## 2.3.155 Modulated oscillation mode PWM modulation frequency setting/query [:SOURce[1|2]]:PWM:INTernal:FREQuency

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

□**[:SOURce[1|2]]:PWM:INTernal:FREQuency?**

**Description**

    Sets/queries the PWM internal modulation frequency

**Setting parameters**

    &lt;frequency&gt;|MINimum|MAXimum

| | | |
|---|---|---|
| &lt;frequency&gt; | ::= | &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;] |
| &lt;REAL&gt; | → | Internal modulation frequency: 0.1 mHz to 100 kHz, Resolution: 5 digits or 0.1 mHz |
| &lt;eunits&gt; | ::= | M\|K\|U\|N |
| &lt;units&gt; | ::= | HZ |
| MINimum | → | 0.1 mHz |
| MAXimum | → | 100 kHz |

**Query parameters**

    [MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:PWM:INTernal:FREQuency 1KHZ

Sets the PWM internal modulation frequency of CH1 to 1 kHz

## 2.3.156 Modulated oscillation mode PWM modulation waveform selection/query [:SOURce[1|2]]:PWM:INTernal:FUNCtion[:SHAPe]

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

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

**Description**

Selects/queries the PWM internal modulation waveform

**Setting parameters**

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

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

**Query parameters**

None

**Response format**

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

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:PWM:INTernal:FUNCtion:SHAPe SINusoid

Sets the PWM internal modulation waveform of CH1 to sine wave

## 2.3.157 Modulated oscillation mode PWM arbitrary waveform of modulation waveform selection/query [:SOURce[1|2]]:PWM:INTernal:FUNCtion:USER

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

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

**Description**:

Selects/queries the arbitrary waveform of PWM internal modulation waveform

**Setting parameters**

<memory>  ::=  <INT>

<INT> → Memory number: 0 to 128

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:SOURce1:PWM:INTernal:FUNCtion:USER 3

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

**Remarks**

† Memory number 0 is the edit memory.

## 2.3.158 Modulated oscillation mode PWM synchronization signal output selection/query :OUTPut[1|2]:SYNC:PWM:TYPE

■:OUTPut[1|2]:SYNC:PWM:TYPE

□:OUTPut[1|2]:SYNC:PWM:TYPE?

**Description**

Selects/queries the PWM synchronization output

**Setting parameters**

SYNC|MSYNc|MFCTn

| | | |
|---|---|---|
| SYNC | → | Waveform synchronization |
| MSYNc | → | Internal modulation synchronization |
| MFCTn | → | Internal modulation signal |

**Query parameters**

None

**Response format**

SYNC|MSYN|MFCT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:OUTPut1:SYNC:PWM:TYPE SYNC

Sets the PWM synchronization output of CH1 to waveform synchronization

## 2.3.159 Sweep oscillation mode sweep selection/query [:SOURce[1|2]]:SWEep:MODE

■[:SOURce[1|2]]:SWEep:MODE

□[:SOURce[1|2]]:SWEep:MODE?

**Description**

Selects/queries the sweep mode

**Setting parameters**

SINGle|CONTinuous|GATed

| | | |
|---|---|---|
| SINGle | → | Single |
| CONTinuous | → | Continuous |
| GATed | → | Gated single |

**Query parameters**

None

**Response format**

SING|CONT|GAT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:SWEep:MODE SINGle

Sets the sweep mode of CH1 to the single

## 2.3.160 Basic sweep setting sweep slop selection/query [:SOURce[1|2]]:SWEep:SPACing

■**[:SOURce[1|2]]:SWEep:SPACing**

□**[:SOURce[1|2]]:SWEep:SPACing?**

**Description**

Selects/queries the sweep slope

**Setting parameters**

LINear|LOGarithmic

LINear        →    Linear

LOGarithmic   →    Logarithmic

**Query parameters**

None

**Response format**

LIN|LOG

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:SWEep:SPACing LINear

Sets the slope of CH1 to linear

## 2.3.161 Basic sweep setting sweep direction selection/query [:SOURce[1|2]]:SWEep:INTernal:FUNCtion

■**[:SOURce[1|2]]:SWEep:INTernal:FUNCtion**

□**[:SOURce[1|2]]:SWEep:INTernal:FUNCtion?**

**Description**

Selects/queries the sweep direction

**Setting parameters**

RAMP|TRIangle

RAMP        →    One way

TRIangle    →    Shuttle

**Query parameters**

None

**Response format**

RAMP|TRI

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:SWEep:INTernal:FUNCtion RAMP

Sets the sweep direction of CH1 to one way

## 2.3.162 Basic sweep setting sweep time setting/query [:SOURce[1|2]]:SWEep:TIME

■**[:SOURce[1|2]]:SWEep:TIME**

□**[:SOURce[1|2]]:SWEep:TIME?**

**Description**

Sets/queries the sweep time

**Setting parameters**

<time>|MINimum|MAXimum

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

        <REAL>  → Sweep time: 0.1ms to 10,000 s,

               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   →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:SWEep:TIME 1MS

Sets the sweep time of CH1 to 1 ms

## 2.3.163 Basic sweep setting stop level setting/query [:SOURce[1|2]]:SWEep:SLEVel

■**[:SOURce[1|2]]:SWEep:SLEVel**

□**[:SOURce[1|2]]:SWEep:SLEVel?**

**Description**

Sets/queries the stop level value of oscillation stop of 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   →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:SWEep:SLEVel 20PCT

Set the stop level value of oscillation stop of gated single-shot sweep of CH1 to 20%

### 2.3.164 Basic sweep setting
### stop level selection/query
### [:SOURce[1|2]]:SWEep:SLEVel:STATe

■**[:SOURce[1|2]]:SWEep:SLEVel:STATe**

□**[:SOURce[1|2]]:SWEep:SLEVel:STATe?**

**Description**

Selects/queries the stop level of oscillation stop of single-shot sweep and gated single-shot sweep

**Setting parameters**

<state>  ::=  <BOL>

<BOL>  → 0/OFF: Disable

1/ON: Enable

**Query parameters**

None

**Response format**

<NBOL>

**Setting example**

:SOURce1:SWEep:SLEVel:STATe ON

Sets the stop level of oscillation stop of single-shot sweep and gated single-shot sweep of CH1 to enable

### 2.3.165 Basic sweep setting
### oscillatin stop unit setting/query
### [:SOURce[1|2]]:SWEep:OSTop

■**[:SOURce[1|2]]:SWEep:OSTop**

□**[:SOURce[1|2]]:SWEep:OSTop?**

**Description**

Selects/queries the oscillation stop unit of sweep oscillation

**Setting parameters**

HALF|CYCLe

HALF  →  Half cycle

CYCLe  →  1 cycle

**Query parameters**

None

**Response format**

HALF|CYCL

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:SWEep:OSTop HALF

Sets the oscillation stop unit of sweep oscillation of CH1 to half cycle

## 2.3.166 Basic sweep setting
## Multiconnector control on/off selection/query
## [:SOURce[1|2]]:SWEep:MCONnector:STATe

■[: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 format**

<NBOL>

**Setting example**

:SOURce1:SWEep:MCONnector:STATe ON

Enables multiconnector control of CH1

## 2.3.167 Basic sweep setting
## sweep synchronization signal selection/query
## :OUTPut[1|2]:SYNC:SWEep:TYPE

■:OUTPut[1|2]:SYNC:SWEep:TYPE

□:OUTPut[1|2]:SYNC:SWEep:TYPE?

**Description**

Selects/queries sweep synchronization output

**Setting parameters**

SYNC|SSYNc|XDRive|MARKer

SYNC  → Reference phase synchronization

SSYNc  → Sweep synchronization

XDRive  → Sweep X drive

MARKer  → Marker

**Query parameters**

None

**Response format**

SYNC|SSYN|XDR|MARK

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:SYNC:SWEep:TYPE SYNC

Sets CH1 sweep synchronization output to reference phase synchronization

## 2.3.168 Sweep oscillation mode frequency sweep selection/query [:SOURce[1|2]]:FREQuency:MODE

■**[:SOURce[1|2]]:FREQuency:MODE**

□**[:SOURce[1|2]]:FREQuency:MODE?**

**Description**

Switches the oscillation mode to the sweep oscillation frequency sweep

Queries whether or not the oscillation mode is the sweep oscillation frequency sweep

**Setting parameters**

CW|FIXed|SWEep

| | | |
|---|---|---|
| CW | → | Switch to the continuous oscillation when the oscillation mode is the sweep oscillation frequency sweep |
| FIXed | → | Switch to the continuous oscillation when the oscillation mode is the sweep oscillation frequency sweep |
| SWEep | → | Switches the oscillation mode to the sweep oscillation frequency sweep |

**Query parameters**

None

**Response format**

CW|FIX|SWE

| | |
|---|---|
| CW \| FIX: | The oscillation mode is not the sweep oscillation frequency sweep |
| SWE: | The oscillation mode is the sweep oscillation frequency sweep |

**Setting example**

:SOURce1:FREQuency:MODE SWEep

Sets the oscillation mode of CH1 to the frequency sweep

## 2.3.169 Frequency sweep start value setting/query [:SOURce[1|2]]:FREQuency:STARt

■**[:SOURce[1|2]]:FREQuency:STARt**

□**[:SOURce[1|2]]:FREQuency:STARt?**

**Description**

Sets/queries the 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 varies depending on the waveform or oscillation mode.

| | | |
|---|---|---|
| <eunits> | ::= | M\|K\|U\|N |
| <units> | ::= | HZ |
| MINimum | → | Sets the minimum value |
| MAXimum | → | Sets the maximum value |

**Query parameters**

[MINimum|MAXimum]

| | | |
|---|---|---|
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

<NR3>

**Setting example**

:SOURce1:FREQuency:STARt 1KHZ

Sets the start value of frequency sweep of CH1 to 1 kHz

## 2.3.170 Frequency sweep
## stop value setting/query
## [:SOURce[1|2]]:FREQuency:STOP

■**[:SOURce[1|2]]:FREQuency:STOP**

□**[:SOURce[1|2]]:FREQuency:STOP?**

**Description**

Sets/queries the stop value of frequency sweep

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

&lt;frequency&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

&lt;REAL&gt;  → Stop value: 0.01 μHz to 30MHz,

Resolution: 0.01 μHz

† The setting range varies depending on the waveform or oscillation mode.

&lt;eunits&gt;  ::= M|K|U|N

&lt;units&gt;  ::= HZ

MINimum  →  Sets the minimum value

MAXimum  →  Sets the maximum value

**Query parameters**

[MINimum|MAXimum]

MINimum  →  Queries the minimum value

MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:FREQuency:STOP 1KHZ

Sets the stop value of frequency sweep of CH1 to 1 kHz

## 2.3.171 Frequency sweep
## center value setting/query
## [:SOURce[1|2]]:FREQuency:CENTer

■**[:SOURce[1|2]]:FREQuency:CENTer**

□**[:SOURce[1|2]]:FREQuency:CENTer?**

**Description**

Sets/queries the center value of frequency sweep

**Setting parameters**

&lt;frequency&gt;|MINimum|MAXimum

&lt;frequency&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

&lt;REAL&gt;  → Center value: 0.01 μHz to 30 MHz,

Resolution: 0.01 μHz

† The setting range varies depending on the waveform or oscillation mode.

&lt;eunits&gt;  ::= M|K|U|N

&lt;units&gt;  ::= HZ

MINimum  →  Sets the minimum value

MAXimum  →  Sets the maximum value

**Query parameters**

    [MINimum|MAXimum]

        MINimum    →    Queries the minimum value

        MAXimum    →    Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:FREQuency:CENTer 1KHZ

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

## 2.3.172 Frequency sweep span value setting/query [:SOURce[1|2]]:FREQuency:SPAN

■**[:SOURce[1|2]]:FREQuency:SPAN**

□**[:SOURce[1|2]]:FREQuency:SPAN?**

**Description**

    Sets/queries the 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 varies depending on the waveform or oscillation mode.

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

            <units>    ::= HZ

        MINimum    →    Sets the minimum value

        MAXimum    →    Sets the maximum value

**Query parameters**

    [MINimum|MAXimum]

        MINimum    →    Queries the minimum value

        MAXimum    →    Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:FREQuency:SPAN 1KHZ

    Sets the span value of frequency sweep of CH1 to 1 kHz

## 2.3.173 Frequency sweep marker value setting/query [:SOURce[1|2]]:MARKer:FREQuency

■**[:SOURce[1|2]]:MARKer:FREQuency**

□**[:SOURce[1|2]]:MARKer:FREQuency?**

**Description**

    Sets/queries the 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 varies depending on the waveform or oscillation mode.

<div align="center">

| | | |
|---|---|---|
| \<eunits\> | ::= | M\|K\|U\|N |
| \<units\> | ::= | HZ |
| CENTer | → | Center value of frequency sweep |
| MINimum | → | Sets the minimum value |
| MAXimum | → | Sets the maximum value |

</div>

**Query parameters**

[CENTer|MINimum|MAXimum]

| | | |
|---|---|---|
| CENTer | → | Queries the center value of frequency sweep |
| MINimum | → | Queries the minimum value |
| MAXimum | → | Queries the maximum value |

**Response format**

\<NR3\>

**Setting example**

:SOURce1:MARKer:FREQuency 1KHZ

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

## 2.3.174 Frequency sweep start/stop value swapping setting [:SOURce[1|2]]:FREQuency:SWAP

**■[:SOURce[1|2]]:FREQuency:SWAP**

**Description**

Swaps the start value with stop value of the frequency sweep

**Setting parameters**

None

**Setting example**

:SOURce1:FREQuency:SWAP

Swaps the start value with stop value of the frequency sweep of CH1

## 2.3.175 Frequency sweep start/stop value output setting [:SOURce[1|2]]:FREQuency:STATe

**■[:SOURce[1|2]]:FREQuency:STATe**

**Description**

Switches the state of frequency sweep

**Setting parameters**

STARt|STOP

STARt → Switches the output to the start value

STOP → Switches the output to the stop value

**Setting example**

:SOURce1:FREQuency:STATe STARt

Switches the state of frequency sweep of CH1 to the start value

### 2.3.176 Sweep oscillation mode
### phase sweep selection/query
### [:SOURce[1|2]]:PHASe:MODE

■**[:SOURce[1|2]]:PHASe:MODE**

□**[:SOURce[1|2]]:PHASe:MODE?**

**Description**

Switches the oscillation mode to the sweep oscillation phase sweep

Queries whether or not the oscillation mode is the sweep oscillation phase sweep

**Setting parameters**

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation phase sweep

SWEep → Switches the oscillation mode to the sweep oscillation phase sweep

**Query parameters**

None

**Response format**

FIX|SWE

FIX: The oscillation mode is not the sweep oscillation phase sweep

SWE: The oscillation mode is the sweep oscillation phase sweep

**Setting example**

:SOURce1:PHASe:MODE SWEep

Sets the oscillation mode of CH1 to the phase sweep

### 2.3.177 Phase sweep
### start value setting/query
### [:SOURce[1|2]]:PHASe:STARt

■**[:SOURce[1|2]]:PHASe:STARt**

□**[:SOURce[1|2]]:PHASe:STARt?**

**Description**

Sets/queries the 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 → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PHASe:STARt 90DEG

Sets the start value of phase sweep of CH1 to 90°

### 2.3.178 Phase sweep
### stop value setting/query
### [:SOURce[1|2]]:PHASe:STOP

■**[:SOURce[1|2]]:PHASe:STOP**

□**[:SOURce[1|2]]:PHASe:STOP?**

**Description**

Sets/queries the stop value of phase sweep

**Setting parameters**

&lt;phase&gt;|MINimum|MAXimum

  &lt;phase&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

    &lt;REAL&gt; → Stop value: -1800.000° to 1800.000°,

      Resolution: 0.001°

    &lt;units&gt; ::= DEG

  MINimum → -1800.000°

  MAXimum → 1800.000°

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:PHASe:STOP 90DEG

Sets the stop value of phase sweep of CH1 to 90°

### 2.3.179 Phase sweep
### center value setting/query
### [:SOURce[1|2]]:PHASe:CENTer

■**[:SOURce[1|2]]:PHASe:CENTer**

□**[:SOURce[1|2]]:PHASe:CENTer?**

**Description**

Sets/queries the center value of phase sweep

**Setting parameters**

&lt;phase&gt;|MINimum|MAXimum

  &lt;phase&gt; ::= &lt;REAL&gt;[&lt;units&gt;]

    &lt;REAL&gt; → Center value: -1800.000° to 1800.000°,

      Resolution: 0.001°

    &lt;units&gt; ::= DEG

  MINimum → -1800.000°

  MAXimum → 1800.000°

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:PHASe:CENTer 90DEG

Sets the center value of phase sweep of CH1 to 90°

## 2.3.180 Phase sweep span value setting/query [:SOURce[1|2]]:PHASe:SPAN

■**[:SOURce[1|2]]:PHASe:SPAN**

□**[:SOURce[1|2]]:PHASe:SPAN?**

**Description**

Sets/queries the span value of phase sweep

**Setting parameters**

&lt;phase&gt;|MINimum|MAXimum

    &lt;phase&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Span value: 0.000° to 3600.000°,

                 Resolution: 0.001°

        &lt;units&gt;    ::= DEG

    MINimum    →   0.000°

    MAXimum   →   3600.000°

**Query parameters**

[MINimum|MAXimum]

    MINimum    →   Queries the minimum value

    MAXimum   →   Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:PHASe:SPAN 90DEG

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

## 2.3.181 Phase sweep marker value setting/query [:SOURce[1|2]]:MARKer:PHASe

■**[:SOURce[1|2]]:MARKer:PHASe**

□**[:SOURce[1|2]]:MARKer:PHASe?**

**Description**

Sets/queries the marker value of phase sweep

**Setting parameters**

&lt;phase&gt;|CENTer|MINimum|MAXimum

    &lt;phase&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

        &lt;REAL&gt;  → Marker value: -1800.000° to 1800.000°,

                 Resolution: 0.001°

        &lt;units&gt;    ::= DEG

    CENTer     →   Center value of phase sweep

    MINimum    →   -1800.000°

    MAXimum   →   1800.000°

**Query parameters**

[CNETer|MINimum|MAXimum]

    CENTer     →   Queries the center value of phase sweep

    MINimum    →   Queries the minimum value

    MAXimum   →   Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:MARKer:PHASe 90DEG

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

## 2.3.182 Phase sweep start/stop value swapping setting [:SOURce[1|2]]:PHASe:SWAP

■**[:SOURce[1|2]]:PHASe:SWAP**

**Description**

Swaps the start value with stop value of the phase sweep

**Setting parameters**

None

**Setting example**

:SOURce1:PHASe:SWAP

Swaps the start value with stop value of the phase sweep of CH1

## 2.3.183 Phase sweep start/stop value output setting [:SOURce[1|2]]:PHASe:STATe

■**[:SOURce[1|2]]:PHASe:STATe**

**Description**

Switches the state of phase sweep

**Setting parameters**

STARt|STOP

STARt → Switches the output to the start value

STOP → Switches the output to the stop value

**Setting example**

:SOURce1:PHASe:STATe STARt

Switches the state of phase sweep of CH1 to the start value

## 2.3.184 Sweep oscillation mode amplitude sweep selection/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE

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

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

**Description**

Switches the oscillation mode to the sweep oscillation amplitude sweep

Queries whether or not the oscillation mode is the sweep oscillation amplitude sweep

**Setting parameters**

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation amplitude sweep

SWEep → Switches the oscillation mode to the sweep oscillation amplitude sweep

**Query parameters**

None

**Response format**

FIX|SWE

FIX: The oscillation mode is not the sweep oscillation amplitude sweep

SWE: The oscillation mode is the sweep oscillation amplitude sweep

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:MODE SWEep

Sets the oscillation mode of CH1 to the amplitude sweep

## 2.3.185 Amplitude sweep
## start value setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt

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

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

**Description**

Sets/queries the 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/50Ω,

Resolution: (999.9 mVp-p or less) 4 digits or 0.1mVp-p,

(1 Vp-p or more) 5 digits or 1mVp-p

<eunits> ::= M

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

MINimum → 0 Vp-p

MAXimum → 20 Vp-p/open, 10 Vp-p/50Ω

**Query parameters**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

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

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

## 2.3.186 Amplitude sweep
## stop value setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STOP

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

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

**Description**

Sets/queries the 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/50Ω,

Resolution: (999.9 mVp-p or less) 4 digits or 0.1mVp-p,

(1 Vp-p or more) 5 digits or 1mVp-p

<eunits> ::= M

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

MINimum → 0 Vp-p

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

**Query parameters**

    [MINimum|MAXimum]

        MINimum    →    Queries the minimum value

        MAXimum    →    Queries the maximum value

**Response format**

    <NR3>

**Setting example**

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

    Sets the stop value of amplitude sweep of CH1 to 5 Vp-p

## 2.3.187 Amplitude sweep center value setting/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CENTer

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

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

**Description**

    Sets/queries the 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/50Ω,

                    Resolution: (999.9 mVp-p or less) 4 digits or 0.1mVp-p,

                              (1 Vp-p or more) 5 digits or 1mVp-p

            <eunits>   ::= M

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

        MINimum    →    0 Vp-p

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

**Query parameters**

    [MINimum|MAXimum]

        MINimum    →    Queries the minimum value

        MAXimum    →    Queries the maximum value

**Response format**

    <NR3>

**Setting example**

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

    Sets the center value of amplitude sweep of CH1 to 5 Vp-p

## 2.3.188 Amplitude sweep span value setting/query [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN

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

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

**Description**

    Sets/queries the 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/50Ω,
                          † 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/50Ω

**Query parameters**

     [MINimum|MAXimum]
              MINimum     →   Queries the minimum value
              MAXimum     →   Queries the maximum value

**Response format**

     <NR3>

**Setting example**

     :SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:SPAN 5VPP
     Sets the span value of amplitude sweep of CH1 to 5 Vp-p

## 2.3.189 Amplitude sweep
## marker value setting/query
## [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]

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

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

**Description**

     Sets/queries the 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/50Ω,
                                 Resolution: (999.9 mVp-p or less) 4 digits or 0.1mVp-p,
                                        (1 Vp-p or more) 5 digits or 1mVp-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/50Ω

**Query parameters**

     [CENTer|MINimum|MAXimum]
              CENTer      →   Queries the center value of amplitude sweep
              MINimum     →   Queries the minimum value
              MAXimum     →   Queries the maximum value

**Response format**

     <NR3>

**Setting example**

     :SOURce1:MARKer:VOLTage:LEVel:IMMediate:AMPLitude 5VPP
     Sets the marker value of amplitude sweep of CH1 to 5 Vp-p

### 2.3.190 Amplitude sweep
### start/stop value swapping setting
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SWAP

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

**Description**

Swaps the start value with stop value of the amplitude sweep

**Setting parameters**

None

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:SWAP

Swaps the start value with stop value of the amplitude sweep of CH1

### 2.3.191 Amplitude sweep
### start/stop value output setting
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STATe

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

**Description**

Switches the state of amplitude sweep

**Setting parameters**

STARt|STOP

STARt → Switches the output to the start value

STOP → Switches the output to the stop value

**Setting example**

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

Switches the state of amplitude sweep of CH1 to the start value

### 2.3.192 Sweep oscillation mode
### DC offset sweep selection/query
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE

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

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

**Description**

Switches the oscillation mode to the sweep oscillation DC offset sweep

Queries whether or not the oscillation mode is the sweep oscillation DC offset sweep

**Setting parameters**

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the
sweep oscillation DC offset sweep

SWEep →Switches the oscillation mode to the sweep oscillation DC offset sweep

**Query parameters**

None

**Response format**

FIX|SWE

FIX: The oscillation mode is not the sweep oscillation DC offset sweep

SWE: The oscillation mode is the sweep oscillation DC offset sweep

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:MODE SWEep

Sets the oscillation mode of CH1 to the DC offset sweep

### 2.3.193 DC offset sweep
### start value setting/query
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt

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

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

**Description**

Sets/queries the DC offset start value

**Setting parameters**

&lt;offset&gt;|MINimum|MAXimum

    &lt;offset&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

        &lt;REAL&gt;  → Start value: ± 10 V/open, ± 5 V/50Ω,

                 Resolution: (± 499.9 mV or less) 4 digits or 0.1 mV,

                        (± 0.5 V or more) 5 digits or 1 mV

        &lt;eunits&gt;  ::= M

        &lt;units&gt;  ::= V

    MINimum  →  -10 V/open, 5 V/50Ω

    MAXimum  →  10 V/open, 5 V/50Ω

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:STARt 2.5V

Sets the start value of DC offset of CH1 to 2.5 V

### 2.3.194 DC offset sweep
### stop value setting/query
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP

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

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

**Description**

Sets/queries the stop value of DC offset

**Setting parameters**

&lt;offset&gt;|MINimum|MAXimum

    &lt;offset&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

        &lt;REAL&gt;  → Stop value: ± 10 V/open, ± 5 V/50Ω,

                 Resolution: (± 499.9 mV or less) 4 digits or 0.1 mV,

                        (± 0.5V or more) 5 digits or 1 mV

        &lt;eunits&gt;  ::= M

        &lt;units&gt;  ::= V

    MINimum  →  -10 V/open, -5 V/50Ω

    MAXimum  →  10 V/open, 5 V/50Ω

**Query parameters**

[MINimum|MAXimum]

    MINimum  →  Queries the minimum value

    MAXimum  →  Queries the maximum value

**Response format**

        &lt;NR3&gt;

**Setting example**

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

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

## 2.3.195 DC offset sweep
## center value setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer

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

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

**Description**

        Sets/queries the center value of DC offset

**Setting parameters**

    &lt;offset&gt;|MINimum|MAXimum

        &lt;offset&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

                &lt;REAL&gt;  → DC offset: ± 10V/open, ± 5V/50Ω,

                        Resolution: (± 499.9 mV or less) 4 digits or 0.1 mV,

                                (± 0.5 V or more) 5 digits or 1 mV

                &lt;eunits&gt;  ::= M

                &lt;units&gt;    ::= V

        MINimum      →   -10V/open, -5V/50Ω

        MAXimum     →   10V/open, 5V/50Ω

**Query parameters**

    [MINimum|MAXimum]

        MINimum     →   Queries the minimum value

        MAXimum     →   Queries the maximum value

**Response format**

        &lt;NR3&gt;

**Setting example**

        :SOURce1:VOLTage:LEVel:IMMediate:OFFSet:CENTer 2.5V

        Sets the center value of DC offset of CH1 to 2.5 V

## 2.3.196 DC offset sweep
## span value setting/query
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN

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

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

**Description**

        Sets/queries the span value of DC offset

**Setting parameters**

    &lt;offset&gt;|MINimum|MAXimum

        &lt;offset&gt;  ::=  &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

                &lt;REAL&gt;  → DC offset: 0 V to 20 V/open, 0 V to 10 V/50Ω,

                † Resolution depends on the start value and stop value.

                &lt;eunits&gt;  ::= M

                &lt;units&gt;    ::= V

        MINimum     →   0 V

        MAXimum    →   20 V/open, 10 V/50Ω

**Query parameters**

[MINimum|MAXimum]

        MINimum      →     Queries the minimum value

        MAXimum     →     Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:VOLTage:LEVel:IMMediate:OFFSet:SPAN 2.5V

    Sets the span value of DC offset of CH1 to 2.5 V

## 2.3.197 DC offset sweep
## marker value setting/query
## [:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet

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

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

**Description**

    Sets/queries the marker value of DC offset

**Setting parameters**

    <offset>|CENTer|MINimum|MAXimum

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

               <REAL>    →   Marker value: $\pm$ 10 Vp-p/open, $\pm$ 5 Vp-p/50$\Omega$,

                            Resolution: ($\pm$ 499.9 mV or less) 4 digits or 0.1 mV,

                                    ($\pm$ 0.5 V or more) 5 digits or 1 mV

               <eunits>   ::= M

               <units>    ::= V

        CENTer      →   Center value of the DC offset sweep

        MINimum    →   -10 V/open, -5 V/50$\Omega$

        MAXimum   →   10 V/open, 5 V/50$\Omega$

**Query parameters**

    [CENTer|MINimum|MAXimum]

        CENTer      →   Queries the center value of DC offset sweep

        MINimum    →   Queries the minimum value

        MAXimum   →   Queries the maximum value

**Response format**

    <NR3>

**Setting example**

    :SOURce1:MARKer:VOLTage:LEVel:IMMediate:OFFSet 2.5V

    Sets the marker value of DC offset of CH1 to 2.5 V

## 2.3.198 DC offset sweep
## start/stop value swapping setting
## [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP

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

**Description**

    Swaps the start value with stop value of the DC offset sweep

**Setting parameters**

    None

**Setting example**

    :SOURce1:VOLTage:LEVel:IMMediate:OFFSet:SWAP

    Swaps the start value with stop value of the DC offset sweep of CH1

### 2.3.199 DC offset sweep
### start/stop value output setting
### [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe

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

**Description**

Switch the state of DC offset sweep

**Setting parameters**

STARt|STOP

STARt → Switches the output to the start value

STOP → Switches the output to the stop value

**Setting example**

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

Switches the state of DC offset sweep of CH1 to the start value

### 2.3.200 Sweep oscillation mode
### duty sweep selection/query
### [:SOURce[1|2]]:PULSe:DCYCle:MODE

■**[:SOURce[1|2]]:PULSe:DCYCle:MODE**

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

**Description**

Switches the oscillation mode to the sweep oscillation duty sweep

Queries whether or not the oscillation mode is the sweep oscillation duty sweep

**Setting parameters**

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the
sweep oscillation duty sweep

SWEep → Switches the oscillation mode to the sweep oscillation duty sweep

**Query parameters**

None

**Response format**

FIX|SWE

FIX: The oscillation mode is not the sweep oscillation duty sweep

SWE: The oscillation mode is the sweep oscillation duty sweep

**Setting example**

:SOURce1:PULSe:DCYCle:MODE SWEep

Sets the oscillation mode of CH1 to the duty sweep

### 2.3.201 duty sweep
### start value setting/query
### [:SOURce[1|2]]:PULSe:DCYCle:STARt

■**[:SOURce[1|2]]:PULSe:DCYCle:STARt**

□**[:SOURce[1|2]]:PULSe:DCYCle:STARt?**

**Description**

Sets/queries the start value of duty sweep

**Setting parameters**

<duty>|MINimum|MAXimum

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

<REAL> → (Square (duty variable range standard))
Start value: 0.0100% to 99.9900%,
Resolution: 0.0001%,
(Square (duty variable range extend))
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 (duty variable range standard)) 0.0100%,
(Square (duty variable range extend)) 0.0000%,
(Pulse wave) 0.0170%

MAXimum → (Square (duty variable range standard)) 99.9900%,
(Square (duty variable range extend)) 100.0000%,
(Pulse wave) 99.9830%

**Query parameters**

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:DCYCle:STARt 20PCT

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

## 2.3.202 duty sweep
## stop value setting/query
## [:SOURce[1|2]]:PULSe:DCYCle:STOP

■**[:SOURce[1|2]]:PULSe:DCYCle:STOP**

□**[:SOURce[1|2]]:PULSe:DCYCle:STOP?**

**Description**

Sets/queries the stop value of duty sweep

**Setting parameters**

<duty>|MINimum|MAXimum

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

<REAL> → (Square (duty variable range standard))
Stop value: 0.0100% to 99.9900%,
Resolution: 0.0001%,
(Square (duty variable range extend))
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 (duty variable range standard)) 0.0100%,
(Square (duty variable range extend)) 0.0000%,
(Pulse wave) 0.0170%

MAXimum → (Square (duty variable range standard)) 99.9900%,
(Square (duty variable range extend)) 100.0000%,

(Pulse wave) 99.9830%

**Query parameters**

[MINimum|MAXimum]

MINimum     →    Queries the minimum value

MAXimum   →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:DCYCle:STOP 20PCT

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

## 2.3.203 duty sweep
## center value setting/query
## [:SOURce[1|2]]:PULSe:DCYCle:CENTer

■**[:SOURce[1|2]]:PULSe:DCYCle:CENTer**

□**[:SOURce[1|2]]:PULSe:DCYCle:CENTer?**

**Description**

Sets/queries the center value of duty sweep

**Setting parameters**

<duty>|MINimum|MAXimum

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

<REAL>   →  (Square (duty variable range standard))

Center value: 0.0100% to 99.9900%,

Resolution: 0.0001%,

(Square (duty variable range extend))

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 (duty variable range standard)) 0.0100%,

(Square (duty variable range extend)) 0.0000%,

(Pulse wave) 0.0170%

MAXimum   →  (Square (duty variable range standard)) 99.9900%,

(Square (duty variable range extend)) 100.0000%,

(Pulse wave) 99.9830%

**Query parameters**

[MINimum|MAXimum]

MINimum     →    Queries the minimum value

MAXimum   →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:DCYCle:CENTer 20PCT

Sets the center value of duty sweep of CH1 to 20%

### 2.3.204 duty sweep
### span value setting/query
### [:SOURce[1|2]]:PULSe:DCYCle:SPAN

■**[:SOURce[1|2]]:PULSe:DCYCle:SPAN**

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

**Description**

Sets/queries the span value of duty sweep

**Setting parameters**

<duty>|MINimum|MAXimum

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

    <REAL> → (Square (duty variable range standard))

      Span value: 0.0000% to 99.9800%,

      Resolution: 0.0001%,

      (Square (duty variable range extend))

      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 (duty variable range standard)) 99.9800%,

      (Square (duty variable range extend)) 100.0000%,

      (Pulse wave) 99.9660%

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:PULSe:DCYCle:SPAN 20PCT

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

### 2.3.205 duty sweep
### marker value setting/query
### [:SOURce[1|2]]:MARKer:PULSe:DCYCle

■**[:SOURce[1|2]]:MARKer:PULSe:DCYCle**

□**[:SOURce[1|2]]:MARKer:PULSe:DCYCle?**

**Description**

Sets/queries the marker value of duty sweep

**Setting parameters**

<duty>|CENTer|MINimum|MAXimum

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

    <REAL> → (Square (duty variable range standard))

      Marker value: 0.0100% to 99.9900%,

      Resolution: 0.0001%,

      (Square (duty variable range extend))

      Marker value: 0.0000% to 100.0000%,

Resolution: 0.0001%,

(Pulse wave)

Marker value: 0.0170% to 99.9830%,

Resolution: 0.0001%

       \<units\>  ::= PCT

    CENTer  → Center value of duty sweep

    MINimum → (Square (duty variable range standard)) 0.0100%,

             (Square (duty variable range extend)) 0.0000%,

             (Pulse wave) 0.0170%

    MAXimum → (Square (duty variable range standard)) 99.9900%,

             (Square (duty variable range extend)) 100.0000%,

             (Pulse wave) 99.9830%

**Query parameters**

  [CENTer|MINimum|MAXimum]

    CENTer  → Queries the center value of duty sweep

    MINimum → Queries the minimum value

    MAXimum → Queries the maximum value

**Response format**

  \<NR3\>

**Setting example**

  :SOURce1:MARKer:PULSe:DCYCle 20PCT

  Sets the marker value of duty sweep of CH1 to 20%

## 2.3.206 duty sweep
## start/stop value swapping setting
## [:SOURce[1|2]]:PULSe:DCYCle:SWAP

  **■[:SOURce[1|2]]:PULSe:DCYCle:SWAP**

**Description**

  Swaps the start value with stop value of the duty sweep

**Setting parameters**

  None

**Setting example**

  :SOURce1:PULSe:DCYCle:SWAP

  Swaps the start value with stop value of the duty sweep of CH1

## 2.3.207 duty sweep
## start/stop value output setting
## [:SOURce[1|2]]:PULSe:DCYCle:STATe

  **■[:SOURce[1|2]]:PULSe:DCYCle:STATe**

**Description**

  Switches the state of duty sweep

**Setting parameters**

  STARt|STOP

    STARt → Switches the output to the start value

    STOP → Switches the output to the stop value

**Setting example**

  :SOURce1:PULSe:DCYCle:STATe STARt

  Switches the state of duty sweep of CH1 to the start value

## 2.3.208 Burst oscillation mode selection/query
### [:SOURce[1|2]]:BURSt:STATe

■**[:SOURce[1|2]]:BURSt:STATe**

□**[:SOURce[1|2]]:BURSt:STATe?**

**Description**

Switches the oscillation mode between the continuous and burst oscillation modes

Queries whether or not the oscillation mode is burst

**Setting parameters**

        &lt;state&gt;   ::=   &lt;BOL&gt;

            &lt;BOL&gt;    → 0/OFF:  Continuous

                              1/ON:   Burst

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

        &lt;NBOL&gt;   → 0: The oscillation mode is not a burst oscillation mode

                         1: The oscillation mode is a burst oscillation mode

**Setting example**

:SOURce1:BURSt:STATe ON

Sets the oscillation mode of CH1 to burst

## 2.3.209 Burst oscillation
## burst mode selection/query
### [:SOURce[1|2]]:BURSt:MODE

■**[:SOURce[1|2]]:BURSt:MODE**

□**[:SOURce[1|2]]:BURSt:MODE?**

**Description**

Selects/queries the burst mode

**Setting parameters**

AUTO|TRIGger|GATE|TGATe

        AUTO        →   Auto burst

        TRIGger    →   Trigger burst

        GATE        →   Gate

        TGATe      →   Triggered gate

**Query parameters**

None

**Response format**

AUTO|TRIG|GATE|TGAT

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:BURSt:MODE AUTO

Sets the burst mode of CH1 to auto burst

### 2.3.210 Burst oscillation stop level setting/query [:SOURce[1|2]]:BURSt:SLEVel

■**[:SOURce[1|2]]:BURSt:SLEVel**

□**[:SOURce[1|2]]:BURSt:SLEVel?**

**Description**

Sets/queries the stop level value of burst

**Setting parameters**

&lt;level&gt;|MAXimum|MINimum

&lt;level&gt;  ::=  &lt;REAL&gt;[&lt;units&gt;]

&lt;REAL&gt;  → Stop level value: -100.00% to 100.00%,

Resolution: 0.01%

&lt;units&gt;  ::= PCT

MINimum  →  -100.00%

MAXimum  →  100.00%

**Query parameters**

[MINimum|MAXimum]

MINimum  →  Queries the minimum value

MAXimum  →  Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:BURSt:SLEVel 20PCT

Sets the stop level value of burst of CH1 to 20%

### 2.3.211 Burst oscillation stop level selection/query [:SOURce[1|2]]:BURSt:SLEVel:STATe

■**[:SOURce[1|2]]:BURSt:SLEVel:STATe**

□**[:SOURce[1|2]]:BURSt:SLEVel:STATe?**

**Description**

Selects/queries the stop level of burst oscillation

**Setting parameters**

&lt;state&gt;  ::=  &lt;BOL&gt;

&lt;BOL&gt;  → 0/OFF:  Disable

1/ON:  Enable

**Query parameters**

None

**Response format**

&lt;NBOL&gt;

**Setting example**

:SOURce1:BURSt:SLEVel:STATe ON

Sets the stop level of burst oscillation of CH1 to enable

### 2.3.212 Burst oscillation
### Synchronization output selection/query
### :OUTPut[1|2]:SYNC:BURSt:TYPE

■:OUTPut[1|2]:SYNC:BURSt:TYPE

□:OUTPut[1|2]:SYNC:BURSt:TYPE?

**Description**

Selects/queries the burst synchronization output

**Setting parameters**

SYNC|BSYNc

SYNC  → Reference phase synchronization

BSYNc → Burst synchronization

**Query parameters**

None

**Response format**

SYNC|BSYN

† For the meaning of each response data, see the setting parameter

**Setting example**

:OUTPut1:SYNC:BURSt:TYPE SYNC

Sets the burst synchronization output of CH1 to reference phase synchronization

### 2.3.213 Burst oscillation
### auto burst mode: mark wave number setting/query
### [:SOURce[1|2]]:BURSt:AUTO:NCYCles

■[:SOURce[1|2]]:BURSt:AUTO:NCYCles

□[:SOURce[1|2]]:BURSt:AUTO:NCYCles?

**Description**

Sets/queries the mark wave number of 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   →  Queries the minimum value

MAXimum  →  Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:BURSt:AUTO:NCYCles 10

Sets the mark wave number of auto burst of CH1 to 10 waves

### 2.3.214 Burst oscillation
### auto burst mode: space wave number setting/query
### [:SOURce[1|2]]:BURSt:AUTO:SPACe

■**[:SOURce[1|2]]:BURSt:AUTO:SPACe**

□**[:SOURce[1|2]]:BURSt:AUTO:SPACe?**

**Description**

Sets/queries the space wave number of 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      →    Queries the minimum value

        MAXimum     →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:BURSt:AUTO:SPACe 10

Sets the space wave number of auto burst of CH1 to 10 waves

### 2.3.215 Burst oscillation
### trigger burst mode: mark wave number setting/query
### [:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles

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

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

**Description**

Sets/queries the mark wave number of 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      →    Queries the minimum value

        MAXimum     →    Queries the maximum value

**Response format**

<NR3>

**Setting example**

:SOURce1:BURSt:TRIGger:NCYCles 10

Sets the mark wave number of trigger burst of CH1 to 10 waves

## 2.3.216 Burst oscillation
## trigger burst mode: trigger delay time setting/query
## [:SOURce[1|2]]:BURSt[:TRIGger]:TDELay

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

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

**Description**

Sets/queries the trigger delay time of trigger burst

**Setting parameters**

&lt;delay&gt;|MINimum|MAXimum

  &lt;delay&gt; ::= &lt;REAL&gt;[&lt;eunits&gt;][&lt;units&gt;]

    &lt;REAL&gt; → Trigger delay time: 0.0 μs to 100 s,

         Resolution: 5 digits or 0.1 μs

    &lt;eunits&gt; ::= MA|K|M|U|N

    &lt;units&gt; ::= S

  MINimum → 0.0 μs

  MAXimum → 100 s

**Query parameters**

[MINimum|MAXimum]

  MINimum → Queries the minimum value

  MAXimum → Queries the maximum value

**Response format**

&lt;NR3&gt;

**Setting example**

:SOURce1:BURSt:TRIGger:TDELay 10MS

Sets the trigger delay time of trigger burst of CH1 to 10 ms

## 2.3.217 Burst oscillation
## gate mode: oscillation stop unit setting/query
## [:SOURce[1|2]]:BURSt:GATE:OSTop

■ [:SOURce[1|2]]:BURSt:GATE:OSTop

□ [:SOURce[1|2]]:BURSt:GATE:OSTop?

**Description**

Selects/queries the oscillation stop unit of gate

**Setting parameters**

HALF|CYCLe

  HALF → Half cycle

  CYCLe → 1 cycle

**Query parameters**

None

**Response format**

HALF|CYCL

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:BURSt:GATE:OSTop HALF

Sets the oscillation stop unit of gate of CH1 to half cycle

## 2.3.218 Burst oscillation
## triggered gate mode: oscillation stop setting/query
## [:SOURce[1|2]]:BURSt:TGATe:OSTop

■ **[:SOURce[1|2]]:BURSt:TGATe:OSTop**

□ **[:SOURce[1|2]]:BURSt:TGATe:OSTop?**

**Description**

Selects/queries the oscillation stop unit of triggered gate

**Setting parameters**

HALF|CYCLe

HALF  → Half cycle

CYCLe → 1 cycle

**Query parameters**

None

**Response format**

HALF|CYCL

† For the meaning of each response data, see the setting parameters.

**Setting example**

:SOURce1:BURSt:TGATe:OSTop HALF

Sets the oscillation stop unit of triggered gate of CH1 to half cycle

## 2.3.219 Sequence
## sequence selection/query
## [:SOURce[1|2]]:SEQuence:STATe

■**[: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 format**

<NBOL>

**Setting example**

:SOURce1:SEQuence:STATe ON

Sets oscillation mode of CH1 to sequence

## 2.3.220 Sequence
## store
## {:TRACe|:DATA}:SEQuence:STORe

■**{:TRACe|:DATA}:SEQuence:STORe**

**Description**

Saves sequence data

**Setting parameters**

<memory>,<name>

        <memory>    ::=    <INT>

            <INT>      →  Memory number: 1 to 10

        <name>     ::=    <STR>

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

            † Optional (If omitted, nothing is changed)

            † If the arbitrary wave name is less than 20 characters, the remaining

               characters are filled with spaces (with the ASCII code 32)

### Setting example

:TRACe:SEQuence:STORe 2,"name"

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

## 2.3.221 Sequence recall {:TRACe|:DATA}:SEQuence:RECall

■**{:TRACe|:DATA}:SEQuence:RECall**

**Description**

Reads out sequence data

**Setting parameters**

<memory>|MINimum|MAXimum

        <memory>    ::=    <INT>

            <INT>      →  Memory number: 1 to 10

        MINimum    →    1

        MAXimum    →    10

**Setting example**

:TRACe:SEQuence:RECall 2

Reads in sequence data of Memory 2

## 2.3.222 Sequence sequence data I/O {:TRACe|:DATA}:SEQuence

■**{: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)

            † Optional (If omitted, nothing is changed)

            † If the arbitrary wave name is less than 20 characters, the remaining

               characters are filled with spaces (with the ASCII code 32).

        <data>      ::=    <BLK>

            <BLK>  →  Sequence data

            (See "2.4 Sequence I/O Data Specifications.")

**Query parameters**

<memory>

        <memory>    ::=    <INT>

<INT>　　　→　Memory number: 0 to 10

**Response format**

    \<name\>,\<sequence\>

        \<name\>　　　::=　\<STR\>

            \<STR\>　　→　Sequence name (20 characters)

        \<sequence\>　::=　\<BLK\>

            \<BLK\>　　→　#\<digit\>\<byte\>\<data\>

            #　　　　→　Start of binary data

            \<digit\>　→　The number of digits of subsequent \<byte\>

            \<byte\>　→　The number of bytes of subsequent data

            \<data\>　→　Sequence data

        (See "2.4 Sequence I/O Data Specifications.")

**Remarks**

    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).

## 2.3.223 Sequence
## sequence data compilation
## :TRIGger[1|2]:COMPile[:IMMediate]

**■:TRIGger[1|2]:COMPile[:IMMediate]**

**Description**

    Compiles sequence data

**Setting parameters**

    None

**Remarks**

    † Whether "[1|2]" exists has no influence on the operation.

## 2.3.224 Sequence
## current step number acquisition
## [:SOURce[1|2]]:SEQuence:CSTep?

**□[:SOURce[1|2]]:SEQuence:CSTep?**

**Description**

    Queries current step of sequence

**Query parameters**

    None

**Response format**

    \<NR1\>

**Remarks**

    † Whether "[1|2]" exists has no influence on the operation.

## 2.3.225 Sequence
## sequence data clear
## {:TRACe|:DATA}:SEQuence:CLEar

**■{:TRACe|:DATA}:SEQuence:CLEar**

**Description**

    Initializes sequence data

**Setting parameters**

    \<memory\>

<div align="center">&lt;memory&gt;   ::=   &lt;INT&gt;</div>

<div align="center">&lt;INT&gt;      → Memory number: 1 to 10</div>

**Remarks**

† Memory 0 is current memory.

## 2.3.226 Basic setting memory clear :MEMory:STATe:DELete

**■:MEMory:STATe:DELete**

**Description**

Clears the setting memory

**Setting parameters**

&lt;memory&gt;|MINimum|MAXimum

&lt;memory&gt;   ::=   &lt;INT&gt;

&lt;INT&gt;      → Memory number: 1 to 10

MINimum    →   1

MAXimum    →   10

## 2.3.227 Basic setting memory store *SAV

**■*SAV**

**Description**

Stores to the setting memory

**Setting parameters**

&lt;memory&gt;   ::=   &lt;INT&gt;

&lt;INT&gt;  →  Memory number: 1 to 10

## 2.3.228 Basic setting memory recall *RCL

**■*RCL**

**Description**

Recalls from the setting memory

**Setting parameters**

&lt;memory&gt;   ::=   &lt;INT&gt;

&lt;INT&gt;  →  Memory number: 1 to 10

## 2.3.229 Status register and related queue clear *CLS

**■*CLS**

**Description**

Clears event register and error queue

**Setting parameters**

None

**Remarks**

① The following registers are cleared:

- 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 can clear the overload message (No.23133).

## 2.3.230 Status reporting related preset setting
### :STATus:PRESet

■**:STATus:PRESet**

**Description**

Presets the registers

**Setting parameters**

None

**Remarks**

† The following registers are cleared by this command:
- 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

## 2.3.231 Status register at power-on clear flag setting/query
### *PSC

■**\*PSC**

□**\*PSC?**

**Description**

Sets/queries the power-on status clear flag

**Setting parameters**

$<state>$ ::= $<INT>$

$<INT>$ → 0: OFF

1: ON

**Query parameters**

None

**Response format**

$<NR1>$

**Setting example**

　　*PSC 1

　　Sets the automatic clear of the enable register, etc. at power-on to enable

## 2.3.232 Status byte register query
## *STB?

□**\*STB?**

**Description**

　　Queries the status byte register

**Query parameters**

　　None

**Response format**

　　<NR1>

## 2.3.233 Service request enable register setting/query
## *SRE

■**\*SRE**

□**\*SRE?**

**Description**

　　Sets/queries the service request enable register

**Setting parameters**

　　<value>　::=　<INT>

　　　　<INT>→　For setting value, see "3. Status System."

**Query parameters**

　　None

**Response format**

　　<NR1>

**Setting example**

　　*SRE 8

　　Sets the service request enable register to 8

## 2.3.234 Standard event status register query
## *ESR?

□**\*ESR?**

**Description**

　　Queries the standard event status register

**Query parameters**

　　None

**Response format**

　　<NR1>

## 2.3.235 Standard event enable register setting/query
## *ESE

■**\*ESE**

□**\*ESE?**

**Description**

　　Sets/queries the standard event status enable register

**Setting parameters**

        &lt;value&gt;   ::=   &lt;INT&gt;

                &lt;INT&gt; →   For setting value, see "3. Status System."

**Query parameters**

        None

**Response format**

        &lt;NR1&gt;

**Setting example**

        *ESE 8

        Sets the standard event status enable register to 8

## 2.3.236 Condition register query :STATus:OPERation:CONDition?

      □:STATus:OPERation:CONDition?

**Description**

        Queries the operation status condition register

**Query parameters**

        None

**Response format**

        &lt;NR1&gt;

## 2.3.237 Transition filter register (negative) setting/query :STATus:OPERation:NTRansition

      ■:STATus:OPERation:NTRansition

      □:STATus:OPERation:NTRansition?

**Description**

        Sets/queries the operation status transition filter (negative)

**Setting parameters**

        &lt;value&gt;   ::=   &lt;INT&gt;

                &lt;INT&gt; →   For setting value, see "3. Status System."

**Query parameters**

        None

**Response format**

        &lt;NR1&gt;

**Setting example**

        :STATus:OPERation:NTRansition 512

        Set the bit 9 of the operation status transition filter (negative) to 1

## 2.3.238 Transition filter register (positive) setting/query :STATus:OPERation:PTRansition

      ■:STATus:OPERation:PTRansition

      □:STATus:OPERation:PTRansition?

**Description**

        Sets/queries the operation status transition filter (positive)

**Setting parameters**

        &lt;value&gt;   ::=   &lt;INT&gt;

                &lt;INT&gt; →   For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

       <NR1>

**Setting example**

       :STATus:OPERation:PTRansition 512

       Set the bit 9 of the operation status transition filter (positive) to 1

## 2.3.239 Event register query
## :STATus:OPERation[:EVENt]?

□:STATus:OPERation[:EVENt]?

**Description**

       Queries the operation status event register

**Query parameters**

       None

**Response format**

       <NR1>

**Setting example**

       :STATus:OPERation:EVENt?

       Queries the operation status event register

## 2.3.240 Event enable register setting/query
## :STATus:OPERation:ENABle

■:STATus:OPERation:ENABle

□:STATus:OPERation:ENABle?

**Description**

       Sets/queries the operation status event enable register

**Setting parameters**

       <value>   ::=   <INT>

             <INT> →   For setting value, see "3. Status System."

**Query parameters**

       None

**Response format**

       <NR1>

**Setting example**

       :STATus:OPERation:ENABle 512

       Sets the bit 9 of the operation status event enable register to 1

## 2.3.241 Operation status register group (CH1)
## condition register query
## :STATus:OPERation:CH1:CONDition?

□:STATus:OPERation:CH1:CONDition?

**Description**

       Queries the CH1 operation status condition register

**Query parameters**

       None

**Response format**

       <NR1>

### 2.3.242 Operation status register group（CH1） transition filter register (negative) setting/query :STATus:OPERation:CH1:NTRansition

■:STATus:OPERation:CH1:NTRansition

□:STATus:OPERation:CH1:NTRansition?

**Description**

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

**Setting parameters**

&lt;value&gt;　::=　&lt;INT&gt;

&lt;INT&gt;→　For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:STATus:OPERation:CH1:NTRansition 8

Set the bit 3 of the CH1 operation status transition filter (negative) to 1

### 2.3.243 Operation status register group (CH1) transition filter register (positive) setting/query :STATus:OPERation:CH1:PTRansition

■:STATus:OPERation:CH1:PTRansition

□:STATus:OPERation:CH1:PTRansition?

**Description**

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

**Setting parameters**

&lt;value&gt;　::=　&lt;INT&gt;

&lt;INT&gt;→　For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:STATus:OPERation:CH1:PTRansition 8

Set the bit 3 of the CH1 operation status transition filter (positive) to 1

### 2.3.244 Operation status register group (CH1) event register query :STATus:OPERation:CH1[:EVENt]?

□:STATus:OPERation:CH1[:EVENt]?

**Description**

Queries the CH1 operation status event register

**Query parameters**

None

**Response format**

&lt;NR1&gt;

### 2.3.245 Operation status register group (CH1) event enable register setting/query :STATus:OPERation:CH1:ENABle

■:STATus:OPERation:CH1:ENABle

□:STATus:OPERation:CH1:ENABle?

**Description**

Sets/queries the operation status event enable register

**Setting parameters**

&lt;value&gt;   ::=   &lt;INT&gt;

&lt;INT&gt;→   For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:STATus:OPERation:CH1:ENABle 8

Sets the bit 3 of the operation status event enable register to 1

### 2.3.246 Operation status register group (CH2) condition register query :STATus:OPERation:CH2:CONDition?

□:STATus:OPERation:CH2:CONDition?

**Description**

Queries the CH2 operation status condition register

**Query parameters**

None

**Response format**

&lt;NR1&gt;

### 2.3.247 Operation status register group (CH2) transition filter register (negative) setting/query :STATus:OPERation:CH2:NTRansition

■:STATus:OPERation:CH2:NTRansition

□:STATus:OPERation:CH2:NTRansition?

**Description**

Sets/queries the CH2 operation status transition filter (negative)

**Setting parameters**

&lt;value&gt;   ::=   &lt;INT&gt;

&lt;INT&gt;→   For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

&lt;NR1&gt;

**Setting example**

:STATus:OPERation:CH2:NTRansition 8

Set the bit 3 of the CH2 operation status transition filter (negative) to 1

### 2.3.248 Operation status register group (CH2) transition filter register (positive) setting/query :STATus:OPERation:CH2:PTRansition

■:STATus:OPERation:CH2:PTRansition

□:STATus:OPERation:CH2:PTRansition?

**Description**

Sets/queries the CH2 operation status transition filter (positive)

**Setting parameters**

<value>  ::=  <INT>

<INT> →  For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:STATus:OPERation:CH2:PTRansition 8

Set the bit 3 of the CH2 operation status transition filter (positive) to 1

### 2.3.249 Operation status register group (CH2) event register setting :STATus:OPERation:CH2[:EVENt]?

□:STATus:OPERation:CH2[:EVENt]?

**Description**

Queries the CH2 operation status event register

**Query parameters**

None

**Response format**

<NR1>

### 2.3.250 Operation status register group (CH2) event enable register setting/query :STATus:OPERation:CH2:ENABle

■:STATus:OPERation:CH2:ENABle

□:STATus:OPERation:CH2:ENABle?

**Description**

Sets/queries the operation status event enable register

**Setting parameters**

<value>  ::=  <INT>

<INT> →  For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:STATus:OPERation:CH2:ENABle 8

Sets the bit 3 of the operation status event enable register to 1

### 2.3.251 Questionable data status register group condition register query :STATus:QUEStionable:CONDition?

□:STATus:QUEStionable:CONDition?

**Description**

Queries the questionable data status condition register

**Query parameters**

None

**Response format**

<NR1>

### 2.3.252 Questionable data status register group transition filter register (negative) setting/query :STATus:QUEStionable:NTRansition

■:STATus:QUEStionable:NTRansition

□:STATus:QUEStionable:NTRansition?

**Description**

Sets/queries the questionable data status transition filter (negative)

**Setting parameters**

<value>  ::=  <INT>

<INT> → For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:STATus:QUEStionable:NTRansition 16

Sets the bit 4 of questionable data status transition filter (negative) to 1

### 2.3.253 Questionable data status register group transition filter register (positive) setting/query :STATus:QUEStionable:PTRansition

■:STATus:QUEStionable:PTRansition

□:STATus:QUEStionable:PTRansition?

**Description**

Sets/queries the questionable data status transition filter (positive)

**Setting parameters**

<value>  ::=  <INT>

<INT> → For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:STATus:QUEStionable:PTRansition 16

Sets the bit 4 of questionable data status transition filter (positive) to 1

### 2.3.254 Questionable data status register group event register query :STATus:QUEStionable[:EVENt]?

□:STATus:QUEStionable[:EVENt]?

**Description**

Queries the questionable data status event register

**Query parameters**

None

**Response format**

<NR1>

### 2.3.255 Questionable data status register group event enable register setting/query :STATus:QUEStionable:ENABle

■:STATus:QUEStionable:ENABle

□:STATus:QUEStionable:ENABle?

**Description**

Sets/queries the questionable data status event enable register

**Setting parameters**

&lt;value&gt;    ::=    &lt;INT&gt;

&lt;INT&gt; →    For setting value, see "3. Status System."

**Query parameters**

None

**Response format**

<NR1>

**Setting example**

:STATus:QUEStionable:ENABle 16

Sets the bit 4 of the questionable data status event enable register to 1

### 2.3.256 Warning event register group event register query :STATus:WARNing[:EVENt]?

□:STATus:WARNing[:EVENt]?

**Description**

Queries the warning event register

**Query parameters**

None

**Response format**

<NR1>

### 2.3.257 Warning event register group event enable register setting/query :STATus:WARNing:ENABle

■:STATus:WARNing:ENABle

□:STATus:WARNing:ENABle?

**Description**

Sets/queries the warning event enable register

**Setting parameters**

                \<value\>   ::=   \<INT\>

                              \<INT\>→   For setting value, see "3. Status System."

**Query parameters**

        None

**Response format**

        \<NR1\>

**Setting example**

        :STATus:WARNing:ENABle 512

        Sets the bit 9 of the warning event enable register to 1

## 2.3.258 Warning event register group (CH1) event register query :STATus:WARNing:CH1[:EVENt]?

□**:STATus:WARNing:CH1[:EVENt]?**

**Description**

        Queries the CH1 warning event register

**Query parameters**

        None

**Response format**

        \<NR1\>

## 2.3.259 Warning event register group (CH1) event enable register setting/query :STATus:WARNing:CH1:ENABle

■**:STATus:WARNing:CH1:ENABle**

□**:STATus:WARNing:CH1:ENABle?**

**Description**

        Sets/queries the CH1 warning event enable register

**Setting parameters**

                \<value\>   ::=   \<INT\>

                              \<INT\>→   For setting value, see "3. Status System."

**Query parameters**

        None

**Response format**

        \<NR1\>

**Setting example**

        :STATus:WARNing:CH1:ENABle 16

        Sets the bit 4 of the CH1 warning event enable register to 1

## 2.3.260 Warning event register group (CH2) event register query :STATus:WARNing:CH2[:EVENt]?

□**:STATus:WARNing:CH2[:EVENt]?**

**Description**

        Queries the CH2 warning event register

**Query parameters**

None

**Response format**

                \<NR1\>

## 2.3.261 Warning event register group (CH2) event enable register setting/query :STATus:WARNing:CH2:ENABle

■**:STATus:WARNing:CH2:ENABle**

□**:STATus:WARNing:CH2:ENABle?**

**Description**

        Sets/queries the CH2 warning event enable register

**Setting parameters**

        \<value\>   ::=   \<INT\>

                \<INT\>→   For setting value, see "3. Status System."

**Query parameters**

        None

**Response format**

        \<NR1\>

**Setting example**

        :STATus:WARNing:CH2:ENABle 16

        Sets the bit 4 of the CH2 warning event enable register to 1

## 2.3.262 Equipment-specific information query *IDN?

□**\*IDN?**

**Description**

        Reads the ID of equipment

**Query parameters**

        None

**Response format**

        \<corporation\>,\<model\>,\<serial\>,\<firmware\>

                \<corporation\> →   Manufacturer: NF Corporation

                \<model\>       →   Model: (Example) WF1973

                \<serial\>        →   Serial number: (Example) 1234567

                \<firmware\>   →   Firmware version: (Example) Ver1.00

## 2.3.263 Error message query :SYSTem:ERRor?

□**:SYSTem:ERRor?**

**Description**

        Queries errors

**Query parameters**

        None

**Response format**

        \<code\>,\<message\>

                \<code\>   ::=   \<INT\>

                        \<INT\>     →   Error code

                \<message\>   ::=   \<STR\>

<STR>　　　→　Error message

## 2.3.264 Setting initialization (status registers, etc. not cleared) *RST

■**\*RST**

**Description**

Initializes the setting

**Setting parameters**

None

## 2.3.265 Operation completion event bit setting *OPC

■**\*OPC**

**Description**

Sets the OPC bit to 1 when all the previous commands are completed

**Setting parameters**

None

## 2.3.266 Setting output key to 1 at operation completion *OPC?

□**\*OPC?**

**Description**

Setting output key to 1 at operation completion

**Query parameters**

None

## 2.3.267 Waiting for command/query execution *WAI

■**\*WAI**

**Description**

Waits for completion of all the previous commands execution

**Setting parameters**

None

## 2.3.268 Self diagnosis result query *TST?

□**\*TST?**

**Description**

Queries the self diagnosis result

**Query parameters**

None

**Response format**

<NR1>　→　0

**Remarks**

① This instrument always responds with 0.

② External control cannot check the internal state. Use the panel operation to check the internal state.

## 2.3.269 External reference frequency input setting/query [:SOURce[1|2]]:ROSCillator:SOURce

■**[:SOURce[1|2]]:ROSCillator:SOURce**

□**[:SOURce[1|2]]:ROSCillator:SOURce?**

**Description**

Sets/queries the reference frequency source

**Setting parameters**

INTernal|EXTernal

INTernal → Internal clock

EXTernal → External reference frequency input

**Query parameters**

None

**Response format**

INT|EXT

**Setting example**

:SOURce:ROSCillator:SOURce INTernal

Sets the reference frequency source to internal clock

**Remarks**

† Specifying "[1|2]" does not affect the operation.

## 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 = \<stsstp\>,\<syncout\>,\<dctrl\>,\<dctrl_mode\>,\<trgslp\>

        \<stsstp\>     ::=  \<INT\>
            \<INT\>  →   Start step (1 to 225)

        \<syncout\>  ::=  \<DISC\>
            \<DISC\>  →   Sync output
                    (SYNC: Waveform synchronization, SSYN: Sequence synchronization)

        \<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>    →   Step number (0 to 225)

        <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 225)

        <evbra_sw>  ::=   <BOL>
            <BOL>   →   Event branch step ON/OFF (0/OFF: OFF, 1/ON: ON)

        <evbra>     ::=   <INT>
            <INT>    →   Event branch step (0 to 225)

        <jpstp_sw>  ::=   <BOL>
            <BOL>   →   Jump step ON/OFF (0/OFF: OFF, 1/ON: ON)

        <jpstp>     ::=   <INT>
            <INT>    →   Jump step (0 to 225)

        <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 225)

        <chan>      ::=   <INT>
             <INT>    →    Channel number (1 to 2)

        <wf_type>   ::=   <DISC>
             <DISC>   →    Waveform (DC: DC, NOIS: Noise, SIN: Sine wave, SQU: Square wave,
                           USER: Arbitrary waveform)

        <wf_arb_no> ::=   <INT>
             <INT>    →    Arbitrary waveform 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 "TRIGger[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 |
| Triggered 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. Changing the system unit is not reflected on this device screen. 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

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.
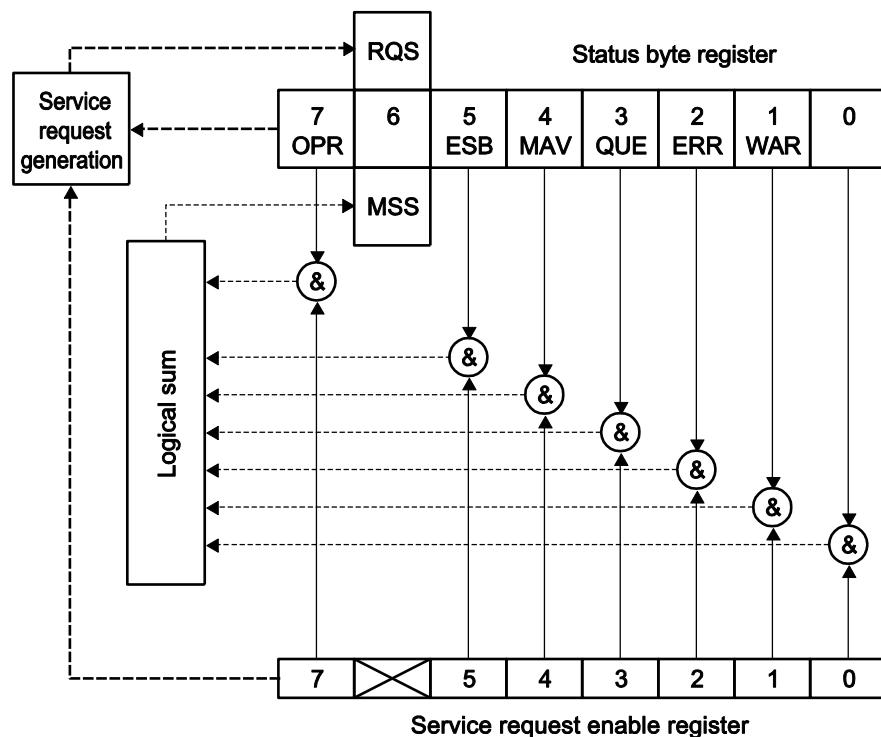


**Figure 3.1. Status Byte Register and Service Request Enable Register**

### 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.
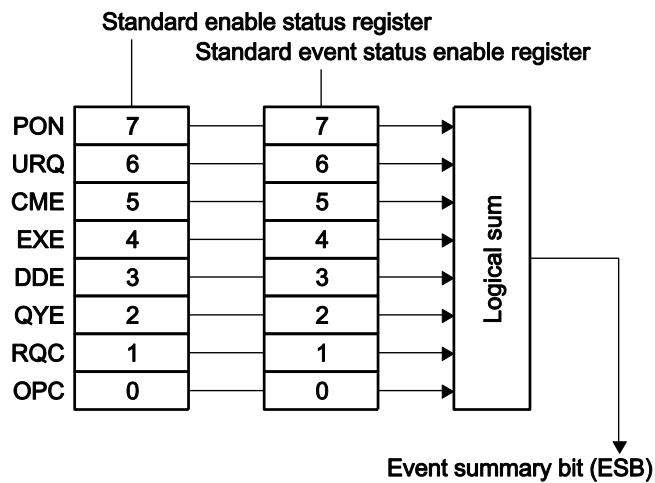


**Figure 3.2. Standard Event Status Register Group**

### 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 reflects 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.
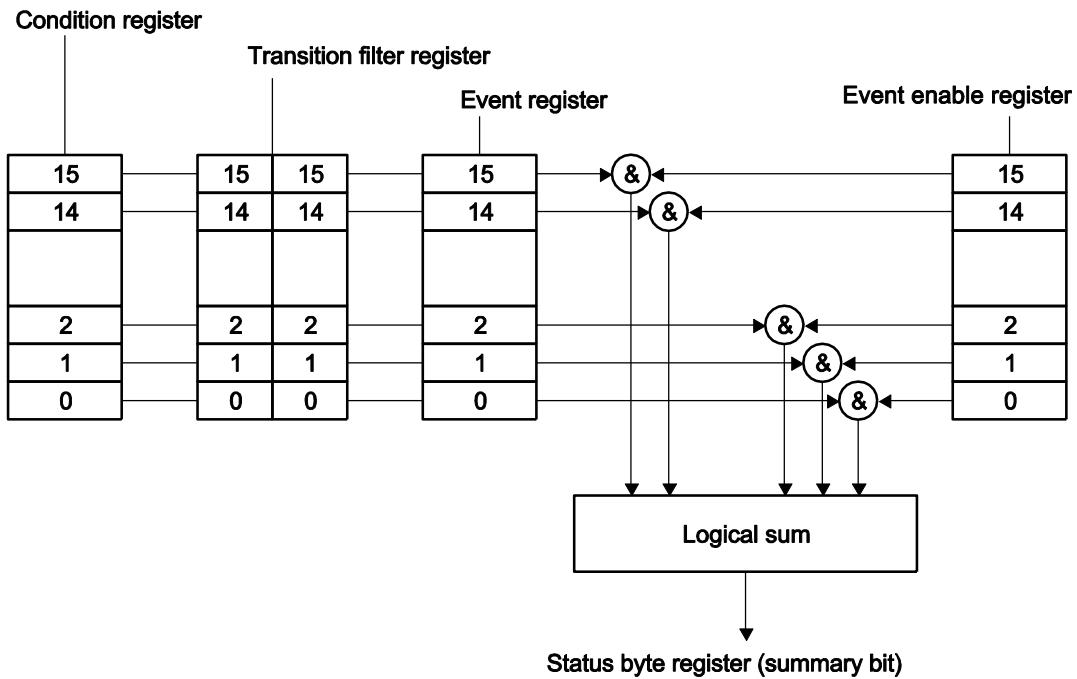


Figure 3.3. Operation Status Register Group/Questionable Data Status Register Group

## 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**
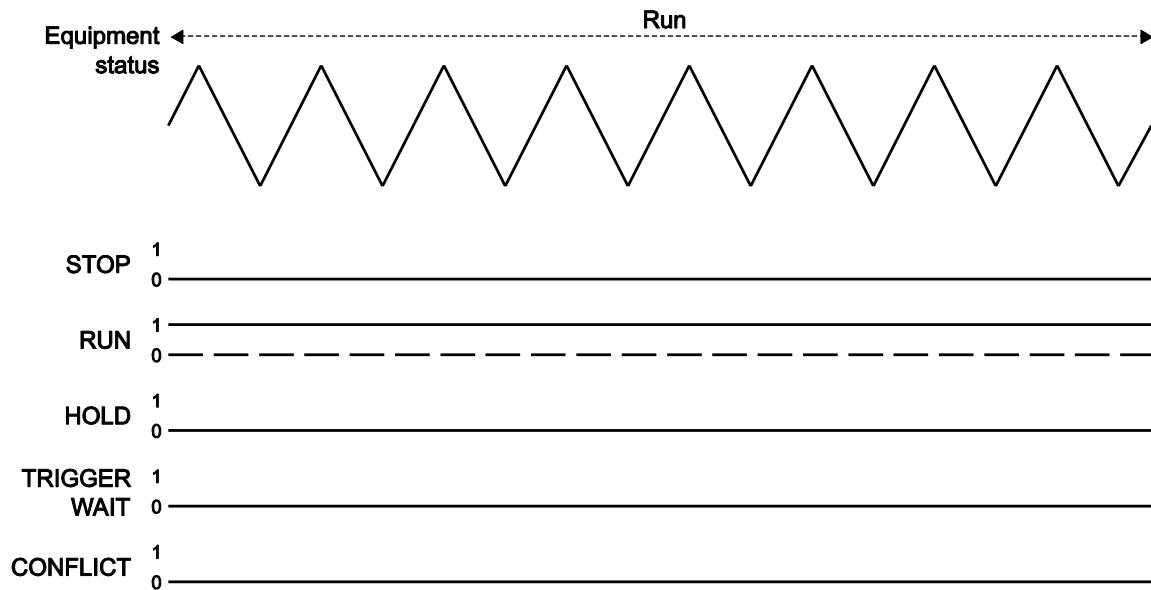
| Bit | Weight | Description |
|---|---|---|
| 0 | | (Unused) |
| 1 | | (Unused) |
| 2 | | (Unused) |
| 3 | | (Unused) |
| 4 | | (Unused) |
| 5 | | (Unused) |
| 6 | | (Unused) |
| 7 | | (Unused) |
| 8 | | (Unused) |
| 9 | 512 | CH1 operation status register summary |
| 10 | 1024 | CH2 operation status 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<br>    Indicates the Edit status. |
| 1 | 2 | Sequence: READY<br>    Indicates the ready status. |
| 2 | 4 | Sequence: RUN<br>    Indicates the Run status and the Hold status |
| 3 | 8 | Sequence: HOLD<br>    Indicates the Hold status. |
| 4 | | (Unused) |
| 5 | | (Unused) |
| 6 | | (Unused) |
| 7 | 128 | Modulation/sweep/burst: STOP<br>    Indicates a status in which the oscillation mode basically does not perform<br>    oscillation, such as the Stop status and the Conflict status.<br>    Moreover, even in the Run status, the value of this bit is 1 during the trigger<br>    delay period in the case of trigger burst, the half pulse from when the gate closes<br>    in the case of triggered gate, and also during the oscillation period for all waves. |
| 8 | 256 | Continuous oscillation/modulation/sweep/burst: RUN<br>    Indicates the Run status and the Hold status. |
| 9 | 512 | Modulation/sweep/burst: HOLD<br>    Indicates the Hold status. |
| 10 | 1024 | Modulation/sweep/burst: TRIGGER WAIT<br>    Indicates the TrigWait status. |
| 11 | 2048 | Modulation/sweep/burst: CONFLICT<br>    Indicates the Conflict status. |
| 12 | | (Unused) |
| 13 | | (Unused) |
| 14 | | (Unused) |
| 15 | | Always 0 |
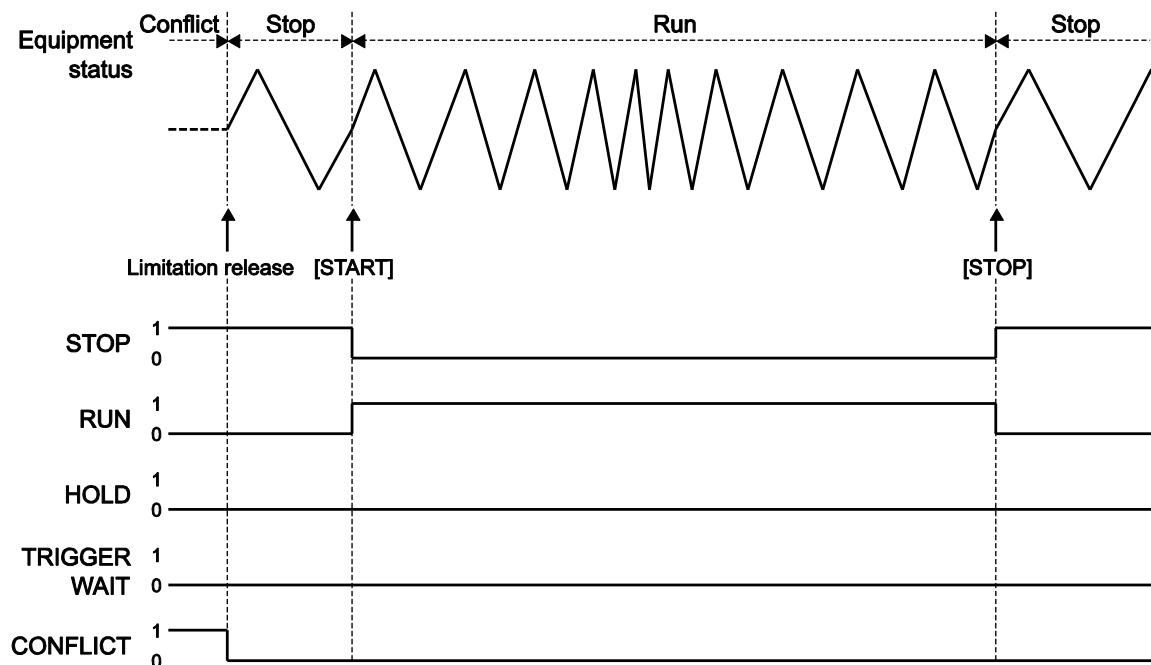
The relationships between the bits listed in Table 3.5 and the output waveform are described below.

### 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
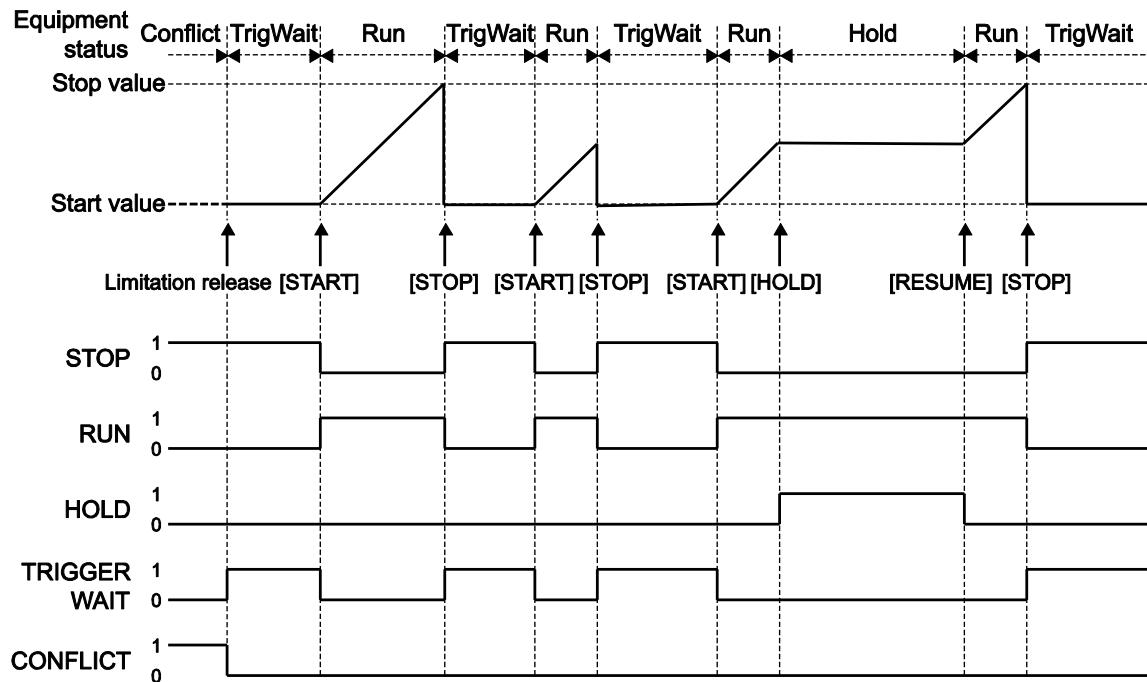


Figure 3.6. Relationship Between Output and Operation Status Register (Bits 7 to 11)
During Single-Shot Sweep, Gated Single-Shot Sweep
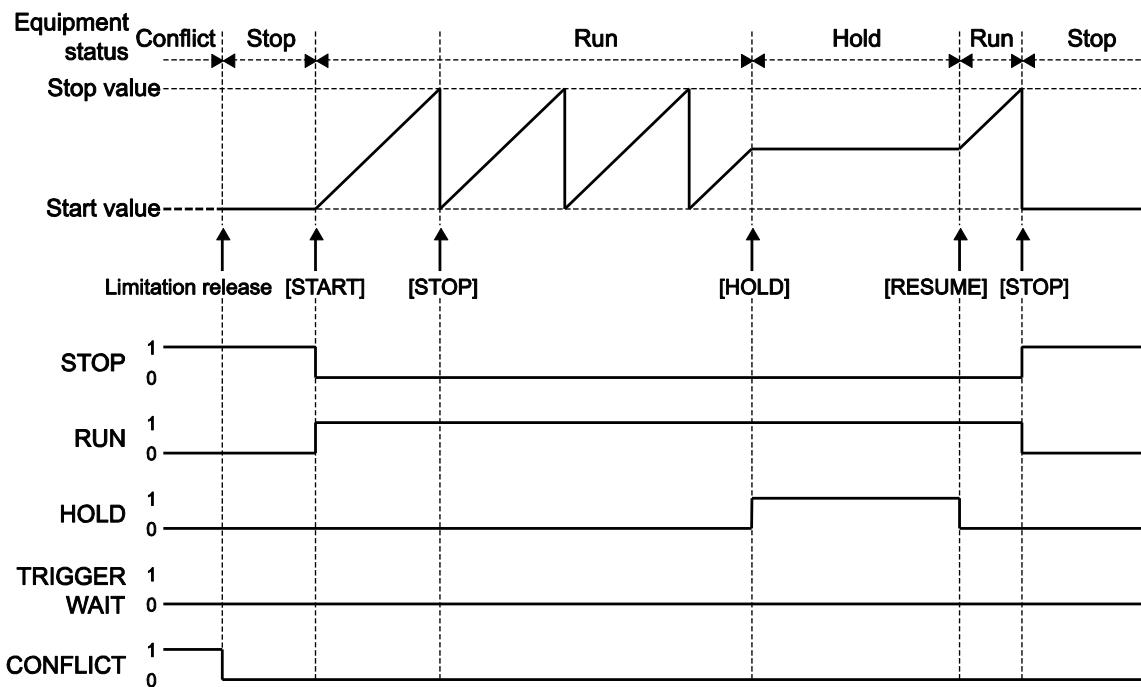


Figure 3.7. Relationship Between Output and Operation Status Register (Bits 7 to 11)
During Continuous Sweep

## 3.3.2.4 Burst
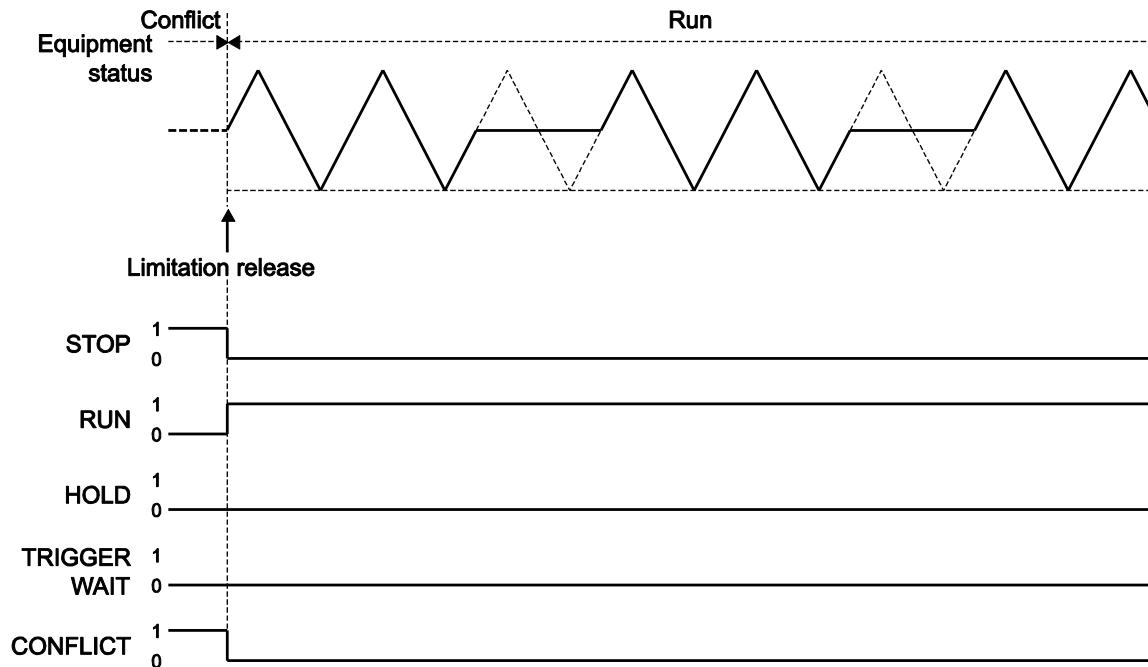


**Figure 3.8. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Auto Burst**
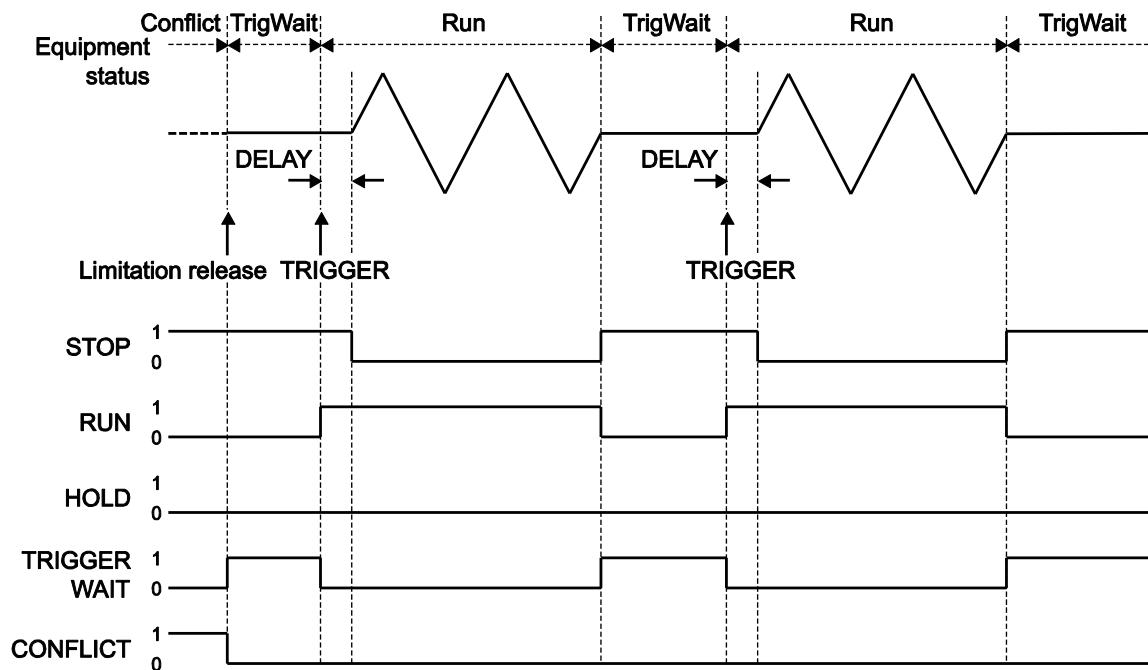


**Figure 3.9. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Trigger Burst**
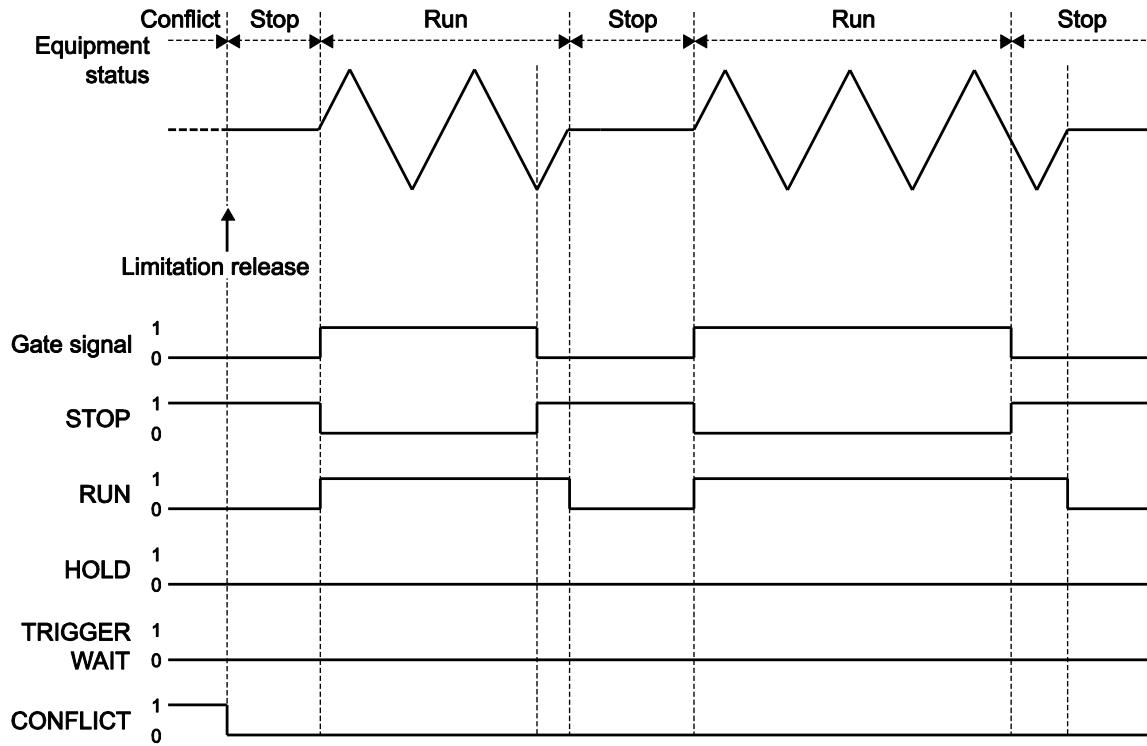
**Figure 3.10. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Gate**
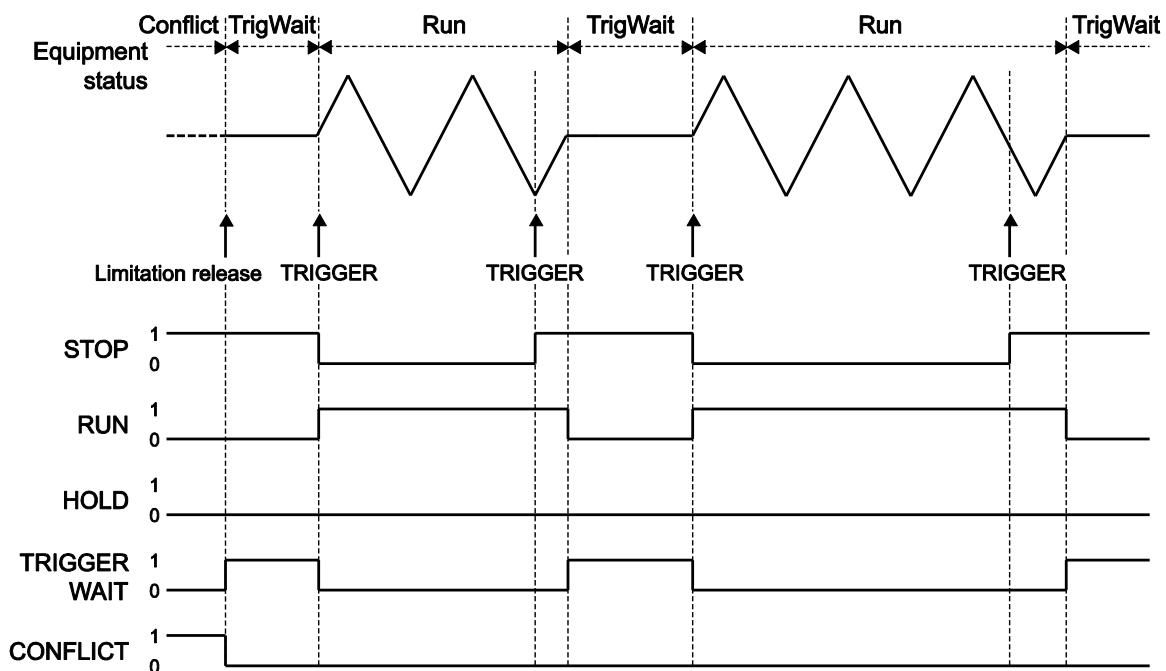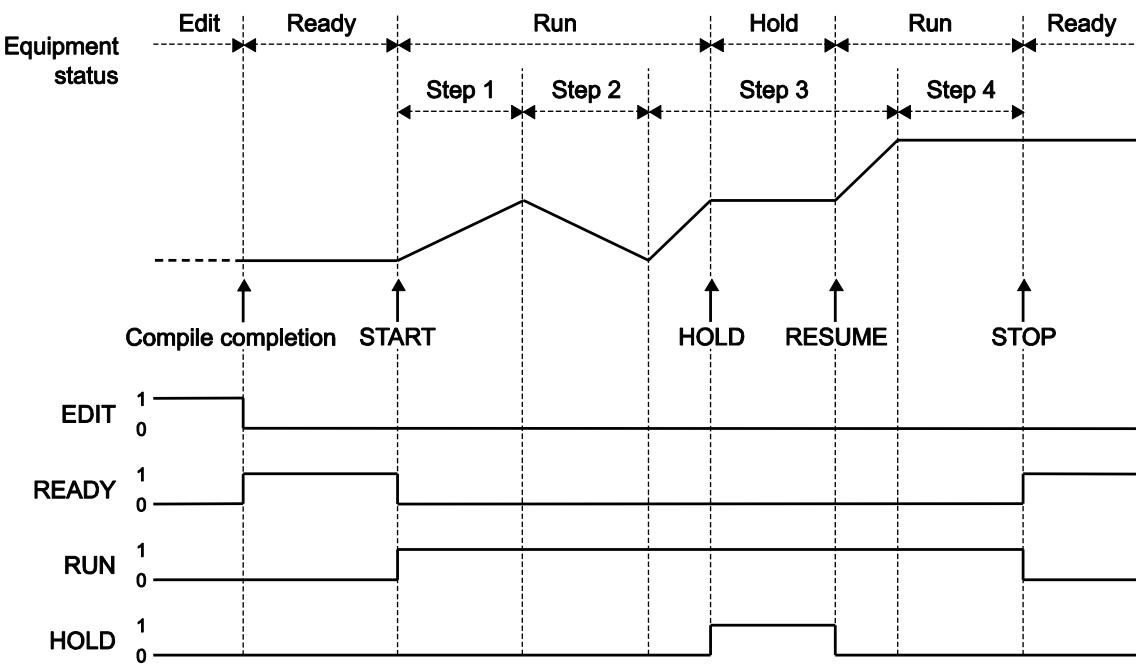


**Figure 3.11. Relationship Between Output and Operation Status Register (Bits 7 to 11) During Triggered Gate**

## 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.
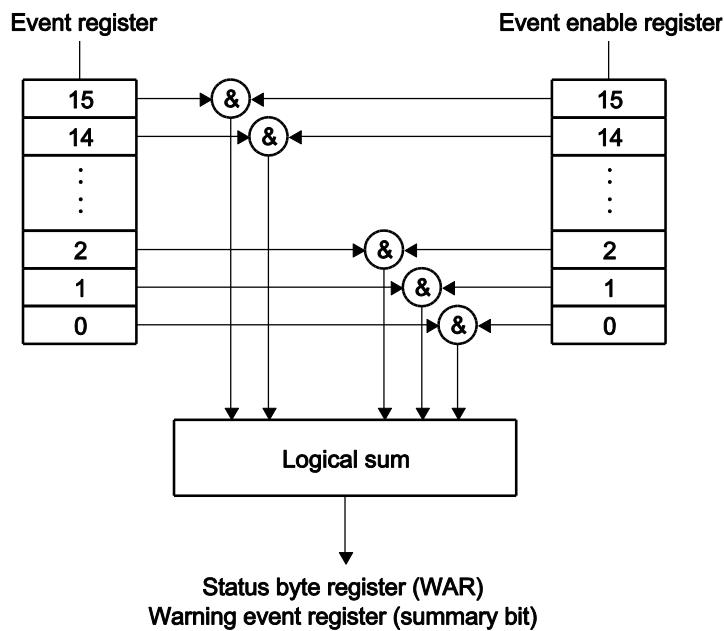


**Figure 3.13. Warning Event Status Register Group Model**

## 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 a 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.<br>• When "*CLS" could not be executed due to the device status<br>• When "*RST" could not be executed due to the device status<br>• When the modification from sequence to other oscillation modes could not be executed due to the device status<br>• 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.<br>• When compilation instruction was ignored because the device is not in Edit status sequence<br>• When the remote trigger was ignored because the device is not in Ready status sequence<br>• When the control command was ignored due to the device status |
| -220 | Parameter error | There is a parameter error. This error occurs in the following cases.<br>• When there was an error in prefix/unit in a numeric parameter<br>• When the specified unit cannot be used due to the device status<br>• When an arbitrary waveform name has exceeded 20 characters<br>• When a double quotation (") was contained in an arbitrary waveform name<br>• When the data points of an arbitrary waveform were not correct<br>• When the compilation of a sequence could not be passed due to the following reasons.<br>  ° The number of the used waveforms exceeds 128 or the total amount of that exceeds 512 KW.<br>  ° When the check was not executed because the setting of a sequence is too complicated. |

| Error number | Message | Contents (Figures in parentheses indicate the error codes displayed on the screen) |
|---|---|---|
| -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.<br>• When the sweep function could not be set to the log because the frequency sweep was not supported for the device<br>• When the arbitrary waveform data in the array format was to be set to the edit memory of an arbitrary waveform<br>• When the specification of the array format/control point format to an arbitrary waveform data contained an error<br>• 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)<br>• When the compilation of a sequence cannot be completed for the following reasons.<br>  ° Upon the relationship between two steps, when the frequency exceeded the upper limit of a waveform (23121)<br>  ° Upon the relationship between two steps, when the amplitude and offset did not satisfy the interdependent restriction (23122)<br>  ° Upon the relationship between two steps, a square waveform frequency and a duty did not satisfy the interdependent restriction. (23123)<br>• When an external modulation/addition input connector could not be used for the external modulation because it is used for the external addition (23129)<br>• 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.<br>• When the data which is out of range was set to each register in a status system<br>• When 0 was set to the frequency ratio of N/M<br>• When the data which was out of range was set to the user-defined unit, m/n.<br>• When the standard waveform of CH2 was copied to the memory in one channel device.<br>• When the data which was out of range was to be set (23045) |
| -225 | Out of memory | Memory capacity is insufficient for the execution. This error occurs in the following cases.<br>• 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.<br>• When the empty memory was specified by the arbitrary waveform number<br>• When the sequence compilation did not pass because the empty memory was specified by the arbitrary waveform number (23125)<br>• When the arbitrary waveforms which are output or used currently are to be deleted (32004) |

| Error number | Message | Contents (Figures in parentheses indicate the error codes displayed on the screen) |
|---|---|---|
| -291 | Out of memory | There is no specified memory. This error occurs in the following cases.<br>• When an arbitrary waveform number of other than 0 to 128 was specified<br>• 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.<br>• When an arbitrary waveform could not be read by a sequence compilation (23124)<br>• 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**
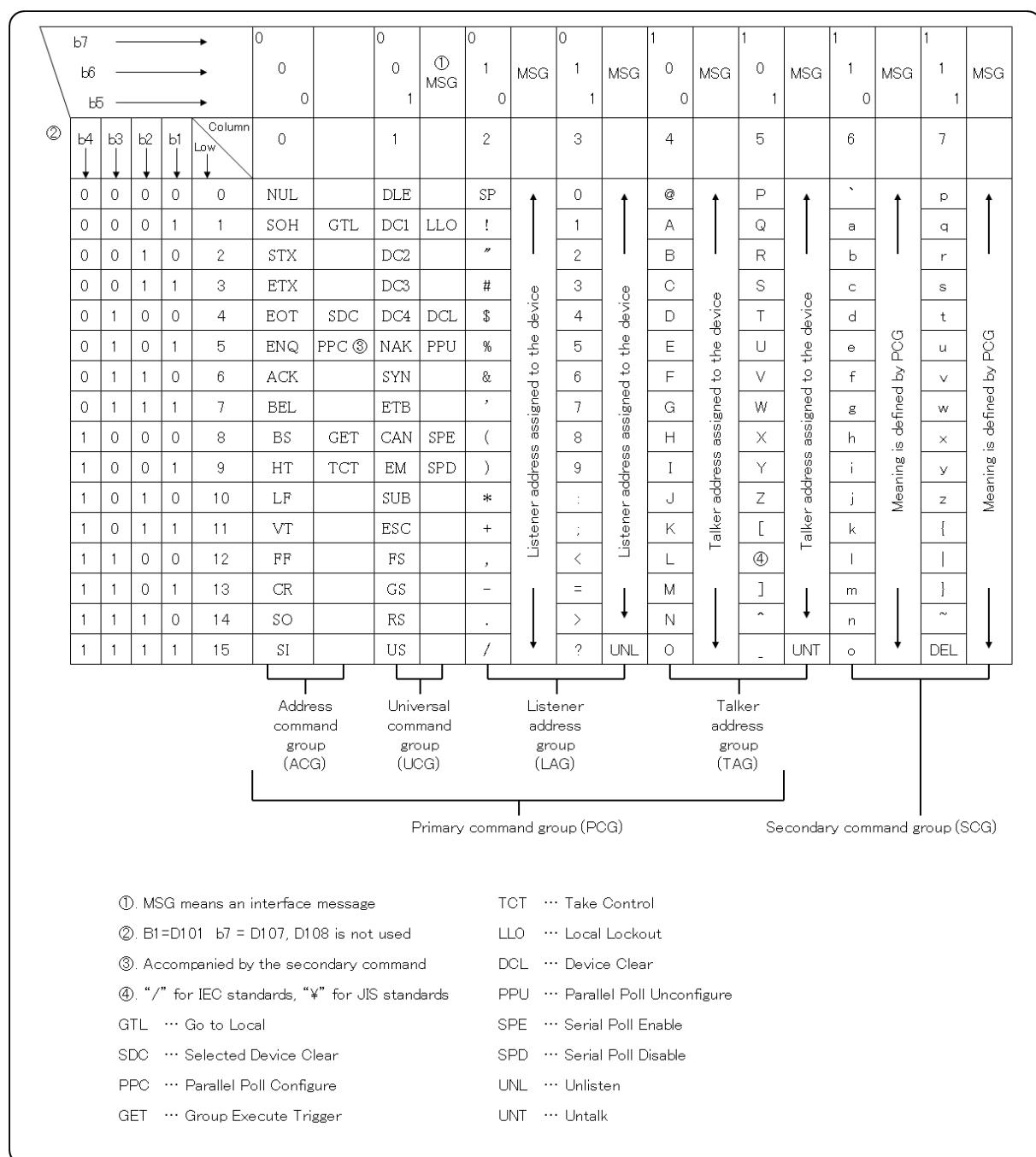
| Function | Subset | Description |
|---|---|---|
| Source handshake | SH1 | All send handshake functions provided |
| Accepter handshake | AH1 | All receive handshake functions provided |
| Talker | T6 | Basic talker function, talker cancellation through MLA provided |
| Listener | L4 | Basic listener 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 | Device trigger function provided |
| Controller | C0 | No controller function provided |

# 5.2　Response to Interface Messages

**Table 5.3. Response to Interface Messages**

| | |
|---|---|
| IFC | ・Initializes interface<br>・Cancels specified listener, talker |
| DCL and SDC | ・Clears I/O buffer<br>・Clears errors<br>・Cancels SRQ origination and resets bit that is source in status byte<br>・Prohibits SRQ originations |
| LLO | ・Disables use of LOCAL keys on panel (software keys) |
| GTL | ・Sets local status |

| b4 | b3 | b2 | b1 | Column Low | 0 | (ACG) | 1 | (UCG) | 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 | PPC③ | 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 | 1 | 0 | 14 | SO | | RS | | . | > | N | ^ | n | ~ |
| 1 | 1 | 1 | 1 | 15 | SI | | US | | / | ? (UNL) | O | _ (UNT) | o | DEL |

Notes on header bits: b7 D107; b6, b5 form the high bits of each column. ② B1=D101　b7=D107, D108 is not used.

- Column 0 (ACG): Address command group
- Column 1 (UCG): Universal command group
- Columns 2–3 (LAG): Listener address group — "Listener address assigned to the device", MSG
- Columns 4–5 (TAG): Talker address group — "Talker address assigned to the device", MSG
- Columns 6–7 (SCG): Secondary command group — "Meaning is defined by PCG", MSG

Primary command group (PCG): ACG + UCG + LAG + TAG
Secondary command group (SCG): columns 6–7

①. MSG means an interface message
②. B1=D101　b7 = D107, D108 is not used
③. Accompanied by the secondary command
④. "/" for IEC standards, "¥" for JIS standards

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

# 6.1 Command Tree

WABUN: (DA00015810-006)

Multifunction Generator

WF1973/WF1974

Instruction Manual (Remote Control)

NF Corporation

6-3-20 Tsunashima Higashi, Kohoku-ku. Yokohama-shi 223-8508, JAPAN

Phone: +81-45-545-8128 Fax: +81-45-545-8187

http://www.nfcorp.co.jp/

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