MULTIFUNCTION GENERATOR

WF1967/WF1968

Instruction Manual
(Remote Control)

NF Corporation

DA00048288-002

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INTRODUCTION

This instruction manual describes the GPIB, USB and LAN (Option) interfaces of WF1967/WF1968. For operations from the panel, see the separate manual "WF1967/WF1968 Instruction Manual (Operations)."

The GPIB, USB and LAN interfaces of WF1967/WF1968 features abundant functions and can control almost all operations on the front panel. In addition, they can read the setting values from external equipment such as personal computer.

WF1967/WF1968 Instruction Manual (Remote Control) consists of the following chapters.

1. Preparation before operation
   This chapter describes the interface settings and the GPIB address and LAN settings.

2. Command explanation
   This chapter describes the overview of the commands and setting examples.

3. Status System
   This chapter describes the status reporting, including status byte and standard event status register.

4. Error Messages
   This chapter describes the error numbers and their meaning.

5. Specification
   This chapter describes the specifications of the remote control interfaces.

6. Command Tree
   This chapter lists commands as a tree structure.

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1. Preparation before Use

1.1 Overview of WF1967/WF1968 GPIB/USB Interface

Almost all the functions of WF1967/WF1968 can be remotely set via the GPIB, USB and LAN (Option) interface. Moreover, the saved data and the settings can be transferred to an external device. This allows you to easily configure an automatic measurement system.

1.2 USB Preparations

The WF1967/WF1968 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

Mount a GPIB controller board (card) to the controlling computer, and then connect between them using a commercial GPIB cable. For details, see the instruction manual of your GPIB controller board (card).

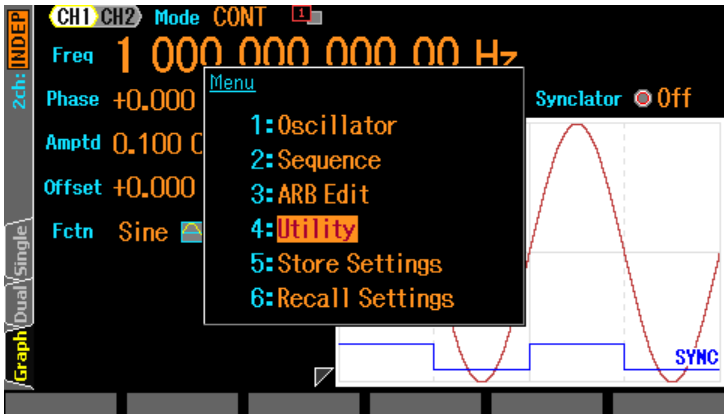
1.4 LAN Preparations

TCP / IP protocol communication only supports.
It does not correspond to the IP address automatic assignment by DHCP. When you connect to the network, contact the administrator, IP address, subnet mask, please set the default gateway.
When you directly connect a personal computer use a crossover cable. However, when the hub or personal computer can automatically recognize the straight and cross, you can use both.

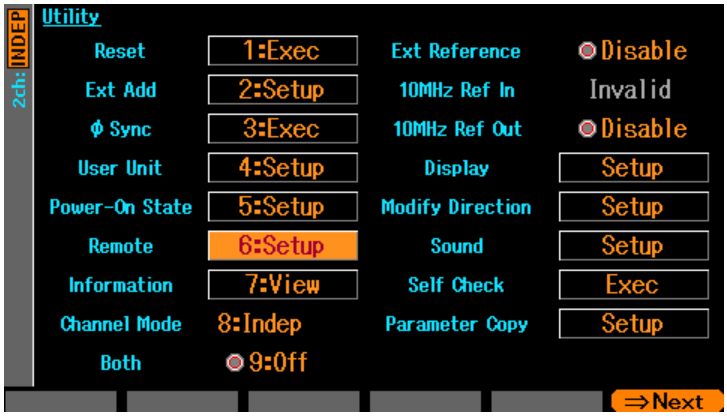
1.5 Selecting Interface

You can select whether the GPIB or the USB interface is to be used. If the LAN option is mounted, you can also select the LAN. WF1967/WF1968 cannot be controlled from the interface that is not selected. The selected interface is backed up even when the power is turned off.
"USB" is selected at shipping.

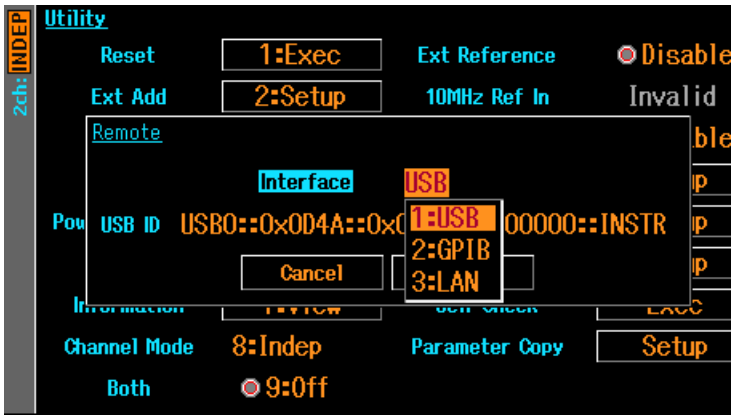
(1) On the Menu screen, select [4:Utility] and then press the ENTER key.



(2) Select [Remote] and then press the ENTER key.



(3) Select [Interface] and then press the ENTER key to display the screen for selecting USB, GPIB or LAN.

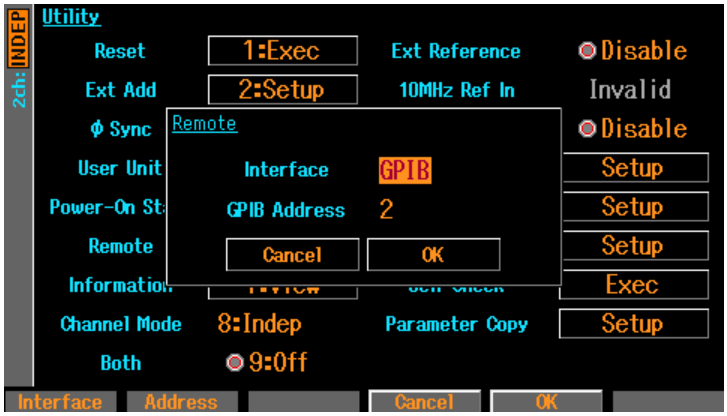


⚠ CAUTION	When the computer recognizes WF1967/WF1968, if you switch the interface from USB to GPIB or disconnect the USB cable, the computer may exhibit unexpected behavior.

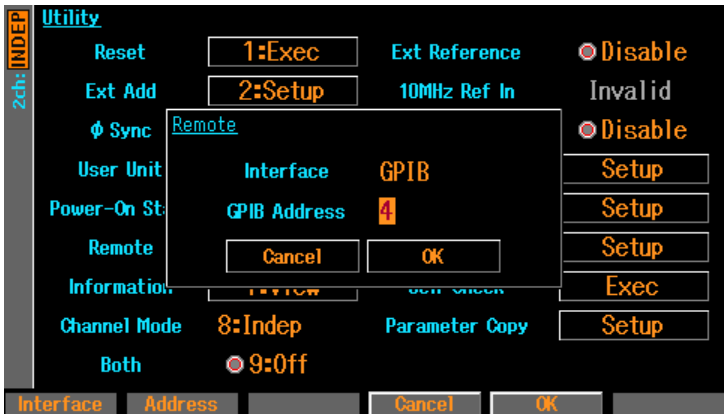
1.6 GPIB Address Setting

When you select the GPIB interface, you can set the GPIB address.
Set the GPIB address to a different value than the addresses of other devices connected with the GPIB cable. The set value is retained in the memory even when the power is turned off.
"2" is set at shipping.

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



1.7 USB ID

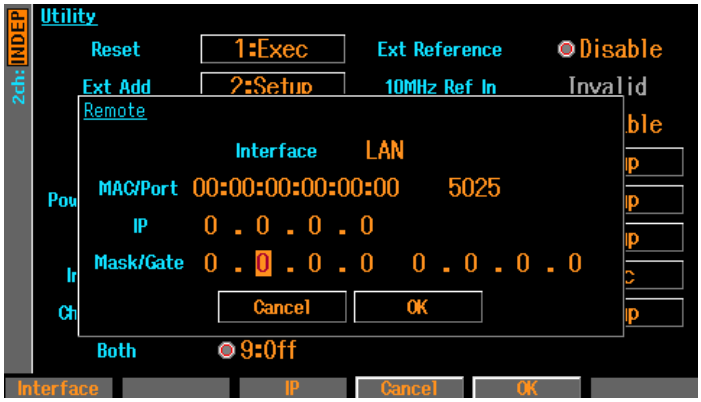
If multiple units of WF1967/WF1968 are connected within a system via USB, the following numbers are used to enable the application identify each unit.

- •Vendor No. : 3402(0x0D4A)
- •Product No. : 57(0x0039)/WF1967, 58(0x003A)/WF1968
- •Serial No. : Product's manufacturing number (serial number)

1.8 LAN settings

If the LAN interface have been installed and the LAN option is selected, a physical address, port number, IP address, subnet mask, default gateway will be displayed. The physical address one by one specific value, the port number is 5025 (decimal) in a fixed, cannot be changed Both.
Set the IP address, subnet mask, default gateway. Set value will be retained even if the power is turned off in memory.

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



(2) Select “IP” and then press the ENTER key to display the screen for IP address.
Enter the address by using the numeric keypad on the panel. Please set four.
It does not correspond to the IP address automatic assignment by DHCP. When you connect to the network, contact the administrator, IP address, subnet mask, please set the default gateway.
Incorrect setting, there is a risk of interfering with the communication on the connected network.

(3) Select “Mask” and then press the ENTER key to display the screen for subnetmask. Please set four.
This is the mask that separates the network address and the host address of the IP address.

(4) Select “Gate” and then press the ENTER key to display the screen for default gateway. Please set four.
This is the mask that separates the network address and the host address of the IP address.
When you access an external network, set the IP address of the gateway used implicitly.

1.9 Releasing Remote State

In the remote state, the "USB" or "GPIB" icon is lit on the LCD, and "LOCAL" is displayed on the [F5] soft-key. When the [F5] key is pressed in this state, the remote state is released and the panel operations become enabled. If "LOCAL" is not displayed (local lockout status), the [F5] key operation is disabled. To enable the panel operations, specify the local control from the remote control controller.

1.10 Considerations

- The USB, GPIB and LAN 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 or disconnect the GPIB connector only after all devices connected on the bus are powered off.
- When using the GPIB interface, power on all devices connected on the bus.
- The total length of GPIB cable must be 2m x (number of devices) or 20m, whichever is shorter.
- The length of a single cable must be 4m or shorter.
- Check the GPIB address carefully 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.
- When LAN is used, you cannot use the GPIB-specific features, such as SRQ and device clear.
- During LAN use, by the misuse of abnormalities and command of the communication path, when the equipment is no longer responding to commands, please turn on the power. Or, once you switch to the other interface, please select the LAN again.
- Since there is no concept of END message to LAN, it does not add EOI.
- In USB interface use, USB memory can not be used.

2. Command explanation

2.1 Overview of Commands

The commands of WF1967/WF1968 comply with IEEE488.2 and SCPI (version 1999.0). SCPI defines the communication method used between controllers and measurement equipment. For general information about SCPI, refer to other appropriate documents.

2.1.1 Conventions

For convenience in describing the commands, the following conventions are used in this document.

< > < > indicates something other than itself. In the case of parameter or response data, the abbreviation of the type is enclosed in < >.

[ ] The items enclosed in [ ] are optional, and can be omitted.

{abc|xyz}
Indicates that either “abc” or “xyz” can be used.

[abc|xyz]
Indicates that either “abc” or “xyz” can be used
but that both are optional and can be omitted.

Uppercase, lowercase
Keywords in a mixture of uppercase and lowercase letters are the long form, while keywords in uppercase letters only are the short form.

2.1.2 Command

The program messages of WF1967/WF1968 consist of common commands and subsystem commands. This section describes the format of each command, the subsystem command tree, and so on.

2.1.2.1 Common Commands

The common commands are to control the comprehensive functions of the equipment.
Figure 2.1 shows the syntax of common commands.

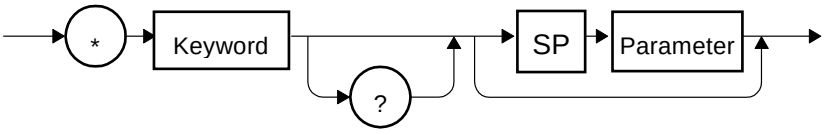


Figure 2.1 Common Command Syntax

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

2.1.2.2 Subsystem Commands

The subsystem commands are used to execute specific functions of the equipment. Each subsystem command consists of a root keyword, one or more lower-level keywords, a parameter, and a suffix. The followings show examples of command and query.

: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 Subsystem command tree

(A) Structure of command tree

In SCPI, a hierarchical structure similar to the one used in a file system is used for the subsystem commands. This command structure is called "command tree."

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

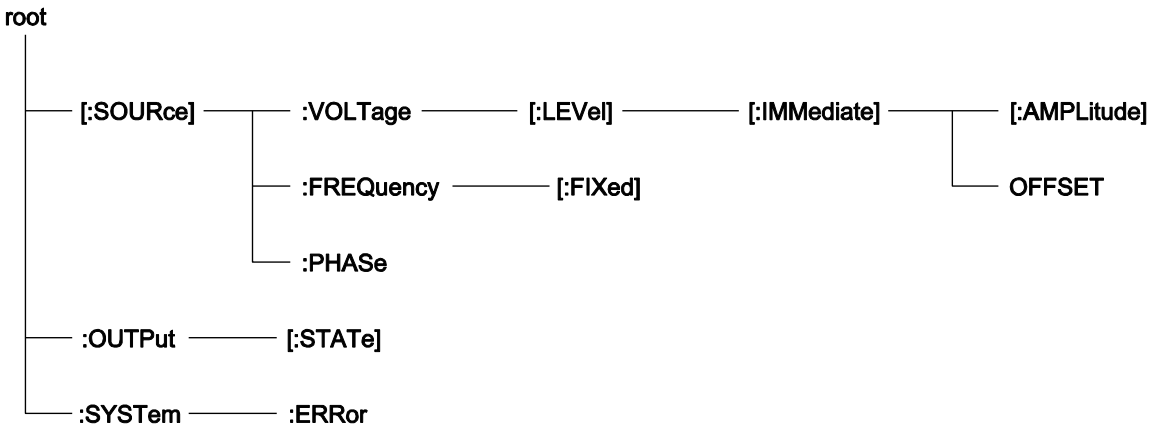


Figure 2.2 Example of Subsystem Command Tree

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 followed. For example, to access ":OFFSet", the path must be [:SOURce] - :VOLTage - [:LEVel] - [:IMMediate] - :OFFSet.

(B) Current path movement

The current path is a level within the command tree, and becomes the first level from which the parser starts the search 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 the root.

(2) Message terminator
Upon reception of a message terminator, the current path is set to the 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 the root.

(5) Semicolon
Semicolons do not affect to the current path.

(6) Space
Spaces do not affect to the current path.

(7) Comma
Commas do not affect to the current path.

(8) EEE488.2 common commands
Common commands do not affect to the current path.

By using semicolons properly, multiple commands can be sent efficiently.
For example,

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

is the same as sending the following two commands:

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

When an optional keyword is omitted, you should pay careful attention to the current path movement.
For example,

:VOLTage 1.0

sets the current path to ":SOURce." Therefore, if the following two program messages

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

are send as one program message,

: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

The syntax of subsystem commands is shown in Figure 2.3.

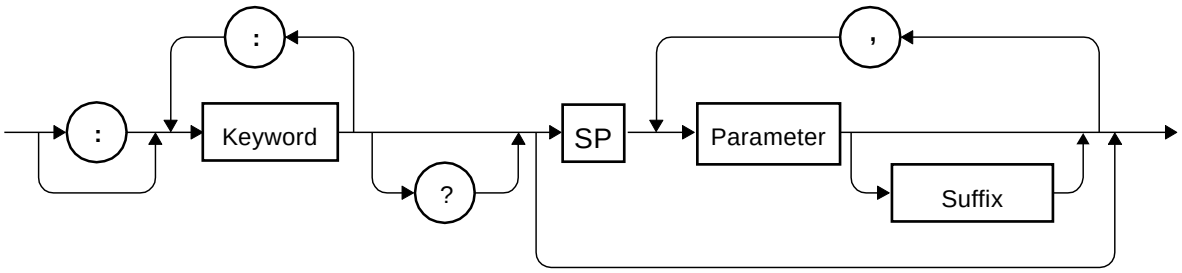


Figure 2.3 Subsystem Command Syntax

(A) Keyword

The keyword in Figure 2.3 is a string of up to 12 characters consisting of uppercase and lowercase alphabetic characters, underscore (_), and numeric characters, beginning with an alphabetic character.
Most of the keywords listed in "2.2 Command List" consist of a mixture of uppercase and lowercase letters. Here, uppercase letters indicate the short form of keywords, while uppercase and lowercase letters indicate the long form of keywords. Keywords are written in uppercase and lowercase letter for convenience, but actual commands are not case sensitive. Examples for the keyword "OUTPut" 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 a 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 the 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 interprets the command as if that optional keyword is received.
For example,

:OUTPut[:STATe]

means that you can use either of the following commands:

:OUTPut:STATe
:OUTPut

(D) Channel specification

In the case of a 2-channel equipment, many commands allow you to specify the channel by using an optional numeric keyword suffix.
For example,

:OUTPut[1|2]:STATe

means that commands for channel 1 and 2 are as follows:

:OUTPut[1]:STATe
:OUTPut2:STATe

If no channel number is specified, [1] is considered to be omitted, and the command is interpreted as the command for channel 1. For example, to control the channel 1 output to be turned ON, you can use either of the following commands.

:OUTPut1:STATe ON
:OUTPut:STATe ON

(E) Parameters

Parameter types are described below.

(1) Numeric parameter (<REAL>, <INT>)
The syntax of numeric parameters is shown in Figure 2.4.

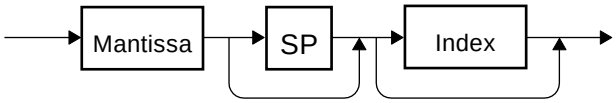


Figure 2.4 Numeric Parameter (<REAL>, <INT>) Syntax

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

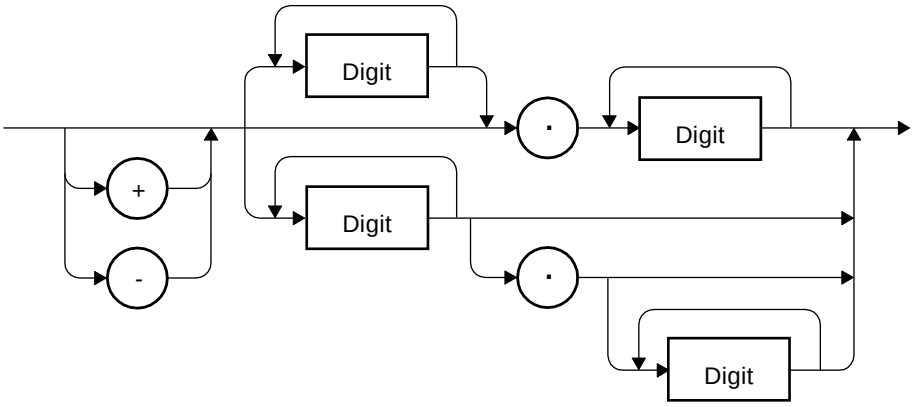


Figure 2.5 Mantissa Syntax

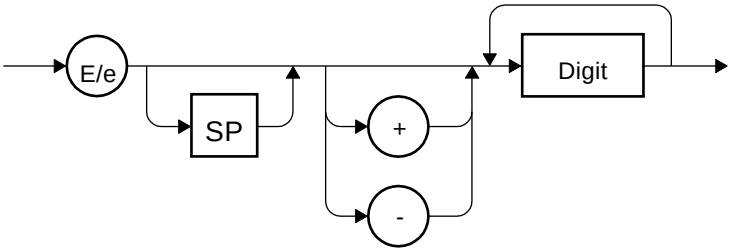


Figure 2.6 Index Syntax

(2) Discrete Parameter (<DISC>)

The syntax of the discrete parameter is shown in Figure 2.7.

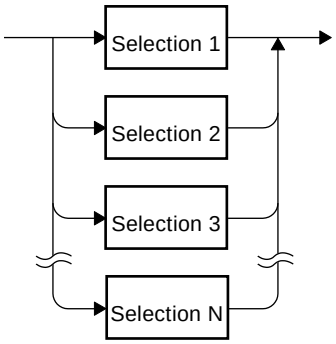


Figure 2.7 Discrete Parameter (<DISC>) Syntax

(3) Boolean Value Parameter (<BOL>)

The syntax of the Boolean value parameter is shown in Figure 2.8.

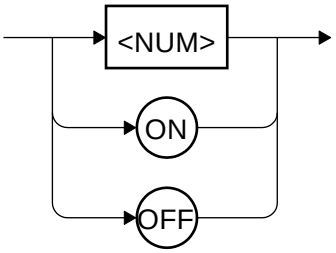


Figure 2.8 Boolean Value Parameter (<BOL>) Syntax

The Boolean value parameter is interpreted as true for values other than 0, and as false for 0 (zero). If the specified value includes a fractional part, that value is interpreted as the whole number obtained by rounding the fractional part. Therefore, for example, "0.4" is false, and "0.5" is true.

(4) String parameter (<STR>)

The syntax of string parameters is shown in Figure 2.9.

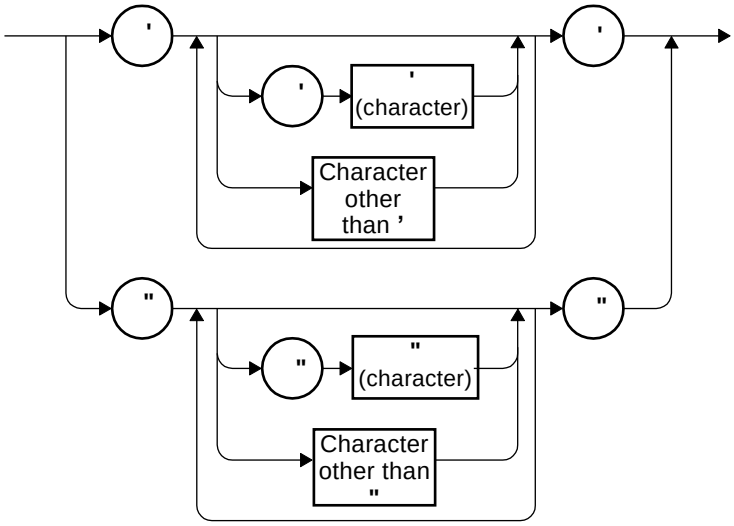


Figure 2.9 String Parameter (<STR>) Syntax

(5) Block parameter (<BLK>)

The syntax of block parameters is shown in Figure 2.10.

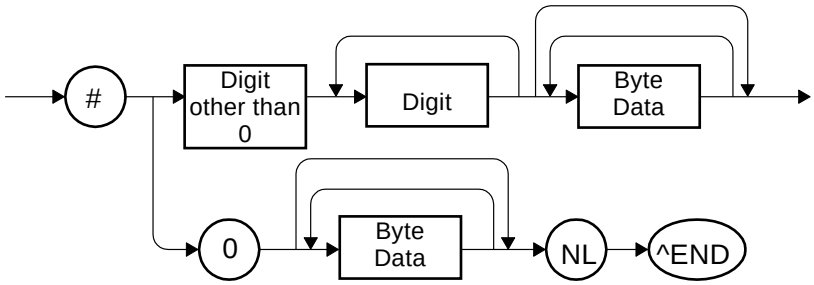


Figure 2.10 Block Parameter (<BLK>) Syntax

In the figure, NL is a new line character (ASCII code 10), and ^END is an EOI asserted by the last byte.

(F) Parameter separator

Parameter separators are used to separate parameters in a command which have two or more parameters.

(G) Query parameter

A query parameter is specified after "?" of query, and can be used for most of queries supported by the commands that have numeric parameters. For example, when "MINimum" or "MAXimum" is

specified as query parameter, the settable minimum value or settable maximum value can be queried, respectively.

(H) Suffix

The syntax of suffix is shown in Figure 2.11.

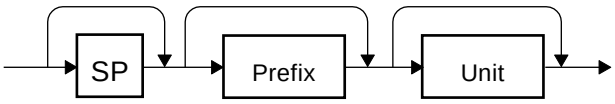


Figure 2.11 Suffix Syntax

In WF1967/WF1968, the prefix and unit attached to a parameter are valid only for that command, and do not affect other commands.

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

2.1.2.5 Program message syntax

Two or more common commands and subsystem commands can be combined and sent from the controller to the equipment as one program message. The syntax of the program message is shown in Figure 2.12.

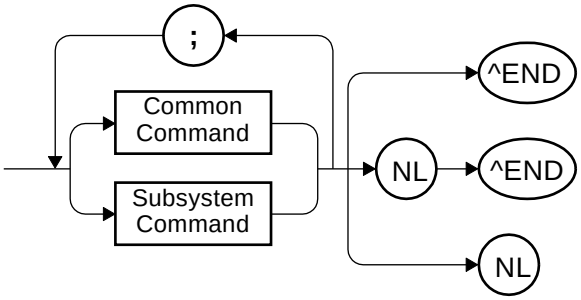


Figure 2.12 Program Message Syntax

Commands are separated by a semicolon (;).

2.1.2.6 Response message syntax

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

(A) Response message syntax

The syntax of the response message is shown in Figure 2.13.

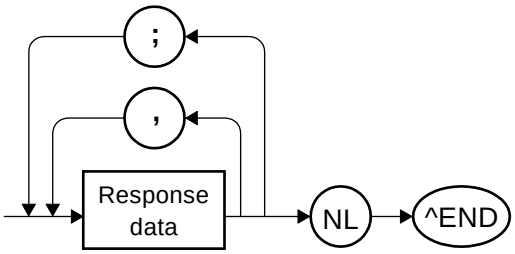


Figure 2.13 Response Message Syntax

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

(B) Response message data

The data types of response messages are as follows.

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

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

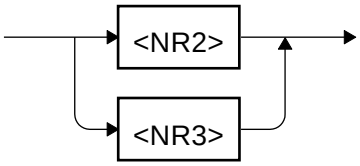


Figure 2.14　Real Number Response Data (<REAL>) Syntax

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

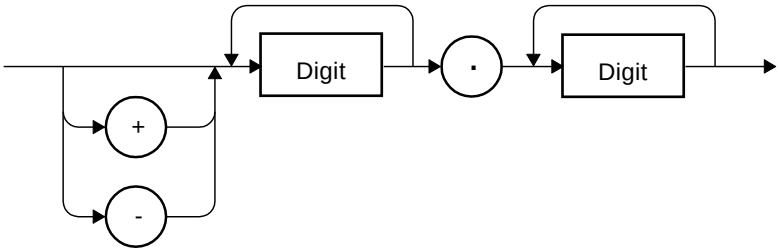


Figure 2.15　NR2 Number Response Data (<NR2>) Syntax

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

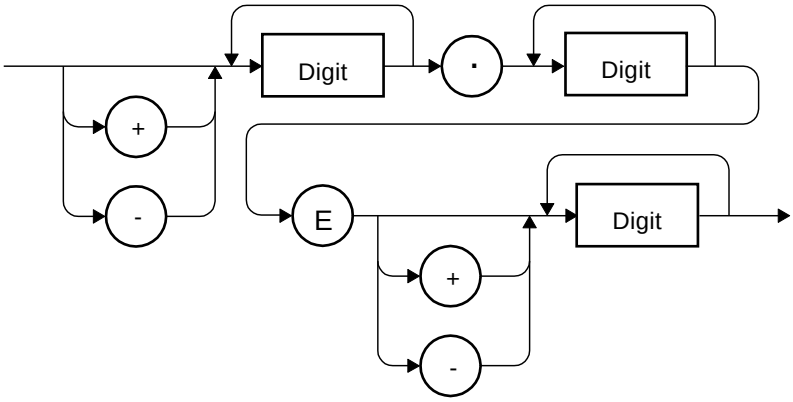


Figure 2.16　NR3 Number Response Data (<NR3>) Syntax

(2) Integer response data (<INT>)

The syntax of the integer response data is shown in Figure 2.17.

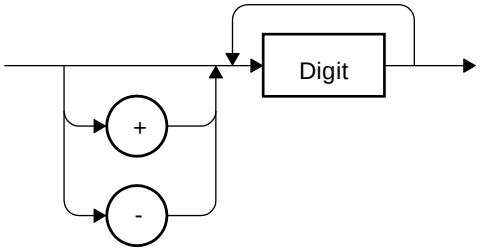


Figure 2.17 Integer Response Data (<INT>) Syntax

(3) Discrete response data (<DISC>)

The syntax of the discrete response data is shown in Figure 2.18.

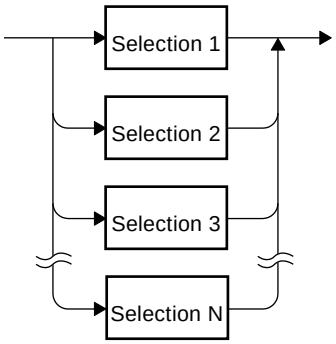


Figure 2.18 Discrete Response Data (<DISC>) Syntax

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

The syntax of the numeric Boolean value response data is shown in Figure 2.19.

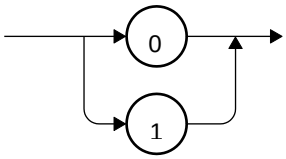


Figure 2.19 Numeric Boolean Value Response Data (<NBOL>) Syntax

(5) String response data (<STR>)

The syntax of the string response data is shown in Figure 2.20.

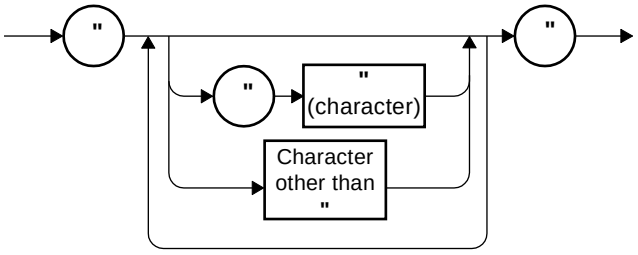


Figure 2.20 String Response Data (<STR>) Syntax

(6) Definite length arbitrary block response data (<DBLK>)

The syntax of the definite length arbitrary block response data is shown in Figure 2.21.

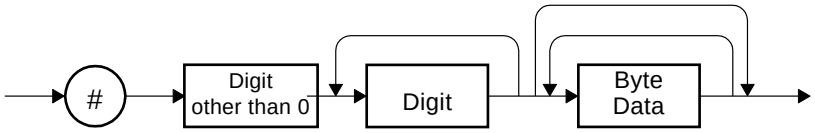


Figure 2.21 Definite Length Arbitrary Block Response Data (<DBLK>) Syntax

(7) Indefinite length arbitrary block response data (<IBLK>)

The syntax of the indefinite length arbitrary block response data is shown in Figure 2.22.

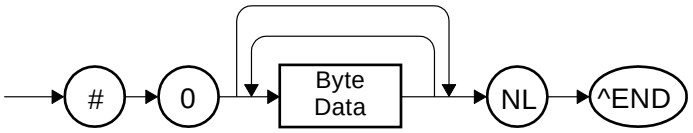


Figure 2.22 Indefinite Length Arbitrary Block Response Data (<IBLK>) Syntax

2.2 Command List

This section shows the list of the remote control commands of WF1967/WF1968.

The meanings of the symbols used in the command list table are as follows.

The lowercase part of each keyword indicates that the part can be omitted.

- Square brackets ([ ]) indicate the optional keywords. (implicit keywords)
- Vertical bars (|) indicate that one of multiple keywords can be selected.

Table 2.2 Command List

(Oscillation Mode)

Function	Command	Description Page
Continuous oscillation mode		
Continuous oscillation mode selection	[:SOURce[1|2]]:CONTinuous[:IMMediate]	42
Continuous oscillation mode query	[:SOURce[1|2]]:CONTinuous:STATe?	42
Synchronization signal output selection/query	:OUTPut[1|2]:SYNC:TYPE	43
Subchannel phase setting/query	[:SOURce[1|2]]:SCHannel:PHASe[:ADJust]	43
Subchannel waveform selection/query	[:SOURce[1|2]]:SCHannel:FUNCtion[:SHAPe]	44
Subchannel Arbitrary waveform selection/query	[:SOURce[1|2]]:SCHannel:FUNCtion:USER	45
Subchannel Noise band setting/query	[:SOURce[1|2]]:SCHannel:FUNCtion:NOISe:BW	45
Modulated oscillation mode common setting of modulation		
Phase of internal modulation source setting/query	[:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM} :INTernal:PHASe[:ADJust]	46
Modulated oscillation mode common setting of FSK/PSK		
Modulation source selection/query	[:SOURce[1|2]]:{FSKey|PSKey}:SOURce	47

Function	Command	Description Page
Signal polarity with external modulation source selection/query	[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe	48
Internal modulation frequency setting/query	[:SOURce[1|2]]:{FSKey|PSKey}:INTernal:FREQuency	48
Synchronization signal output selection/query	:OUTPut[1|2]:SYNC :{FSKey|PSKey}:TYPE	49
Modulated oscillation mode common setting of other than FSK/PSK		
Modulation source selection/query	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:SOURce	50
Internal modulation frequency setting/query	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FREQuency	50
Internal modulation waveform selection/query	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal :FUNCtion[:SHAPe]	51
Arbitrary waveform for internal modulation selection/query	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal :FUNCtion:USER	52
Noise band for internal modulation setting/query	[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal :FUNCtion:NOISe:BW	52
Synchronization signal output selection/query	:OUTPut[1|2]:SYNC:{FM |PM|AM|AMSC|OFSM|PWM}:TYPE	53
Modulated oscillation mode FSK (frequency shift keying)		
FSK selection/query	[:SOURce[1|2]]:FSKey:STATe	54
Hop frequency setting/query	[:SOURce[1|2]]:FSKey[:FREQuency]	55
Modulated oscillation mode PSK (phase shift keying)		
PSK selection/query	[:SOURce[1|2]]:PSKey:STATe	55
Deviation setting/query	[:SOURce[1|2]]:PSKey[:DEViation]	56
Modulated oscillation mode FM (frequency modulation)		
FM selection/query	[:SOURce[1|2]]:FM:STATe	57
Peak deviation setting/query	[:SOURce[1|2]]:FM[:DEViation]	57
Modulated oscillation mode PM (phase modulation)		

Function	Command	Description Page
PM selection/query	[:SOURce[1|2]]:PM:STATe	58
Peak deviation setting/query	[:SOURce[1|2]]:PM[:DEViation]	59
Modulated oscillation mode AM (amplitude modulation)		
AM selection/query	[:SOURce[1|2]]:AM:STATe	60
Modulation depth setting/query	[:SOURce[1|2]]:AM[:DEPTh]	60
Modulated oscillation mode AM (DSB-SC)(carrier suppression amplitude modulation)		
AM (DSB-SC) selection/query	[:SOURce[1|2]]:AMSC:STATe	61
Modulation depth setting/query	[:SOURce[1|2]]:AMSC[:DEPTh]	62
Modulated oscillation mode DC offset modulation		
DC offset modulation selection/query	[:SOURce[1|2]]:OFSM:STATe	63
Peak deviation setting/query	[:SOURce[1|2]]:OFSM[:DEViation]	63
Modulated oscillation mode PWM (pulse width modulation)		
PWM selection/query	[:SOURce[1|2]]:PWM:STATe	64
Peak deviation setting/query	[:SOURce[1|2]]:PWM[:DEViation]:DCYCle	65
Sweep oscillation mode common setting of sweep		
Sweep mode selection/query	[:SOURce[1|2]]:SWEep:MODE	66
Sweep slope selection/query	[:SOURce[1|2]]:SWEep:SPACing	66
Sweep direction selection/query	[:SOURce[1|2]]:SWEep:INTernal:FUNCtion	67
Sweep time setting/query	[:SOURce[1|2]]:SWEep:TIME	67
Stop level setting/query	[:SOURce[1|2]]:SWEep:SLEVel	68
Stop level selection/query	[:SOURce[1|2]]:SWEep:SLEVel:STATe	69
Oscillation stop unit setting/query	[:SOURce[1|2]]:SWEep:OSTop	69
Multi-connector control On/Off selection/query	[:SOURce[1|2]]:SWEep:MCONnector:STATe	70
Synchronization output selection/query	:OUTPut[1|2]:SYNC:SWEep:TYPE	70

Function	Command	Description Page
Sweep oscillation mode frequency sweep setting		
Frequency sweep selection/query	[:SOURce[1|2]]:FREQuency:MODE	71
Starting value setting/query	[:SOURce[1|2]]:FREQuency:STARt	72
Stop value setting/query	[:SOURce[1|2]]:FREQuency:STOP	72
Center value setting/query	[:SOURce[1|2]]:FREQuency:CENTer	73
Span value setting/query	[:SOURce[1|2]]:FREQuency:SPAN	74
Marker value setting/query	[:SOURce[1|2]]:MARKer:FREQuency	75
Start/stop value swapping setting	[:SOURce[1|2]]:FREQuency:SWAP	75
Start/stop value output setting	[:SOURce[1|2]]:FREQuency:STATe	76
Sweep oscillation mode phase sweep setting		
Phase sweep selection/query	[:SOURce[1|2]]:PHASe:MODE	76
Starting value setting/query	[:SOURce[1|2]]:PHASe:STARt	77
Stop value setting/query	[:SOURce[1|2]]:PHASe:STOP	77
Center value setting/query	[:SOURce[1|2]]:PHASe:CENTer	78
Span value setting/query	[:SOURce[1|2]]:PHASe:SPAN	79
Marker value setting/query	[:SOURce[1|2]]:MARKer:PHASe	79
Start/stop value swapping setting	[:SOURce[1|2]]:PHASe:SWAP	80
Start/stop value output setting	[:SOURce[1|2]]:PHASe:STATe	80
Sweep oscillation mode amplitude sweep setting		
Amplitude sweep selection/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE	81
Starting value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt	81
Stop value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STOP	82
Center value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CEN	83

Function	Command	Description Page
	Ter	
Span value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN	84
Marker value setting/query	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate] [:AMPLitude]	85
Start/stop value swapping setting	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SWAP	86
Start/stop value output setting	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STATe	86
Sweep oscillation mode DC offset sweep setting		
DC offset sweep selection/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE	86
Starting value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt	87
Stop value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP	88
Center value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer	88
Span value setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN	89
Marker value setting/query	[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet	90
Start/stop value swapping setting	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP	91
Start/stop value output setting	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe	91
Sweep oscillation mode duty sweep setting		
Duty sweep selection/query	[:SOURce[1|2]]:PULSe:DCYCle:MODE	92
Starting value setting/query	[:SOURce[1|2]]:PULSe:DCYCle:STARt	92
Stop value setting/query	[:SOURce[1|2]]:PULSe:DCYCle:STOP	93
Center value setting/query	[:SOURce[1|2]]:PULSe:DCYCle:CENTer	94
Span value setting/query	[:SOURce[1|2]]:PULSe:DCYCle:SPAN	95
Marker value setting/query	[:SOURce[1|2]]:MARKer:PULSe:DCYCle	96
Start/stop value swapping setting	[:SOURce[1|2]]:PULSe:DCYCle:SWAP	96

Function	Command	Description Page
Start/stop value output setting	[:SOURce[1|2]]:PULSe:DCYCle:STATe	97
Burst oscillation mode common setting of burst		
Burst oscillation mode selection/query	[:SOURce[1|2]]:BURSt:STATe	97
Burst mode selection/query	[:SOURce[1|2]]:BURSt:MODE	98
Stop level setting/query	[:SOURce[1|2]]:BURSt:SLEVel	98
Stop level selection/query	[:SOURce[1|2]]:BURSt:SLEVel:STATe	99
Synchronization signal output selection/query	:OUTPut[1|2]:SYNC:BURSt:TYPE	99
Burst oscillation mode auto burst		
Mark wave number setting/query	[:SOURce[1|2]]:BURSt:AUTO:NCYCles	100
Space wave number setting/query	[:SOURce[1|2]]:BURSt:AUTO:SPACe	101
Burst oscillation mode trigger burst		
Mark wave number setting/query	[:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles	101
Trigger delay time setting/query	[:SOURce[1|2]]:BURSt[:TRIGger]:TDELay	102
Burst oscillation mode gate		
Oscillation stop unit setting/query	[:SOURce[1|2]]:BURSt:GATE:OSTop	103
Burst oscillation mode triggered gate		
Oscillation stop unit setting/query	[:SOURce[1|2]]:BURSt:TGATe:OSTop	103

(Waveform selection/setting mode)

Function	Command	Description Page
Waveform selection/query	[:SOURce[1|2]]:FUNCtion[:SHAPe]	104
Waveform polarity selection/query	:OUTPut[1|2]:POLarity	105
Amplitude range selection/query	:OUTPut[1|2]:SCALe	107
Square/pulse wave shared commands		
Duty unit selection/query	[:SOURce[1|2]]:PULSe:DCYCle:UNIT	108
Duty user-defined unit setting/query	[:SOURce[1|2]]:PULSe:DCYCle:USER	109
Square wave		
Extension on/off selection/query	[:SOURce[1|2]]:FUNCtion:SQUare:EXTend	110
Duty value setting/query	[:SOURce[1|2]]:FUNCtion:SQUare:DCYCle	110
Pulse wave		
Duty value setting/query	[:SOURce[1|2]]:PULSe:DCYCle	111
Pulse width setting/query	[:SOURce[1|2]]:PULSe:WIDTh	112
Rising time setting/query	[:SOURce[1|2]]:PULSe:TRANsition[:LEADing]	113
Falling time setting/query	[:SOURce[1|2]]:PULSe:TRANsition:TRAiling	113
Cycle setting/query	[:SOURce[1|2]]:PULSe:PERiod	114
Cycle unit selection/query	[:SOURce[1|2]]:PULSe:PERiod:UNIT	115
Cycle user-defined unit setting/query	[:SOURce[1|2]]:PULSe:PERiod:USER	115
Ramp wave		
Symmetry setting/query	[:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry	116
Noise		
Noise bandwidth setting/query	[:SOURce[1|2]]:FUNCtion:NOISe:BW	117
PWF waveform steady sine wave group		
Unbalanced sine wave : first half amplitude	[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude[1]	118

Function	Command	Description Page
setting/query		
Unbalanced sine wave : second half amplitude setting/query	[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2	118
Clipped sine wave : clip rate setting/query	[:SOURce[1|2]]:FUNCtion:CSINe:CLIP	119
CF controlled sine wave : crest factor setting/query	[:SOURce[1|2]]:FUNCtion:CFCSine:CFACtor	120
Conduction angle controlled sine wave : conduction angle setting/query	[:SOURce[1|2]]:FUNCtion:ACSine:ANGLe	120
Staircase sine wave : number of steps setting/query	[:SOURce[1|2]]:FUNCtion:SSINe:STEPs	121
Multi-cycle sine wave : number of cycles setting/query	[:SOURce[1|2]]:FUNCtion:MCSine:CYCLes	121
Multi-cycle sine wave : start phase setting/query	[:SOURce[1|2]]:FUNCtion:MCSine:PHASe	122
PWF waveform transient sine wave group		
On-phase controlled sine wave : complete-on phase setting/query	[:SOURce[1|2]]:FUNCtion:ONPSine:ONPHase	123
On-phase controlled sine wave : on-slope time setting/query	[:SOURce[1|2]]:FUNCtion:ONPSine:STIMe	123
Off-phase controlled sine wave : off-phase setting/query	[:SOURce[1|2]]:FUNCtion:OFPSine:OFPHase	124
Off-phase controlled sine wave : off-slope time setting/query	[:SOURce[1|2]]:FUNCtion:OFPSine:STIMe	125
Chattering-on sine wave : on-phase setting/query	[:SOURce[1|2]]:FUNCtion:CONSine:ONPHase	125
Chattering-on sine wave : number of chattering setting/query	[:SOURce[1|2]]:FUNCtion:CONSine:NCHattering	126
Chattering-on sine wave : on-state time setting/query	[:SOURce[1|2]]:FUNCtion:CONSine:TON	126
Chattering-on sine wave	[:SOURce[1|2]]:FUNCtion:CONSine:TOFF	127

Function	Command	Description Page
: off-state time setting/query		
Chattering-off sine wave : off-phase setting/query	[:SOURce[1|2]]:FUNCtion:COFSine:OFPHase	128
Chattering-off sine wave : number of chattering setting/query	[:SOURce[1|2]]:FUNCtion:COFSine:NCHattering	128
Chattering-off sine wave : on-state time setting/query	[:SOURce[1|2]]:FUNCtion:COFSine:TON	129
Chattering-off sine wave : off-state time setting/query	[:SOURce[1|2]]:FUNCtion:COFSine:TOFF	129
PWF waveform pulse waveform group		
Gaussian pulse : standard deviation setting/query	[:SOURce[1|2]]:FUNCtion:GAUSsian:SIGMa	130
Lorentz pulse : half value of width setting/query	[:SOURce[1|2]]:FUNCtion:LORentz:HWIDth	131
Haversine: Width setting/query	[:SOURce[1|2]]:FUNCtion:HAVersine:WIDTh	131
Half-sine pulse: Width setting/query	[:SOURce[1|2]]:FUNCtion:HSPulse:WIDTh	132
Trapezoid pulse: Slope width setting/query	[:SOURce[1|2]]:FUNCtion:TPULse:RFALl	133
Trapezoid pulse: Upper base width setting/query	[:SOURce[1|2]]:FUNCtion:TPULse:UBASe	133
Sin(x)/x : number of zero crossings setting/query	[:SOURce[1|2]]:FUNCtion:SINC:ZCRossing	134
PWF waveform transient response waveform group		
Exponential rise : time constant setting/query	[:SOURce[1|2]]:FUNCtion:ERISe:TCONstant	134
Exponential fall : time constant setting/query	[:SOURce[1|2]]:FUNCtion:EFALl:TCONstant	135
2nd-order LPF step response : natural frequency setting/query	[:SOURce[1|2]]:FUNCtion:SOLStep:NFRequency	136

Function	Command	Description Page
2nd-order LPF step response : Q setting/query	[:SOURce[1|2]]:FUNCtion:SOLStep:Q	136
Damped oscillation : oscillation frequency setting/query	[:SOURce[1|2]]:FUNCtion:DOSCillation:OFRequency	137
Damped oscillation : damping time constant setting/query	[:SOURce[1|2]]:FUNCtion:DOSCillation:DTConstant	138
PWF waveform surge waveform group		
Oscillation surge : oscillation frequency setting/query	[:SOURce[1|2]]:FUNCtion:OSURge:OFRequency	138
Oscillation surge : damping time constant setting/query	[:SOURce[1|2]]:FUNCtion:OSURge:DTConstant	139
Oscillation surge : trailing time constant setting/query	[:SOURce[1|2]]:FUNCtion:OSURge:TTConstant	139
Pulse surge : rising time setting/query	[:SOURce[1|2]]:FUNCtion:PSURge:TR	140
Pulse surge : duration time setting/query	[:SOURce[1|2]]:FUNCtion:PSURge:TD	141
PWF waveform other waveform group		
Trapezoid wave with offset : leading delay setting/query	[:SOURce[1|2]]:FUNCtion:TOFFset:DELay	141
Trapezoid wave with offset : rising-slope width setting/query	[:SOURce[1|2]]:FUNCtion:TOFFset:RISe	142
Trapezoid wave with offset : upper base width setting/query	[:SOURce[1|2]]:FUNCtion:TOFFset:UBASe	143
Trapezoid wave with offset : falling-slope width setting/query	[:SOURce[1|2]]:FUNCtion:TOFFset:FALL	143
Trapezoid wave with offset : offset setting/query	[:SOURce[1|2]]:FUNCtion:TOFFset:OFFSet	144
Half-sine edge pulse : leading edge time	[:SOURce[1|2]]:FUNCtion:HSEPulse:LE	144

Function	Command	Description Page
setting/query		
Half-sine edge pulse : trailing edge time setting/query	[:SOURce[1|2]]:FUNCtion:HSEPulse:TE	145
Half-sine edge pulse : duty setting/queyr	[:SOURce[1|2]]:FUNCtion:HSEPulse:DCYCle	146
Bottom-referenced ramp wave : symmetry setting/query	[:SOURce[1|2]]:FUNCtion:BRRAMp:SYMMetry	146
Arbitrary waveform		
Arbitrary waveform selection/query	[:SOURce[1|2]]:FUNCtion:USER	147
Arbitrary waveform data read/write	{:TRACe|:DATA}[:DATA]	147
Arbitrary waveform memory operations		
Store	{:TRACe|:DATA}:STORe	150
Recall	{:TRACe|:DATA}:RECall	150
Copy	{:TRACe|:DATA}:COPY	151
Delete	{:TRACe|:DATA}:DELete	152
Information acquisition	{:TRACe|:DATA}:INFormation?	153

(Output signal setting)

Function	Command	Description Page
Frequency		
Setting/query	[:SOURce[1|2]]:FREQuency[:CW|:FIXed]	153
Unit selection/query	[:SOURce[1|2]]:FREQuency:UNIT	154
User-defined unit setting/query	[:SOURce[1|2]]:FREQuency:USER	155
Frequency external synchronization oscillation mode (Synclator)		
Selection/query	[:SOURce[1|2]]:FREQuency:SYNC	156
Synchronization source selection/query	[:SOURce[1|2]]:FREQuency:SYNC:SOURce	156
Signal polarity of synchronization source selection/query	[:SOURce[1|2]]:FREQuency:SYNC:SLOPe	157
Phase		
Setting/query	[:SOURce[1|2]]:PHASe[:ADJust]	157
Unit selection/query	[:SOURce[1|2]]:PHASe:UNIT	158
User-defined unit setting/query	[:SOURce[1|2]]:PHASe:USER	159
Amplitude		
Setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	160
Unit selection/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:UNIT	161
User-defined unit setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:USER	161
DC offset		
Setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet	162
Unit setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT	163
User-defined unit setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:USER	164
Upper and lower limit voltage		
High level setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH	165
High level unit selection/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT	165
Low level setting/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW	166

Function	Command	Description Page
Low level unit selection/query	[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT	167
Subchannel operation		
Amplitude setting/query	[:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate] [:AMPLitude]	167
Offset setting/query	[:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate]:OFFSet	168

(Signal output operation)

Function	Command	Description Page
Output on/off setting/query	:OUTPut[1|2][:STATe]	169
Output-on at power-on setting/query	:OUTPut[1|2]:PON	169
Auto-range operation (output range) selection/query	[:SOURce[1|2]]:VOLTage:RANGe:AUTO	170
Phase synchronization setting	[:SOURce[1|2]]:PHASe:INITiate	170
External addition input setting/query	[:SOURce[1|2]]:COMBine:FEED	171
Load impedance setting/query	:OUTPut[1|2]:LOAD	171

(Trigger operation)

Function	Command	Description Page
Sweep mode trigger source Selection/query	:TRIGger[1|2]:SWEep:SOURce	172
Sweep mode internal trigger cycle setting/query	:TRIGger[1|2]:SWEep:TIMer	173
Sweep mode external trigger signal polarity selection/query	:TRIGger[1|2]:SWEep:SLOPe	173

Burst mode trigger source selection/query	:TRIGger[1|2]:BURSt:SOURce	174
Burst mode internal trigger cycle setting/query	:TRIGger[1|2]:BURSt:TIMer	174
Burst mode external trigger signal polarity selection/query	:TRIGger[1|2]:BURSt:SLOPe	175
Manual trigger (TRIG key operation)	*TRG	176
Manual trigger (TRIG key operation)	:TRIGger[1|2][:SEQuence][:IMMediate]	176
Execution control setting	:TRIGger[1|2]:SELected:EXECute	176

(Setting memory operations)

Function	Command	Description Page
Clear	:MEMory:STATe:DELete	177
Store	*SAV	177
Recall	*RCL	178

(Status operations)

Function	Command	Description Page
Status register and related queue clear	*CLS	178
Status reporting related preset setting	:STATus:PRESet	178
Status register at power-on clear flag setting/query	*PSC	179
Status byte register query	*STB?	180

Function	Command	Description Page
Service request enable register setting/query	*SRE	180
Standard event status register query	*ESR?	180
Standard event status enable register setting/query	*ESE	181
Operation Status Register Group		
Condition register query	:STATus:OPERation[:CH1|:CH2]:CONDition?	181
Transition filter register (negative) setting/query	:STATus:OPERation[:CH1|:CH2]:NTRansition	182
Transition filter register (positive) setting/query	:STATus:OPERation[:CH1|:CH2]:PTRansition	182
Event register query	:STATus:OPERation[:CH1|:CH2][:EVENt]?	183
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(2-channel operation)

Function	Command	Description

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(Sequence mode)

Function	Command	Description Page
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(Others)

Function	Command	Description Page
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2.3 Descriptions of Individual Commands

This section describes the details of each command.

2.3.1 Oscillation Mode

2.3.1.1 Continuous oscillation mode

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

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

Description

Sets the oscillation mode to the continuous oscillation

Setting parameter

None

Setting example

:SOURce1:CONTinuous:IMMediate
Sets the oscillation mode of CH1 to the continuous oscillation

2.3.1.1.2 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 parameter

None

Response format

<NBOL>

<NBOL> → 0 : Oscillation mode is not the continuous oscillation mode
1 : 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.

2.3.1.1.3 Synchronization signal output selection/query :OUTPut[1|2]:SYNC:TYPE

■:OUTPut[1|2]:SYNC:TYPE

□:OUTPut[1|2]:SYNC:TYPE?

Description

Selects/queries the synchronization output in the continuous oscillation mode

Setting parameter

SYNC|SFCTn|OFF

SYNC → Waveform synchronization
SFCTn → Subchannel signal
OFF → Output stop

Query parameter

None

Response format

SYNC|SFCT|OFF
† For the meaning of each response data, see the setting parameter

Setting example

:OUTPut1:SYNC:TYPE SYNC
Sets the synchronization output of CH1 in the continuous oscillation mode to the waveform synchronization

2.3.1.1.4 Subchannel phase setting/query [:SOURce[1|2]]:SCHannel:PHASe[:ADJust]

■ [:SOURce[1|2]]:SCHannel:PHASe[:ADJust]

□[:SOURce[1|2]]:SCHannel:PHASe[:ADJust]?

Description

Sets/queries the phase of subchannel

Setting parameter

<phase>|MINimum|MAXimum

<phase> ::= <REAL>[<units>]
<REAL> → Phase :-180.000° to 180.000°
Resolution :0.001°
<units> ::= DEG
MINimum → -180.000°
MAXimum → 180.000°

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:SCHannel:PHASe:ADJust 90DEG
Sets the subchannel phase of CH1 to 90°

Remarks

The phase setting of modulation source at the time of internal modulation is the same as the entity

2.3.1.1.5 Subchannel waveform selection/query [:SOURce[1|2]]:SCHannel:FUNCtion[:SHAPe]

■ [:SOURce[1|2]]:SCHannel:FUNCtion[:SHAPe]

□[:SOURce[1|2]]:SCHannel:FUNCtion[:SHAPe]?

Description

Selects/queries the subchannel waveform

Setting parameter

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 parameter

None

Response format

SIN|SQU|TRI|PRAM|NRAM|NOIS|USER
† For the meaning of each response data, see the setting parameter

Setting example

:SOURce1:SCHannel:FUNCtion:SHAPe SINusoid
Sets the subchannel waveform of CH1 to sine wave

Remarks

The waveform setting of modulation source at the time of internal modulation is the same as the entity

2.3.1.1.6 Subchannel arbitrary waveform selection/query [:SOURce[1|2]]:SCHannel:FUNCtion:USER

■ **[:SOURce[1|2]]:SCHannel:FUNCtion:USER**

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

Description

Selects/queries the arbitrary waveform of subchannel

Setting parameter

<memory> ::= <INT>
<INT> Memory number: 0 to 128

Query parameter

None

Response format

<NR1>

Setting example

:SOURce1:SCHannel:FUNCtion:USER 3
Sets the data of memory number 3 to the arbitrary waveform of the subchannel of CH1

Remarks

† Memory number 0 is the edit memory.
The arbitrary waveform setting of internal modulation source at the time of modulated oscillation is the same as the entity

2.3.1.1.7 Subchannel noise band setting/query [:SOURce[1|2]]:SCHannel:FUNCtion:NOISe:BW

■ **[:SOURce[1|2]]:SCHannel:FUNCtion:NOISe:BW**

□**[:SOURce[1|2]]:SCHannel:FUNCtion:NOISe:BW?**

Description

Sets/queries the bandwidth of noise of subchannel

Setting parameter

<bw>|MINimum|MAXimum
<bw> ::= <INT>
<INT> → Bandwidth number : 1 to 7
MINimum → 1 (Narrowband 100kHz)
MAXimum → 7 (Wideband 100MHz)

Query parameter

[MINimum|MAXimum]

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

Response format

<NR1>

Setting example

:SOURce1:FUNCtion:NOISe:BW 1
Sets the noise from the modulation source of CH1 to the narrowest bandwidth (100kHz)

Remarks

The noise bandwidth setting of internal modulation source at the time of modulated oscillation is the same as the entity
Noise bandwidth corresponding to each parameter is as follows: 1 (100kHz), 2 (300kHz), 3 (1MHz), 4 (3MHz), 5 (10MHz), 6 (30MHz), and 7 (100MHz).

2.3.1.2 Modulated oscillation mode

Some of the modulation functions are available in the burst oscillation mode or the sweep oscillation mode. Therefore, when the "oscillation mode" is "burst oscillation mode" or "sweep oscillation mode," it is necessary to perform "Continuous oscillation mode selection" to switch to the "modulated oscillation mode."

2.3.1.2.1 Common setting of modulation

Starting/stopping of modulation can be performed by "TRIGger[1|2]:SELected:EXECute" described in "Trigger operation/execution control."

2.3.1.2.1.1 Phase of internal modulation source setting/query [:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:INTernal:PHASe[:ADJust]

■[:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:INTernal:PHASe[:ADJust]

□[:SOURce[1|2]]:{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:INTernal:PHASe[:ADJust]?

Description

Sets/queries the phase of internal modulation source
Whichever modulation type is specified, the result is the same

Setting parameter

<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Phase : -180.000° to 180.000°
Resolution : 0.001°
<units> ::= DEG
MINimum → -180.000°

MAXimum → 180.000°

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FM:INTernal:PHASe:ADJust 90DEG
Sets the phase of the internal modulation source of CH1 to 90°

Remarks

The subchannel phase setting in the continuous oscillation mode is the same as the entity

2.3.1.2.2 Common setting of FSK/PSK

2.3.1.2.2.1 Modulation source selection/query [:SOURce[1|2]]:{FSKey|PSKey}:SOURce

■ [:SOURce[1|2]]:{FSKey|PSKey}:SOURce

□[:SOURce[1|2]]:{FSKey|PSKey}:SOURce?

Description

Selects/queries the modulation source of FSK/PSK
Also when FSKey is specified at the time of PSK, the result is the same

Setting parameter

INTernal|EXTernal|CH1

INTernal → Internal
EXTernal → External
CH1 → Setting of CH1 (Only CH2 of the 2-channel equipment (WF1968) can be selected)

Query parameter

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 modulation source of FSK/PSK of CH1 to the internal

2.3.1.2.2.2 Signal polarity with external modulation source selection/query [:SOURce[1|2]]:{FSKey|PSKey}:SLOPe

■ **[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe**

□**[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe?**

Description

Selects/queries the polarity while the external modulation source is selected at the time of FSK/PSK

Setting parameter

POSitive|NEGative

POSitive → Positive polarity
NEGative → Negative polarity

Query parameter

None

Response format

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

Setting example

:SOURce1:FSKey:SLOPe NEGative
Sets the polarity of the external modulation source of FSK/PSK of CH1 to the negative polarity

2.3.1.2.2.3 Internal modulation frequency setting/query [:SOURce[1|2]]:{FSKey|PSKey}:INTernal:FREQuency

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

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

Description

Sets/queries the internal modulation frequency of FSK/PSK
Also when FSKey is specified at the time of PSK, the result is the same

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Internal modulation frequency : 0.1mHz to 5MHz

Resolution : 11 digits or 1µHz

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

MINimum → 0.1mHz
MAXimum → 5MHz

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FSKey:INTernal:FREQuency 1KHZ
Sets the internal modulation frequency of FSK/PSK of CH1 to 1kHz

2.3.1.2.2.4 Synchronization signal output selection/query :OUTPut[1|2]:SYNC :{FSKey|PSKey}:TYPE

■:OUTPut[1|2]:SYNC:{FSKey|PSKey}:TYPE

□:OUTPut[1|2]:SYNC:{FSKey|PSKey}:TYPE?

Description

Selects/queries the synchronization output at the time of FSK/PSK modulation
Whichever modulation type is specified, the result is the same

Setting parameter

SYNC|MSYNc|SFCTn|OFF

SYNC → Waveform synchronization
MSYNc → Internal modulation synchronization
SFCTn → Sub waveformOFF → Output stop

Query parameter

None

Response format

SYNC|MSYN|SFCT|OFF
† For the meaning of each response data, see the setting parameter

Setting example

:OUTPut1:SYNC:FSKey:TYPE SYNC
Sets the synchronization output of CH1 to the waveform synchronization

Remarks

At the time of burst modulation, ":OUTPut[1|2]:SYNC:BURSt:TYPE" should be used and at the time of sweep modulation, "OUTPut[1|2]:SYNC[:SWEep]:TYPE" should be used.

2.3.1.2.3 Common setting for other than FSK/PSK

2.3.1.2.3.1 Modulation source selection/query [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:SOURce

■[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:SOURce

□ [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:SOURce?

Description

Selects/queries the modulation source of FM/PM/AM/AM (DSB-SC)/DC offset modulation/PWM
Whichever modulation type is specified, the result is the same

Setting parameter

INTernal|EXTernal|CH1
INTernal → Internal
EXTernal → External
CH1 → Setting of CH1
(Only CH2 of the 2-channel equipment (WF1968) can be selected)

Query parameter

None

Response format

INT|EXT|CH1
† For the meaning of each response data, see the setting parameter

Setting example

:SOURce1:FM:SOURce INTernal
Sets the modulation source of FM of CH1 to the internal

2.3.1.2.3.2 Internal modulation frequency setting/query [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FREQuency

■[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FREQuency

□[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FREQuency?

Description

Sets/queries the internal modulation frequency of FM/PM/AM/AM (DSB-SC)/DC offset modulation/PWM
Whichever modulation type is specified, the result is the same

Setting parameter

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]

<REAL> → Internal modulation frequency : 0.1mHz to 20MHz,
Resolution : 12 digits or 1µHz
<eunits> ::= M (mega) K|U|N
† Note that when the unit is frequency, M is used to mean "10^6"
<units> ::= HZ
MINimum → 0.1mHz
MAXimum → 20MHz

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FM:INTernal:FREQuency 1KHZ
Sets the internal modulation frequency of CH1 to 1kHz

2.3.1.2.3.3 Internal modulation waveform selection/query [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion[:SHAPe]

■[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion[:SHAPe]

□ [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion[:SHAPe]?

Description

Selects/queries the internal modulation waveform of FM/PM/AM/AM (DSB-SC)/DC offset modulation/PWM
Whichever modulation type is specified, the result is the same

Setting parameter

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 parameter

None

Response format

SIN|SQU|TRI|PRAM|NRAM|NOIS|USER
† For the meaning of each response data, see the setting parameter

Setting example

:SOURce1:FM:INTernal:FUNCtion:SHAPe SINusoid
Sets the internal modulation waveform of CH1 to sine wave

Remarks

The subchannel waveform setting in the continuous oscillation mode is the same as the entity

2.3.1.2.3.4 Arbitrary waveform for internal modulation selection/query [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:USER

■[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:USER

□ [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:USER?

Description

Selects/queries the arbitrary waveform of the internal modulation waveform of FM/PM/AM/AM (DSB-SC)/DC offset modulation/PWM
Whichever modulation type is specified, the result is the same

Setting parameter

<memory> ::= <INT>
<INT> Memory number:0 to 128

Query parameter

None

Response format

<NR1>

Setting example

:SOURce1:FM:INTernal:FUNCtion:USER 3
Sets the data of memory number 3 to the arbitrary waveform of the internal modulation waveform of CH1

Remarks

† Memory number 0 is the edit memory.
The subchannel arbitrary waveform setting in the continuous oscillation mode is the same as the entity

2.3.1.2.3.5 Noise bandwidth for internal modulation setting/query [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:NOISe:BW

■[:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:NOISe:BW

□ [:SOURce[1|2]]:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal:FUNCtion:NOISe:BW?

Description

Sets/queries the bandwidth of noise
Whichever modulation type is specified, the result is the same

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number:1 to 7

MINimum → 1 (Narrowband 100kHz)

MAXimum → 7 (Wideband 100MHz)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR1>

Setting example

:SOURce1:FM:INTernal:FUNCtion:NOISe:BW 1

Sets the noise from the modulation source of CH1 to the narrowest bandwidth (100kHz)

Remarks

The subchannel waveform noise bandwidth setting in the continuous oscillation mode is the same as the entity

Noise bandwidth corresponding to each parameter is as follows: 1 (100kHz), 2 (300kHz), 3 (1MHz), 4 (3MHz), 5 (10MHz), 6 (30MHz), and 7 (100MHz).

2.3.1.2.3.6 Synchronization signal output selection/query :OUTPut[1|2]:SYNC:{FM |PM|AM|AMSC|OFSM|PWM}:TYPE

■:OUTPut[1|2]:SYNC:{FM|PM|AM|AMSC|OFSM|PWM}:TYPE

□:OUTPut[1|2]:SYNC:{FM|PM|AM|AMSC|OFSM|PWM}:TYPE?

Description

Selects/queries the synchronization output at the time of modulation other than FSK/PSK

Whichever modulation type is specified, the result is the same

The operation target is the same as with the selection/query of the synchronization output in the continuous oscillation mode

Setting parameter

SYNC|MSYNc|MFCTn|SFCTn|OFF

SYNC → Waveform synchronization

MSYNc → Internal modulation synchronization

MFCTn → Internal modulation signal

SFCTn → Sub waveform

OFF → Output stop

Query parameter

None

Response format

SYNC|MSYN|MFCT|SFCT|OFF

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

Setting example

:OUTPut1:SYNC:FSKey:TYPE SYNC

Sets the synchronization output of CH1 to the waveform synchronization

Remarks

When the modulation is stopped in the MSYNc/MFCTn setting, the output shall be converted to SSYNc/SFCTn.

At the time of burst modulation, ":OUTPut[1|2]:SYNC:BURSt:TYPE" should be used and at the time of sweep modulation, "OUTPut[1|2]:SYNC:SWEep:TYPE" should be used.

2.3.1.2.4 FSK (frequency shift keying)

2.3.1.2.4.1 FSK selection/query [:SOURce[1|2]]:FSKey:STATe

■[:SOURce[1|2]]:FSKey:STATe

□ [:SOURce[1|2]]:FSKey:STATe?

Description

Switches the modulation type to FSK (frequency shift keying)

Queries whether or not the modulation type is FSK

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Switches off FSK when the modulation type is FSK (frequency shift keying)

1/ON : Switches the modulation type to FSK (frequency shift keying)

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not FSK (frequency shift keying)

1 : Modulation type is FSK (frequency shift keying)

Setting example

:SOURce1:FSKey:STATe ON

Switches the modulation type of CH1 to FSK (frequency shift keying)

Remarks

Depending on the state, FSK may be used also when the current oscillation mode is the burst oscillation mode

2.3.1.2.4.2 Hop frequency setting/query [:SOURce[1|2]]:FSKey[:FREQuency]

■[:SOURce[1|2]]:FSKey[:FREQuency]

□ [:SOURce[1|2]]:FSKey[:FREQuency]?

Description

Sets/queries the hop frequency of FSK

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Hop frequency

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

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

MINimum → Sets the maximum value

MAXimum → Sets the minimum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FSKey:FREQuency 1KHZ

Sets the hop frequency of FSK of CH1 to 1kHz

2.3.1.2.5 PSK (phase shift keying)

2.3.1.2.5.1 PSK selection/query [:SOURce[1|2]]:PSKey:STATe

■[:SOURce[1|2]]:PSKey:STATe

□ [:SOURce[1|2]]:PSKey:STATe?

Description

Switches the modulation type to PSK (phase shift keying)

Queries whether or not the modulation type is PSK

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : When the modulation type is PSK (phase shift keying),cancels PSK

1/ON : Switches the modulation type to PSK (phase shift keying)

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not PSK (phase shift keying)

1 : Modulation type is PSK (phase shift keying)

Setting example

:SOURce1:FSKey:STATe ON

Switches the modulation type of CH1 to PSK (phase shift keying)

Remarks

Depending on the state, PSK may be used even when the current oscillation mode is the burst oscillation mode

2.3.1.2.5.2 Deviation setting/query [:SOURce[1|2]]:PSKey[:DEViation]

■[:SOURce[1|2]]:PSKey[:DEViation]

□ [:SOURce[1|2]]:PSKey[:DEViation]?

Description

Sets/queries the deviation of PSK

Setting parameter

<deviation>|MINimun|MAXimum

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

<REAL> → Deviation : -1800.000°to 1800.000°,
Resolution : 0.001°

<units> ::= DEG

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:PSKey:DEViation 30DEG
Sets the deviation of PSK of CH1 to 30°

2.3.1.2.6 FM (frequency modulation)

2.3.1.2.6.1 FM selection/query [:SOURce[1|2]]:FM:STATe

■[:SOURce[1|2]]:FM:STATe

□ [:SOURce[1|2]]:FM:STATe?

Description

Switches the modulation type to FM (frequency modulation)
Queries whether or not the modulation type is FM

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Cancels FM (frequency modulation) when the modulation type is FM
1/ON : Switches the modulation type to FM (frequency modulation)

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not FM (frequency modulation)
1 : Modulation type is FM (frequency modulation)

Setting example

:SOURce1:FM:STATe ON
Switches the modulation type of CH1 to FM (frequency modulation)

Remarks

Depending on the state, FM may be used also when the current oscillation mode is the burst oscillation mode or sweep oscillation mode

2.3.1.2.6.2 Peak deviation setting/query [:SOURce[1|2]]:FM[:DEViation]

■[:SOURce[1|2]]:FM[:DEViation]

□ [:SOURce[1|2]]:FM[:DEViation]?

Description

Sets/queries the peak deviation of FM

Setting parameter

<deviation>|MINimum|MAXimum

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

<REAL> → Peak deviation : 0.00µHz or more but less than 100MHz

Resolution : 8 digits or 0.01µHz

† The setting range is where carrier + peak deviation is within the allowed range of frequency setting for carrier waveform.

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> :: = HZ

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FM:DEViation 1KHZ

Sets the peak deviation of FM of CH1 to 1kHz

2.3.1.2.7 PM (phase modulation)

2.3.1.2.7.1 PM selection/query [:SOURce[1|2]]:PM:STATe

■[:SOURce[1|2]]:PM:STATe

□ [:SOURce[1|2]]:PM:STATe?

Description

Switches the modulation type to PM (phase modulation)

Queries whether or not the modulation type is PM

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Cancels PM (phase modulation) when the modulation type is PM

1/ON : Switches the modulation type to PM (phase modulation)

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not PM (phase modulation)
1 : Modulation type is PM (phase modulation)

Setting example

:SOURce1:PM:STATe ON
Switches the modulation type of CH1 to PM (phase modulation)

Remarks

Depending on the state, PM may be used also when the current oscillation mode is the burst oscillation mode or sweep oscillation mode.

2.3.1.2.7.2 Peak deviation setting/query [:SOURce[1|2]]:PM[:DEViation]

■[:SOURce[1|2]]:PM[:DEViation]

□ [:SOURce[1|2]]:PM[:DEViation]?

Description

Sets/queries the peak deviation of PM

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:PM:DEViation 30DEG
Sets the peak deviation of PM of CH1 to 30°

2.3.1.2.8 AM (amplitude modulation)

2.3.1.2.8.1 AM selection/query [:SOURce[1|2]]:AM:STATe

■[:SOURce[1|2]]:AM:STATe

□ [:SOURce[1|2]]:AM:STATe?

Description

Switches the modulation type to AM (amplitude modulation)
Queries whether or not the modulation type is AM

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Cancels AM (amplitude modulation) when the modulation type is AM
1/ON : Switches the modulation type to AM (amplitude modulation)

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not AM (amplitude modulation)
1 : Modulation type is AM (amplitude modulation)

Setting example

:SOURce1:AM:STATe ON
Switches the modulation type of CH1 to AM

Remarks

Depending on the state, AM may be used also when the current oscillation mode is the burst oscillation mode or sweep oscillation mode.

2.3.1.2.8.2 Modulation depth setting/query [:SOURce[1|2]]:AM[:DEPTh]

■[:SOURce[1|2]]:AM[:DEPTh]

□ [:SOURce[1|2]]:AM[:DEPTh]?

Description

Sets/queries the modulation depth of AM

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:AM:DEPTh 30PCT
Sets the modulation depth of AM of CH1 to 30%

Remarks

When the modulation depth is set to 0%, the output amplitude is one-half of the set amplitude.

2.3.1.2.9 AM (DSB-SC)(carrier suppression amplitude modulation)

2.3.1.2.9.1 AM (DSB-SC) selection/query [:SOURce[1|2]]:AMSC:STATe

■[:SOURce[1|2]]:AMSC:STATe

□ [:SOURce[1|2]]:AMSC:STATe?

Description

Switches the modulation type to AM (DSB-SC)(carrier suppression amplitude modulation)
Queries whether or not the modulation type is AM (DSB-SC)

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Cancels AM (DSB-SC) when the modulation type is AM (DSB-SC)
1/ON : Switches the modulation type to modulation AM (DSB-SC)

Query parameter

None

Response format

<NBOL>
<NBOL> → 0 : Modulation type is not AM (DSB-SC)
1 : Modulation type is AM (DSB-SC)

Setting example

:SOURce1:AMSC:STATe ON
Switches the modulation type of CH1 to AM (DSB-SC)

Remarks

Depending on the state, AM (SC) may be used also when the current oscillation mode is
the burst oscillation mode or sweep oscillation mode.

2.3.1.2.9.2 Modulation depth setting/query [:SOURce[1|2]]:AMSC[:DEPTh]

■[:SOURce[1|2]]:AMSC[:DEPTh]

□ [:SOURce[1|2]]:AMSC[:DEPTh]?

Description

Sets/queries the modulation depth of AM (DSB-SC)

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:AMSC:DEPTh 30PCT
Sets the modulation depth of AM (DSB-SC) of CH1 to 30%

Remarks

When the modulation depth is set to 100%, the maximum amplitude of output becomes equal to the amplitude setting.

2.3.1.2.10 DC offset modulation

2.3.1.2.10.1 DC offset modulation selection/query [:SOURce[1|2]]:OFSM:STATe

■[:SOURce[1|2]]:OFSM:STATe

□ [:SOURce[1|2]]:OFSM:STATe?

Description

Switches the modulation type to DC offset modulation
Queries whether or not the modulation type is DC offset modulation

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Cancels the DC offset modulation when the modulation type is DC offset modulation
1/ON : Switches the modulation type to DC offset modulation

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not DC offset modulation
1 : Modulation type is DC offset modulation

Setting example

:SOURce1:OFSM:STATe ON
Switches the modulation type of CH1 to DC offset modulation

Remarks

Depending on the state, DC offset modulation may be used also when the current oscillation mode is
the burst oscillation mode or sweep oscillation mode.

2.3.1.2.10.2 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 parameter

<deviation>|MINimum|MAXimum

<deviation> ::= <REAL>[<eunits>][<units>]
<REAL> → Peak deviation : 0V to 10V/open,
Resolution : 4 digits or 0.1mV (499.9mV or less),
: 5 digits or 1mV (0.5V or more),
<eunits> ::= M (milli)
<units> ::= V
MINimum → 0V/open
MAXimum → 10V/open

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:OFSM:DEViation 3V
Sets the peak deviation of DC offset modulation of CH1 to 3V

2.3.1.2.11 PWM (pulse width modulation)

2.3.1.2.11.1 PWM selection/query [:SOURce[1|2]]:PWM:STATe

■[:SOURce[1|2]]:PWM:STATe

□[:SOURce[1|2]]:PWM:STATe?

Description

Switches the modulation type to PWM (pulse width modulation)
Queries whether or not the modulation type is PWM

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Cancels PWM when the modulation type is PWM
1/ON : Switches the modulation type to PWM (pulse width modulation)

Query parameter

None

Response format

<NBOL>
<NBOL> → 0 : Modulation type is not PWM (pulse width modulation)
1 : Modulation type is PWM (pulse width modulation)

Setting example

:SOURce1:PWM:STATe ON
Switches the modulation type of CH1 to PWM (pulse width modulation)

Remarks

Depending on the state, PWM may be used also when the current oscillation mode is
the burst oscillation mode or sweep oscillation mode.

2.3.1.2.11.2 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 peak deviation of PWM
† The upper limit of peak deviation setting may vary depending on the duty valueof the carrier, or on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave

Setting parameter

<deviation>|MINimum|MAXimum
<deviation> ::= <REAL>[<units>]
<REAL> → Peak deviation : 0.0000 % to 49.9900 %
(Square wave/normal duty range)
: 0.0000 % to 50.0000 %
(Square wave/extended duty range)
: 0.0000% to 49.9000% (pulse wave)
Resolution :0.0001 %
<units> ::= PCT
MINimum → 0.0000 %
MAXimum → 49.9900 % (Square wave/normal duty range),
50.0000 % (Square wave/extended duty range),
49.9000% (Pulse wave)

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:PWM:DEViation:DCYCle 30PCT
Sets the peak deviation of PWM of CH1 to 30%

2.3.1.3 Sweep oscillation mode

2.3.1.3.1 Common setting of sweep

Starting/stopping/hold/resume of sweep can be performed by "TRIGger[1|2]:SELected:EXECute" described in "2.3.5.9 Trigger operation/execution control."

2.3.1.3.1.1 Sweep mode selection/query [:SOURce[1|2]]:SWEep:MODE

■[:SOURce[1|2]]:SWEep:MODE

□[:SOURce[1|2]]:SWEep:MODE?

Description

Selects/queries the sweep mode

Setting parameter

SINGle|CONTinuous|GATed

SINGle	→	Single
CONTinuous	→	Continuous
GATed	→	Gated single

Query parameter

None

Response format

SING|CONT|GAT

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

Setting example

:SOURce1:SWEep:MODE SINGle

Sets the sweep mode of CH1 to the single

2.3.1.3.1.2 Sweep slope selection/query [:SOURce[1|2]]:SWEep:SPACing

■[:SOURce[1|2]]:SWEep:SPACing

□[:SOURce[1|2]]:SWEep:SPACing?

Description

Selects/queries the sweep slope

Setting parameter

LINear|LOGarithmic

LINear	→	Linear
LOGarithmic	→	Logarithmic

Query parameter

None

Response format

LIN|LOG

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

Setting example

:SOURce1:SWEep:SPACing LINear

Sets the sweep slope of CH1 to linear

2.3.1.3.1.3 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 parameter

RAMP|TRIangle

RAMP → One way

TRIangle → Shuttle

Query parameter

None

Response format

RAMP|TRI

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

Setting example

:SOURce1:SWEep:INTernal:FUNCtion RAMP

Sets the sweep direction of CH1 to one-way

2.3.1.3.1.4 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 parameter

<time>|MINimum|MAXimum

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

<REAL> → Sweep time : 0.1ms to 10ks

Resolution : 4 digits or 0.1ms

<eunits> ::= MA (mega) |K|M (milli) U|N
<units> ::= S
MINimum → 0.1 ms
MAXimum → 10,000 s

Query parameter

[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 1ms

2.3.1.3.1.5 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 when the oscillation is stopped, in case of gated single-shot sweep

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:SWEep:SLEVel 20PCT
Sets the stop level value to 20% when gated single-shot sweep of CH1 is stopped

2.3.1.3.1.6 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 value when the oscillation is stopped, in case of single-shot sweep or gated single-shot sweep

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Disabled
1/ON : Enabled

Query parameter

None

Response format

<NBOL>

Setting example

:SOURce1:SWEep:SLEVel:STATe ON

Enables the stop level value when the oscillation is stopped, in case of single-shot sweep or gated single-shot sweep of CH1

2.3.1.3.1.7 Oscillation 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 at the time of sweep oscillation

Setting parameter

HALF|CYCLe

HALF → Half-cycle
CYCLe → 1 cycle

Query parameter

None

Response format

HALF|CYCL

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

Setting example

:SOURce1:SWEep:OSTop HALF
Sets the oscillation stop unit of CH1 at the time of sweep oscillation to half-cycle

2.3.1.3.1.8 Multi-connector 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 whether or not the multi-connector control is enabled/disabled

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Disabled
1/ON : Enabled

Query parameter

None

Response format

<NBOL>

Setting example

:SOURce1:SWEep:MCONnector:STATe ON
Enables the multi-connector control of CH1

2.3.1.3.1.9 Synchronization output selection/query :OUTPut[1|2]:SYNC:SWEep:TYPE

■:OUTPut[1|2]:SYNC:SWEep:TYPE

□:OUTPut[1|2]:SYNC:SWEep:TYPE?

Description

Selects/queries the synchronization output in the sweep oscillation mode

Setting parameter

SYNC|SSYNc|XDRive|MARKer|OFF
SYNC → Reference phase synchronization
SSYNc → Sweep synchronization
XDRive → Sweep X drive
MARKer → Marker
OFF → Output stop

Query parameter

None

Response format

SYNC|SSYN|XDR|MARK|OFF

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

Setting example

:SOURce1:SYNC:SWEep:TYPE SYNC
Sets the sweep synchronization output of CH1 to the reference phase synchronization

2.3.1.3.2 Frequency Sweep Setting

2.3.1.3.2.1 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 type
Queries whether or not the oscillation mode is the sweep oscillation frequency sweep type

Setting parameter

CW|FIXed|SWEep

CW|FIXed	→	Switch to the continuous oscillation when the oscillation mode is the sweep oscillation frequency sweep type
SWEep	→	Switches the oscillation mode to the sweep oscillation frequency sweep type

Query parameter

None

Response format

CW|FIX|SWE

CW|FIX :	The oscillation mode is not the sweep oscillation frequency sweep type
SWE :	The oscillation mode is the sweep oscillation frequency sweep type

Setting example

:SOURce1:FREQuency:MODE SWEep
Sets the oscillation mode of CH1 to the sweep oscillation frequency sweep type

2.3.1.3.2.2 Starting value setting/query [:SOURce[1|2]]:FREQuency:STARt

■[:SOURce[1|2]]:FREQuency:STARt

□[:SOURce[1|2]]:FREQuency:STARt?

Description

Sets/queries the starting value of the frequency sweep

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Stop value : 0.01 µHz to 200 MHz
Resolution : 0.01 µHz (<50 MHz), 0.1 µHz(≧ 50MHz)

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

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FREQuency:STARt 1KHZ

Sets the starting value of the frequency sweep of CH1 to 1kHz

2.3.1.3.2.3 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 parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Stop value : 0.01 µHz to 200 MHz
Resolution : 0.01 µHz (<50 MHz),
0.1 µHz(≧ 50 MHz)
† The setting range varies depending on the waveform and oscillation mode.
<eunits> ::= M (mega) K|U|N
† Note that when the unit is frequency, M is used to mean "10^6"
<units> ::= HZ
MINimum → Sets the minimum value
MAXimum → Sets the maximum value

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FREQuency:STOP 1KHZ
Sets the stop value of the frequency sweep of CH1 to 1kHz

2.3.1.3.2.4 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 parameter

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Center value : 0.01 µHz to 200 MHz
Resolution : 0.01 µHz (< 50 MHz), 0.1 µHz(≧ 50 MHz)
† The setting range varies depending on the waveform and oscillation mode.
<eunits> ::= M (mega) K|U|N
† Note that when the unit is frequency, M is used to mean "10^6"
<units> ::= HZ
MINimum → Sets the minimum value
MAXimum → Sets the maximum value

Query parameter

[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 for the frequency sweep of CH1 to 1kHz

2.3.1.3.2.5 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 parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Span value : 0Hz to 199.999 999 999 999 9 MHz ,

Resolution :0.01 µHz (<50 MHz), 0.1 µHz(≧ 50 MHz)

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

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[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 for the frequency sweep of CH1 to 1kHz

2.3.1.3.2.6 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 parameter

<frequency>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value: 0.01 µHz to 200 MHz
Resolution : 0.01 µHz (< 50 MHz), 0.1 µHz(≧ 50 MHz)

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

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

CENTer → Center value of frequency sweep
MINimum → Sets the minimum value
MAXimum → Sets the maximum value

Query parameter

[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 the frequency sweep of CH1 to 1kHz

2.3.1.3.2.7 Start/stop value swapping setting [:SOURce[1|2]]:FREQuency:SWAP

■[:SOURce[1|2]]:FREQuency:SWAP

Description

Swaps the starting value and the stop value of the frequency sweep

Setting parameter

None

Setting example

:SOURce1:FREQuency:SWAP
Swaps the starting value and the stop value of the frequency sweep of CH1

2.3.1.3.2.8 Start/stop value output setting [:SOURce[1|2]]:FREQuency:STATe

■[:SOURce[1|2]]:FREQuency:STATe

Description

Switches the state of frequency sweep

Setting parameter

STARt|STOP

STARt → Switches the output to the starting 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 starting value

2.3.1.3.3 Phase sweep setting

2.3.1.3.3.1 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 type
Queries whether or not the oscillation mode is the sweep oscillation phase sweep type

Setting parameter

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation phase sweep type
SWEep → Switches the oscillation mode to the sweep oscillation phase sweep type

Query parameter

None

Response format

FIX|SWE
FIX : Oscillation mode is not the sweep oscillation phase sweep type
SWE : Oscillation mode is the sweep oscillation phase sweep type

Setting example

:SOURce1:PHASe:MODE SWEep
Sets the oscillation mode of CH1 to the sweep oscillation phase sweep type

2.3.1.3.3.2 Starting value setting/query [:SOURce[1|2]]:PHASe:STARt

■[:SOURce[1|2]]:PHASe:STARt

□[:SOURce[1|2]]:PHASe:STARt?

Description

Sets/queries the starting value of the phase sweep

Setting parameter

<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Starting value : -1800.000° to 1800.000°
Resolution : 0.001°
<units> ::= DEG
MINimum → - 1800.000°
MAXimum → 1800.000°

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:PHASe:STARt 90DEG
Sets the starting value of the phase sweep of CH1 to 90°

2.3.1.3.3.3 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 the phase sweep

Setting parameter

<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Stop value : -1800.000° to 1800.000°,
Resolution : 0.001°

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

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:PHASe:STOP 90DEG
Sets the stop value of the phase sweep of CH1 to 90°

2.3.1.3.3.4 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 the phase sweep

Setting parameter

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

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:PHASe:CENTer 90DEG
Sets the center value of the phase sweep of CH1 to 90°

2.3.1.3.3.5 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 the phase sweep

Setting parameter

<phase>|MINimum|MAXimum

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

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

<units> ::= DEG

MINimum → 0.000°

MAXimum → 3600.000°

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:PHASe:SPAN 90DEG

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

2.3.1.3.3.6 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 the phase sweep

Setting parameter

<phase>|CENTer|MINimum|MAXimum

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

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

<units> ::= DEG

CENTer → Center value of the phase sweep

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameter

[CNETer|MINimum|MAXimum]

CENTer → Queries the center value of the 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 the phase sweep of CH1 to 90°

2.3.1.3.3.7 Start/stop value swapping setting [:SOURce[1|2]]:PHASe:SWAP

■[:SOURce[1|2]]:PHASe:SWAP

Description

Swaps the starting value and the stop value of the phase sweep

Setting parameter

None

Setting example

:SOURce1:PHASe:SWAP
Swaps the starting value and the stop value of the phase sweep of CH1

2.3.1.3.3.8 Start/stop value output setting [:SOURce[1|2]]:PHASe:STATe

■[:SOURce[1|2]]:PHASe:STATe

Description

Switches the state of phase sweep

Setting parameter

STARt|STOP

STARt → Switches the output to the starting 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 starting value

2.3.1.3.4 Amplitude sweep setting

2.3.1.3.4.1 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 type
Queries whether or not the oscillation mode is the sweep oscillation amplitude sweep type

Setting parameter

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation amplitude sweep type
SWEep → Switches the oscillation mode to the sweep oscillation amplitude sweep type

Query parameter

None

Response format

FIX|SWE

FIX : The oscillation mode is not the sweep oscillation amplitude sweep type
SWE : The oscillation mode is the sweep oscillation amplitude sweep type

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:MODE SWEep
Sets the oscillation mode of CH1 to the sweep oscillation amplitude sweep type

2.3.1.3.4.2 Starting 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 starting value of the amplitude sweep

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Starting value : 0Vp-p to 20Vp-p/open,

: 0 Vp-p to 10 Vp-p/50Ω,
:-Inf, -89.03 to +16.98dBV/open,
:-Inf, -82.04 to +23.97 dBm/50Ω

Resolution : 4 digits or 0.1mVp-p
(999.9mVp-p or less),
5 digits or 1mVp-p
(1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> ::= M (milli)

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

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 starting value of the amplitude sweep of CH1 to 5Vp-p

2.3.1.3.4.3 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 the amplitude sweep

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Stop value : 0Vp-p to 20Vp-p/open,
: 0Vp-p to 10Vp-p/50Ω,
:-Inf, -89.03 to +16.98dBV/open,
: -Inf, -82.04 to +23.97 dBm/50Ω

Resolution : 4 digits or 0.1mVp-p (999.9mVp-p or less),
: 5 digits or 1mVp-p (1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> ::= M (milli)

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

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 the amplitude sweep of CH1 to 5Vp-p

2.3.1.3.4.4 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 the amplitude sweep

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Center value : 0Vp-p to 20Vp-p/open,
: 0 Vp-p to 10 Vp-p/50Ω,
:-Inf, -89.03 to +16.98dBV/open,
: -Inf, -82.04 to +23.97 dBm/50Ω

Resolution : 4 digits or 0.1mVp-p
(999.9mVp-p or less),
: 5 digits or 1mVp-p
(1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> ::= M (milli)

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

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω

(This is the settable upper limit with the current setting)

Query parameter

[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 the amplitude sweep of CH1 to 5Vp-p

2.3.1.3.4.5 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 the amplitude sweep

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Span value : 0Vp-p to 20Vp-p/open,
: 0 Vp-p to 10 Vp-p/50Ω,
: -Inf, -89.03 to +16.98dBV/open,
: -Inf, -82.04 to +23.97 dBm/50Ω
Resolution : 4 digits or 0.1mVp-p (999.9mVp-p or less),
: 5 digits or 1mVp-p (1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> :::= M (milli)

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

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 the amplitude sweep of CH1 to 5Vp-p

2.3.1.3.4.6 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 the amplitude sweep

Setting parameter

<amplitude>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value : 0Vp-p to 0Vp-p/open,
: 0 Vp-p to 10 Vp-p/50Ω,
: -Inf, -89.03 to +16.98dBV/open,
: -Inf, -82.04 to +23.97 dBm/50Ω

Resolution : 4 digits or 0.1mVp-p
(999.9mVp-p or less),
: 5 digits or 1mVp-p
(1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> ::= M (milli)

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

CENTer → Center value of the amplitude sweep

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[CENTer|MINimum|MAXimum]

CENTer → Queries the center value of the 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 the amplitude sweep of CH1 to 5Vp-p

2.3.1.3.4.7 Start/stop value swapping setting [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SWAP

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

Description

Swaps the starting value and the stop value of the amplitude sweep

Setting parameter

None

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:SWAP
Swaps the starting value and the stop value of the amplitude sweep of CH1

2.3.1.3.4.8 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 parameter

STARt|STOP

STARt → Switches the output to the starting 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 starting value

2.3.1.3.5 DC offset sweep setting

2.3.1.3.5.1 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 type
Queries whether or not the oscillation mode is the sweep oscillation DC offset sweep type

Setting parameter

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation DC offset sweep type
SWEep → Switches the oscillation mode to the sweep oscillation DC offset sweep type

Query parameter

None

Response format

FIX|SWE

FIX : The oscillation mode is not the sweep oscillation DC offset sweep type

SWE : The oscillation mode is the sweep oscillation DC offset sweep type

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:MODE SWEep

Sets the oscillation mode of CH1 to the sweep oscillation DC offset sweep type

2.3.1.3.5.2 Starting 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 starting value of the DC offset sweep

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10V/open, ±5V/50Ω,
Resolution : 4 digits or 0.1mV (±499.9mV or less),
: 5 digits or 1mV (±0.5V or more),

<eunits> ::= M (milli)

<units> ::= V

MINimum → -10V/open, -5V/50Ω
(This is the settable lower limit with the current setting)

MAXimum → 10V/open, 5V/50Ω (This is the settable upper limit with the current setting)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:STARt 2.5V
Sets the starting value of the DC offset sweep of CH1 to 2.5V

2.3.1.3.5.3 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 sweep

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10V/open, ±5V/50Ω,
Resolution : 4 digits or 0.1mV
(±499.9mV or less),
: 5 digits or 1mV (±0.5V or more),

† The setting range varies depending on the amplitude setting.

<eunits> ::= M (milli)

<units> ::= V

MINimum → -10V/open, -5V/50Ω
(This is the settable lower limit with the current setting)

MAXimum → 10V/open, 5V/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:STOP 2.5V
Sets the stop value of the DC offset sweep of CH1 to 2.5V

2.3.1.3.5.4 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 sweep

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10V/open, ±5V/50Ω,
Resolution : 4 digits or 0.1mV
(±499.9mV or less),
: 5 digits or 1mV (±0.5V or more)

† The setting range varies depending on the amplitude setting.

<eunits> ::= M (milli)

<units> ::= V

MINimum → -10V/open, -5V/50Ω
(This is the settable lower limit with the current setting)

MAXimum → 10V/open, 5V/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

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

Sets the center value of the DC offset sweep of CH1 to 2.5V

2.3.1.3.5.5 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 the DC offset sweep

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : 0 to 20V/open, 0 to 5V/50Ω,
Resolution : 4 digits or 0.1mV
(±499.9mV or less),
: 5 digits or 1mV (±0.5V or more),

† Resolution depends on the starting and stop values.

† The setting range varies depending on the amplitude setting.
<eunits> ::= M (milli)
<units> ::= V
MINimum → 0V
MAXimum → 20V/open, 10V/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 the DC offset sweep of CH1 to 2.5V

2.3.1.3.5.6 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 the DC offset sweep

Setting parameter

<offset>|CENTer|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → DC offset : ±10V/open, ±5V/50Ω,
Resolution : 4 digits or 0.1mV
(±499.9mV or less),
: 5 digits or 1mV (±0.5V or more)
† The setting range varies depending on the amplitude setting.
<eunits> ::= M (milli)
<units> ::= V
CENTer → The center value of DC offset sweep
MINimum → -10V/open, -5V/50Ω
(This is the settable lower limit with the current setting)
MAXimum → 10V/open, 5V/50Ω
(This is the settable lower limit with the current setting)

Query parameter

[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 the DC offset sweep of CH1 to 2.5V

2.3.1.3.5.7 Start/stop value swapping setting [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP

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

Description

Swaps the starting value and the stop value of the DC offset sweep

Setting parameter

None

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:SWAP
Swaps the starting value and the stop value of the DC offset sweep of CH1

2.3.1.3.5.8 Start/stop value output setting [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe

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

Description

Switches the state of DC offset sweep

Setting parameter

STARt|STOP

STARt → Switches the output to the starting 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 starting value

2.3.1.3.6 Duty sweep setting

2.3.1.3.6.1 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 type
Queries whether or not the oscillation mode is the sweep oscillation duty sweep type

Setting parameter

FIXed|SWEep

FIXed → Switch to the continuous oscillation when the oscillation mode is the sweep oscillation duty sweep type
SWEep → Switches the oscillation mode to the sweep oscillation duty sweep type

Query parameter

None

Response format

FIX|SWE

FIX : The oscillation mode is not the sweep oscillation duty sweep type
SWE : The oscillation mode is the sweep oscillation duty sweep type

Setting example

:SOURce1:PULSe:DCYCle:MODE SWEep
Sets the oscillation mode of CH1 to the sweep oscillation duty sweep type

2.3.1.3.6.2 Starting 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 starting value of the duty sweep
† The Allowed range of setting varies depending on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Starting value : 0.0100 % to 99.9900 %

(Square wave/normal duty range)
: 0.0000 % to 100.0000 %
(Square wave/extended duty range)
: 0.0001 % to 99.9999 %
(Pulse wave)
Resolution : 0.0001 %

<units> ::= PCT

MINimum → 0.0100 % (Square wave/normal duty range),
0.0000 % (Square wave/extended duty range),
0.0001 % (Pulse wave)

MAXimum → 99.9900 % (Square wave/normal duty range),
100.0000 % (Square wave/extended duty range),
99.9999 % (Pulse wave)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:PULSe:DCYCle:STARt 20PCT

Sets the starting value of the duty sweep of CH1 to 20%

2.3.1.3.6.3 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

† The Allowed range of setting varies depending on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Stop value : 0.0100% to 99.9900 %
(Square wave/normal duty range)
: 0.0000 % to 100.0000 %
(Square wave/extended duty range)
: 0.0001 % to 99.9999 % (Pulse wave)
Resolution : 0.0001 %

<units> ::= PCT

MINimum → 0.0100 % (Square wave/normal duty range),
0.0000 % (Square wave/extended duty range),

0.0001 % (Pulse wave)

MAXimum → 99.9900 % (Square wave/normal duty range),
100.0000 % (Square wave/extended duty range),
99.9999 % (Pulse wave)

Query parameter

[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 the duty sweep of CH1 to 20%

2.3.1.3.6.4 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

† The Allowed range of setting varies depending on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Center value : 0.0100 % to 99.9900 %
(Square wave/normal duty range)
: 0.0000 % to 100.0000 %
(Square wave/extended duty range)
: 0.0001 % to 99.9999 %
(Pulse wave)

Resolution : 0.0001%

<units> ::= PCT

MINimum → 0.0100 % (Square wave/normal duty range),
0.0000 % (Square wave/extended duty range),
0.0001 % (Pulse wave)

MAXimum → 99.9900 % (Square wave/normal duty range),
100.0000 % (Square wave/extended duty range),
99.9999 % (Pulse wave)

Query parameter

[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 the duty sweep of CH1 to 20%

2.3.1.3.6.5 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
† The Allowed range of setting varies depending on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave.

Setting parameter

<duty>|MINimum|MAXimum
<duty> ::= <REAL>[<units>]
<REAL> → Span value : 0.0000 % to 99.9800 %
(Square wave/normal duty range)
: 0.0000 % to 100.0000 %
(Square wave/extended duty range)
: 0.0000 % to 99.9998 % (Pulse wave)
Resolution : 0.0000%
<units> ::= PCT
MINimum → 0.0000 %
MAXimum → 99.9800 % (Square wave/normal duty range),
100.0000 % (Square wave/extended duty range),
99.9998 % (Pulse wave)

Query parameter

[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 the duty sweep of CH1 to 20%

2.3.1.3.6.6 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
† The Allowed range of setting varies depending on the oscillation frequency in case of square wave with the normal duty range setting or in case of pulse wave.

Setting parameter

<duty>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value : 0.0100 % to 99.9900 %
(Square wave/normal duty range)
: 0.0000 % to 100.0000 %
(Square wave/extended duty range)
: 0.0001 % to 99.9999 %
(Pulse wave)
Resolution : 0.0001 %

<units> ::= PCT

MINimum → 0.0100 % (Square wave/normal duty range),
0.0000 % (Square wave/extended duty range),
0.0001 % (Pulse wave)

MAXimum → 99.9900 % (Square wave/normal duty range),
100.0000 % (Square wave/extended duty range),
99.9999 % (Pulse wave)

Query parameter

[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 the duty sweep of CH1 to 20%

2.3.1.3.6.7 Start/stop value swapping setting [:SOURce[1|2]]:PULSe:DCYCle:SWAP

■[:SOURce[1|2]]:PULSe:DCYCle:SWAP

Description

Swaps the starting value and the stop value of the duty sweep

Setting parameter

None

Setting example

:SOURce1:PULSe:DCYCle:SWAP
Swaps the starting value and the stop value of the duty sweep of CH1

2.3.1.3.6.8 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 parameter

STARt|STOP

STARt → Switches the output to the starting 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 starting value

2.3.1.4 Burst oscillation mode

2.3.1.4.1 Common setting of burst

For the trigger related settings, see the section for "Trigger Operation"

2.3.1.4.1.1 Burst oscillation mode selection/query [:SOURce[1|2]]:BURSt:STATe

■[:SOURce[1|2]]:BURSt:STATe

□[:SOURce[1|2]]:BURSt:STATe?

Description

Switches the continuous/burst of the oscillation mode
Queries whether or not the oscillation mode is burst

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Continuous
1/ON : Burst

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Oscillation mode is not the burst oscillation mode
1 : Oscillation mode is the burst oscillation mode

Setting example

:SOURce1:BURSt:STATe ON
Sets the oscillation mode of CH1 to burst

2.3.1.4.1.2 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 parameter

AUTO|TRIGger|GATE|TGATe

AUTO → Auto burst
TRIGger → Trigger burst
GATE → Gate
TGATe → Triggered gate

Query parameter

None

Response format

AUTO|TRIG|GATE|TGAT
† For the meaning of each response data, see the setting parameter

Setting example

:SOURce1:BURSt:MODE AUTO
Sets the burst mode of CH1 to auto burst

2.3.1.4.1.3 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 at the time of burst

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:BURSt:SLEVel 20PCT
Sets the stop level value of CH1 at the time of burst to 20%

2.3.1.4.1.4 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 at the time of burst oscillation

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Disabled
1/ON : Enabled

Query parameter

None

Response format

<NBOL>

Setting example

:SOURce1:BURSt:SLEVel:STATe ON
Enables the stop level of CH1 at the time of burst oscillation

2.3.1.4.1.5 Synchronization signal 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 synchronization output in the burst mode

Setting parameter

SYNC|BSYNc| MSYNc|MFCTn|SFCTn|OFF

SYNC → Reference phase synchronization
BSYNc → Burst synchronization
MSYNc → Internal modulation synchronization
MFCTn → Internal modulation signal
SFCTn → Sub waveform
OFF → Output stop

Query parameter

None

Response format

SYNC|BSYN| MSYN|MFCT|SFCT|OFF
† 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 the reference phase synchronization

Remarks

When the modulation function is stopped, MSYNc/MFCTn setting is converted to OFF

2.3.1.4.2 Auto burst

2.3.1.4.2.1 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 at the time of auto burst

Setting parameter

<mark>|MINimum|MAXimum

<mark> ::= <REAL>

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

MINimum → 0.5 waves
MAXimum → 999,999.5 waves

Query parameter

[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 CH1 at the time of auto burst to 10

2.3.1.4.2.2 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 at the time of auto burst

Setting parameter

<space>|MINimum|MAXimum

<space> ::= <REAL>

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

MINimum → 0.5 waves

MAXimum → 999,999.5 waves

Query parameter

[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 CH1 at the time of auto burst to 10

2.3.1.4.3 Trigger burst

2.3.1.4.3.1 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 at the time of trigger burst

Setting parameter

<mark>|MINimum|MAXimum

<mark> ::= <REAL>

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

Resolution : 0.5 waves

MINimum → 0.5 waves

MAXimum → 999,999.5 waves

Query parameter

[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 CH1 at the time of trigger burst to 10

2.3.1.4.3.2 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 parameter

<delay>|MINimum|MAXimum

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

<REAL> → Trigger delay time : 0.0 ns to 1 ks,

Resolution : 8 digits or 0.1ns

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

<units> ::= S

MINimum → 0.0ns

MAXimum → 1000s

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:BURSt:TRIGger:TDELay 10MS

Sets the trigger delay time of CH1 at the time of trigger burst to 10ms

2.3.1.4.4 Gate

2.3.1.4.4.1 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 at the time of gate

Setting parameter

HALF|CYCLe

HALF → Half-cycle
CYCLe → 1 cycle

Query parameter

None

Response format

HALF|CYCL

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

Setting example

:SOURce1:BURSt:GATE:OSTop HALF

Sets the oscillation stop unit of CH1 at the time of gate to half-cycle

2.3.1.4.5 Triggered gate

2.3.1.4.5.1 Oscillation stop unit 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 at the time of triggered gate

Setting parameter

HALF|CYCLe

HALF → Half-cycle
CYCLe → 1 cycle

Query parameter

None

Response format

HALF|CYCL

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

Setting example

:SOURce1:BURSt:TGATe:OSTop HALF

Sets the oscillation stop unit of CH1 at the time of triggered gate to half-cycle

2.3.2 Waveform Selection/Setting

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

■[:SOURce[1|2]]:FUNCtion[:SHAPe]

□[:SOURce[1|2]]:FUNCtion[:SHAPe]?

Description

Sets/queries the waveform

Setting parameter

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	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation
OSURge	→	Oscillation surge
PSURge	→	Pulse surge
TOFFset	→	Trapezoid wave with offset
HSEPulse	→	Half-sine edge pulse
BRRamp	→	Bottom-referenced ramp wave
USER	→	Arbitrary waveform

Query parameter

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 parameter

Setting example

:SOURce1:FUNCtion:SHAPe RAMP
Sets the waveform of CH1 to ramp wave

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

■:OUTPut[1|2]:POLarity

□:OUTPut[1|2]:POLarity?

Description

Selects/queries the polarity of waveform

Setting parameter

<shape>,<polarity>
<shape>::= SINusoid|SQUare|PULSe|RAMP |NOISe
|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
NOISe → Noise
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 → 2nd-order LPF step response
DOSCillation → Damped oscillation
OSURge → Oscillation surge
PSURge → Pulse surge
TOFFset → Trapezoid wave with offset
HSEPulse → Half-sine edge pulse
BRRamp → Bottom-referenced ramp wave
USER → Arbitrary waveform

<polarity> ::= NORMal|INVerted

NORMal → Normal
INVerted → Inverted

Query parameter

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

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

Response format

NORM|INV

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

Setting example

:OUTPut1:POLarity SINusoid,NORMal
Set the polarity of sine wave of CH1 to normal

2.3.2.3 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 parameter

<shape>,<scale>

<shape>::= SINusoid|SQUare|PULSe|RAMP |NOISe
|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
NOISe	→	Noise
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
COFSin	→	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	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation

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

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

Query parameter

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

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

Response format

MFS|FS|PFS

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

Setting example

:OUTPut1:SCALe SINusoid,FS

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

2.3.2.4 Individual waveform setting

2.3.2.4.1 Square/pulse wave shared commands

2.3.2.4.1.1 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 parameter

PCT|USER

PCT → %
USER→ User-defined unit

Query parameter

None

Response format

PCT|USER

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

Setting example

:SOURce1:PULSe:DCYCle:UNIT PCT

Sets the duty unit 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.

2.3.2.4.1.2 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 parameter

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

<name> ::= <STR>
<STR> → Name of user-defined unit (maximum 4 letters)
† Optional (If omitted, the setting is not changed)

<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Log
† Optional (If omitted, the setting is not changed)

<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

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

<name> ::= <STR>

<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR3>

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

Setting example

:SOURce1:PULSe:DCYCle:USER "INTN",LINear,100,0
Sets the user-defined unit of the duty of CH1 to "INTN"

2.3.2.4.2 Square wave

2.3.2.4.2.1 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 the square wave extended duty range on/off

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Square wave extension off = normal duty range
1/ON : Square wave extension on = extended duty range

Query parameter

None

Response format

<NBOL>
<NBOL> → 0 : Square wave extension off = normal duty range
1 : Square wave extension on = extended duty range

Setting example

:SOURce1:FUNCtion:SQUare:EXTend ON
Sets the square wave of CH1 to the extended duty range

2.3.2.4.2.2 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 (square wave)
† The setting range of duty varies depending on the oscillation frequency in case of normal duty range setting.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0.0100 % to 99.9900 % (Normal range), : 0.0000 % to 100.0000 % (Extended range),

Resolution : 0.0001%

<units> ::= PCT|USER

MINimum → 0.0100 % (Normal range), 0.0000 % (Extended range)

MAXimum → 99.9900 % (Normal range), 100.0000 % (Extended range)

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:SQUare:DCYCle 20PCT

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

Remarks

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

† This command cannot set/query the frequency of sequence.

2.3.2.4.3 Pulse wave

2.3.2.4.3.1 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 oscillation frequency.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0.01 % to 99.99 %,

Resolution :0.0001%

<units> ::= PCT|USER

MINimum → 0.01% or the current settable minimum value

MAXimum → 99.99% or the current settable maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the current settable minimum value

MAXimum → Queries the current settable maximum value

Response format

<NR3>

Setting example

:SOURce1:PULSe:DCYCle 20PCT

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

2.3.2.4.3.2 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 parameter

<width>|MINimum|MAXimum

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

<REAL> → Pulse width : 7.31 ns to 99.999 9 Ms,

Resolution : 0.0001% or less of the cycle or 0.01ns

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

<units> ::= S

MINimum → The current settable minimum value

MAXimum → The current settable maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the current settable minimum value

MAXimum → Queries the current settable maximum value

Response format

<NR3>

Setting example

:SOURce1:PULSe:WIDTh 1ms

Sets the pulse width of CH1 to 1ms

2.3.2.4.3.3 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 rising time of pulse wave

Setting parameter

<seconds>|MINimum|MAXimum

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

<REAL> → Rising time : 4.3 ns to 58.8 Ms,
Resolution : 3 digits or 0.1ns

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

<units> ::= S

MINimum → 4.3 ns

MAXimum → 58.8 Ms

Query parameter

[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 the pulse wave of CH1 to 1ms

2.3.2.4.3.4 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 falling time of pulse wave

Setting parameter

<seconds>|MINimum|MAXimum

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

<REAL> → Falling time : 4.3 ns to 58.8 Ms,
Resolution : 3 digits or 0.1ns

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

<units> ::= S

MINimum → 4.3 ns

MAXimum → 58.8Ms

Query parameter

[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 the pulse wave of CH1 to 1ms

2.3.2.4.3.5 Cycle setting/query [:SOURce[1|2]]:PULSe:PERiod

■[:SOURce[1|2]]:PULSe:PERiod

□[:SOURce[1|2]]:PULSe:PERiod?

Description

Sets/queries the cycle

Setting parameter

<period>|MINimum|MAXimum

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

<REAL> → Cycle : 5.00 ns to 100 Ms
Resolution : 0.01ns or 16 digits

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

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

<units> ::= S|USER

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

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:PULSe:PERiod 1US
Sets the cycle of CH1 to 1µs

2.3.2.4.3.6 Cycle 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 cycle unit

Setting parameter

S|USER

S → s (second)
USER→ User-defined unit

Query parameter

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 cycle 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.

2.3.2.4.3.7 Cycle 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 cycle

Setting parameter

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

<name> ::= <STR>
<STR> → Name of user-defined unit (maximum 4 letters)
† Optional (If omitted, the setting is not changed)
<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Log

† Optional (If omitted, the setting is not changed)

<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

<name>,<form>,<m>,<n>
<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR3>
† 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 the cycle of CH1 to "ms"

2.3.2.4.4 Ramp wave

2.3.2.4.4.1 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 parameter

<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 parameter

[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 the ramp wave of CH1 to 20%

2.3.2.4.5 Noise

2.3.2.4.5.1 Noise bandwidth setting/query [:SOURce[1|2]]:FUNCtion:NOISe:BW

■[:SOURce[1|2]]:FUNCtion:NOISe:BW

□[:SOURce[1|2]]:FUNCtion:NOISe:BW?

Description

Sets/queries the bandwidth of noise

Setting parameter

<bw>|MINimum|MAXimum
<bw> ::= <INT>
<INT> → Bandwidth number: 1 to 7
MINimum → 1 (Narrowband 100kHz)
MAXimum → 7 (Wideband 100MHz)

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:NOISe:BW 1
Sets the bandwidth of the noise from CH1 to the narrowest (100kHz)
Noise bandwidth corresponding to each parameter is as follows: 1 (100kHz), 2 (300kHz), 3 (1MHz), 4 (3MHz), 5 (10MHz), 6 (30MHz), and 7 (100MHz).

2.3.2.5 PWF waveform

2.3.2.5.1 Steady sine wave group

2.3.2.5.1.1 Unbalanced sine wave first half 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 the first half amplitude of unbalanced sine wave

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → First half amplitude : -100.00 % to 100.00 %,
Resolution : 0.01%

<units> ::= PCT

MINimum → -100.00%

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:USINe:AMPLitude1 20PCT

Sets the first half amplitude of the unbalanced sine wave of CH1 to 20%

2.3.2.5.1.2 Unbalanced sine wave second half amplitude setting/query [:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2

■[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2

□[:SOURce[1|2]]:FUNCtion:USINe:AMPLitude2?

Description

Sets/queries the second half amplitude of unbalanced sine wave

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Second half amplitude: -100.00 % to 100.00 %,

Resolution : 0.01%

<units> ::= PCT

MINimum → -100.00%

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:USINe:AMPLitude2 20PCT

Sets the second half amplitude of the unbalanced sine wave of CH1 to 20%

2.3.2.5.1.3 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 the clip rate of clipped sine wave

Setting parameter

<clip>|MINimum|MAXimum

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

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

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00%

MAXimum → 99.99%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:CSINe:CLIP 20PCT

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

2.3.2.5.1.4 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 the crest factor of CF controlled sine wave

Setting parameter

::= <REAL>
<REAL> → Crest factor : 1.41 to 10.00,
Resolution : 0.01
MINimum → 1.41
MAXimum → 10.00

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:CFCSine:CFACtor 5.00
Sets the crest factor of the CF controlled sine wave of CH1 to 5.00

2.3.2.5.1.5 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 the conduction angle of conduction angle controlled sine wave

Setting parameter

<angle>|MINimum|MAXimum
<angle> ::= <REAL>[<units>]
<REAL> → Conduction angle : -180.00° to 180.00°,
Resolution : 0.01°
<units> ::= DEG
MINimum → -180.00°
MAXimum → 180.00°

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:ACSine:ANGLe 30DEG
Sets the conduction angle of the conduction angle controlled sine wave of CH1 to 30°

2.3.2.5.1.6 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 the number of steps of staircase sine wave

Setting parameter

<steps>|MINimum|MAXimum

<steps> ::= <INT>
<INT> → Number of steps : 2 to 256,
MINimum → 2
MAXimum → 256

Query parameter

[MINimum|MAXimum]

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

Response format

<NR1>

Setting example

:SOURce1:FUNCtion:SSINe:STEPs 10
Sets the number of steps of the staircase sine wave of CH1 to 10

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

■[:SOURce[1|2]]:FUNCtion:MCSine:CYCLes

□[:SOURce[1|2]]:FUNCtion:MCSine:CYCLes?

Description

Sets/queries the number of cycle of multi-cycle sine wave

Setting parameter

<cycles>|MINimum|MAXimum

<cycles> ::= <REAL>

<REAL> → Number of cycle : 0.01 to 50.00,
Resolution : 0.01

MINimum → 0.01

MAXimum → 50.00

Query parameter

[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 cycle of the multi-cycle sine wave of CH1 to 0.2

2.3.2.5.1.8 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 the start phase of multi-cycle sine wave

Setting parameter

<clip>|MINimum|MAXimum

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

<REAL> → Start phase : -360.00° to 360.00°,
Resolution : 0.01°

<units> ::= DEG

MINimum → -360.00°

MAXimum → 360.00°

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:MCSine:PHASe 30DEG

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

2.3.2.5.2 Transient sine wave group

2.3.2.5.2.1 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 the complete-on phase of on-phase controlled sine wave

Setting parameter

<phase>|MINimum|MAXimum

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

<REAL> → Complete-on phase : 0.00° to 360.00°,
Resolution : 0.01°

<units> ::= DEG

MINimum → 0.00°

MAXimum → 360.00°

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:ONPSine:ONPHase 30DEG

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

2.3.2.5.2.2 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 the on-slope time of on-phase controlled sine wave

Setting parameter

<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 parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:ONPSine:STIMe 20PCT
Sets the on-slope time of the on-phase controlled sine wave of CH1 to 20%

2.3.2.5.2.3 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 the off-phase of the off-phase controlled sine wave

Setting parameter

<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 parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:OFPSine:OFPHase 30DEG
Sets the off-phase of the off-phase controlled sine wave of CH1 to 30°

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

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

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

Description

Sets/queries the off-slope time of the off-phase controlled sine wave

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Off-slope time : 0.00 % to 50.00 %,
Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00%

MAXimum → 50.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:OFPSine:STIMe 20PCT

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

2.3.2.5.2.5 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 the on-phase of chattering-on sine wave

Setting parameter

<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 parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:CONSine:ONPHase 30DEG
Sets the on-phase of the chattering-on sine wave of CH1 to 30°

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

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

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

Description

Sets/queries the number of chattering of chattering-on sine wave

Setting parameter

<chattering>|MINimum|MAXimum

<chattering> ::= <INT>
<INT> → Number of chattering : 0 to 20,
MINimum → 0
MAXimum → 20

Query parameter

[MINimum|MAXimum]

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

Response format

<NR1>

Setting example

:SOURce1:FUNCtion:CONSine:NCHattering 2
Sets the number of chattering of the chattering-on sine wave of CH1 to 2

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

■[:SOURce[1|2]]:FUNCtion:CONSine:TON

□[:SOURce[1|2]]:FUNCtion:CONSine:TON?

Description

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

Setting parameter

<time>|MINimum|MAXimum

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

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

<units> ::= PCT

MINimum → 0.00%

MAXimum → 20.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:CONSine:TON 20PCT

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

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

■[:SOURce[1|2]]:FUNCtion:CONSine:TOFF

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

Description

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

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Off-state time :0.00 % to 20.00 %,
Resolution :0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 20.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:CSINe:CLIP 20PCT

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

2.3.2.5.2.9 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 the off-phase of chattering-off sine wave

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:COFSine:OFPHase 30DEG

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

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

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

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

Description

Sets/queries the number of chattering of chattering-off sine wave

Setting parameter

<chattering>|MINimum|MAXimum

<chattering> ::= <INT>

<INT> → Number of chattering : 0 to 20,

MINimum → 0

MAXimum → 20

Query parameter

[MINimum|MAXimum]

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

Response format

<NR1>

Setting example

:SOURce1:FUNCtion:COFSine:NCHattering 2
Sets the number of chattering of the chattering-off sine wave of CH1 to 2

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

■[:SOURce[1|2]]:FUNCtion:COFSine:TON

□[:SOURce[1|2]]:FUNCtion:COFSine:TON?

Description

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

Setting parameter

<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → On-state time: 0.00 % to 20.00 %,
Resolution : 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 20.00%

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:COFSine:TON 20PCT
Sets the on-state time of the chattering-off sine wave of CH1 to 20%

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

■[:SOURce[1|2]]:FUNCtion:COFSine:TOFF

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

Description

Sets/queries the off-state time of chattering-off sine wave

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Off-state time : 0.00 % to 20.00 %,
Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00%

MAXimum → 20.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:COFSine:TOFF 20PCT

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

2.3.2.5.3 Pulse waveform group

2.3.2.5.3.1 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 the standard deviation of Gaussian pulse

Setting parameter

<sigma>|MINimum|MAXimum

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

<REAL> → Standard deviation : 0.01 % to 100.00 %,
Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.01 %

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:GAUSsian:SIGMa 20PCT
Sets the standard deviation of the Gaussian pulse of CH1 to 20%

2.3.2.5.3.2 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 the half value of width of Lorentz pulse

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:LORentz:HWIDth 20PCT
Sets the half value of width of the Lorentz pulse of CH1 to 20%

2.3.2.5.3.3 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 the width of Haversine

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:HAVersine:WIDTh 20PCT
Sets the width of the Haversine of CH1 to 20%

2.3.2.5.3.4 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 the width of half-sine pulse

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:HSPulse:WIDTh 20PCT
Sets the width of the half-sine pulse of CH1 to 20%

2.3.2.5.3.5 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 the slope width of trapezoid pulse

Setting parameter

<width>|MINimum|MAXimum

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

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

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 50.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TPULse:RFALl 20PCT

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

2.3.2.5.3.6 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 the upper base width of trapezoid pulse

Setting parameter

<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 parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TPULse:UBASe 20PCT
Sets the upper base width of the trapezoid pulse of CH1 to 20%

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

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

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

Description

Sets/queries the number of zero crossings of Sin(x)/x

Setting parameter

<number>|MINimum|MAXimum

<number> ::= <INT>
<INT> → Number of zero crossings : 1 to 50,
MINimum → 1
MAXimum → 50

Query parameter

[MINimum|MAXimum]

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

Response format

<NR1>

Setting example

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

2.3.2.5.4 Transient response waveform group

2.3.2.5.4.1 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 the time constant of exponential rise

Setting parameter

<tc>|MINimum|MAXimum

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

<REAL> → Time constant : 0.01 % to 100.00 %,

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.01%

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:ERISe:TCONstant 20PCT

Sets the time constant of the exponential rise of CH1 to 20%

2.3.2.5.4.2 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 the time constant of exponential fall

Setting parameter

<tc>|MINimum|MAXimum

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

<REAL> → Time constant : 0.01 % to 100.00 %,

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.01%

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:EFALl:TCONstant 20PCT
Sets the time constant of the exponential fall of CH1 to 20%

2.3.2.5.4.3 2nd-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 the natural frequency of 2nd-order LPF step response

Setting parameter

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>
<REAL> → Natural frequency: 1.00 to 50.00,
Resolution : 0.01
MINimum → 1.00
MAXimum → 50.00

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:SOLStep:NFRequency 10
Sets the natural frequency of the 2nd-order LPF step response of CH1 to 10

2.3.2.5.4.4 2nd-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 the Q of 2nd-order LPF step response

Setting parameter

<q>|MINimum|MAXimum
<q> ::= <REAL>
<REAL> → LPF Q : 0.50 to 50.00,
Resolution : 0.01
MINimum → 0.50

MAXimum → 50.00

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:SOLStep:Q 10
Sets the Q of the 2nd-order LPF step response of CH1 to 10

2.3.2.5.4.5 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 the oscillation frequency of damped oscillation

Setting parameter

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>

<REAL> → Attenuating frequency : 0.01 to 50.00,
Resolution : 0.01

MINimum → 0.01
MAXimum → 50.00

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:DOSCillation:OFRequency 10
Sets the oscillation frequency of the damped oscillation of CH1 to 10

2.3.2.5.4.6 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 the damping time constant of damped oscillation

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion: DOSCillation:DTConstant 20PCT

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

2.3.2.5.5 Surge waveform group

2.3.2.5.5.1 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 the oscillation frequency of oscillation surge

Setting parameter

<frequency>|MINimum|MAXimum

<frequency> ::= <REAL>

<REAL> → Oscillation frequency : 0.01 to 50.00,
Resolution : 0.01

MINimum → 0.01

MAXimum → 50.00

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:OSURge:OFRequency 10
Sets the oscillation frequency of the oscillation surge of CH1 to 10

2.3.2.5.5.2 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 the damping time constant of oscillation surge

Setting parameter

<tc>|MINimum|MAXimum

<tc> ::= <REAL>[<units>]
<REAL> → Damping time constant : 0.01 % to 100.00 %,
Resolution : 0.01 %
<units> ::= PCT
MINimum → 0.01%
MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:OSURge:DTConstant 20PCT
Sets the damping time constant of the oscillation surge of CH1 to 20%

2.3.2.5.5.3 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 the trailing time constant of oscillation surge

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:OSURge:TTConstant 20PCT

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

2.3.2.5.5.4 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 the rising time of pulse surge

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

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

2.3.2.5.5.5 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 the duration time of pulse surge

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

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

2.3.2.5.6 Other waveform group

2.3.2.5.6.1 Trapezoid wave 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 the leading delay of trapezoid wave with offset

Setting parameter

<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 parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TOFFset:DELay 20PCT
Sets the leading delay of the trapezoid wave with offset of CH1 to 20%

2.3.2.5.6.2 Trapezoid wave 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 the rising-slope width of trapezoid wave with offset

Setting parameter

<width>|MINimum|MAXimum
<width> ::= <REAL>[<units>]
<REAL> → Rising-slope width : 0.00 % to 100.00 %,
Resolution : 0.01 %
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TOFFset:RISe 20PCT
Sets the rising-slope width of the trapezoid wave with offset of CH1 to 20%

2.3.2.5.6.3 Trapezoid wave 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 the upper base width of trapezoid wave with offset

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TOFFset:UBASe 20PCT

Sets the upper base width of the trapezoid wave with offset of CH1 to 20%

2.3.2.5.6.4 Trapezoid wave with offset falling-slope width setting/query [:SOURce[1|2]]:FUNCtion:TOFFset:FALL

■[:SOURce[1|2]]:FUNCtion:TOFFset:FALL

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

Description

Sets/queries the falling-slope width of trapezoid wave with offset

Setting parameter

<width>|MINimum|MAXimum

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

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

<units> ::= PCT

MINimum → 0.00%

MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

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

2.3.2.5.6.5 Trapezoid wave 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 the offset of trapezoid wave with offset

Setting parameter

<offset>|MINimum|MAXimum

<offset> ::= <REAL>[<units>]
<REAL> → Offset : 0.00 % to 100.00 %,
Resolution : 0.01%
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:TOFFset:OFFSet 20PCT
Sets the offset of the trapezoid wave with offset of CH1 to 20%

2.3.2.5.6.6 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 the leading edge time of half-sine edge pulse

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:HSEPulse:LE 20PCT

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

2.3.2.5.6.7 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 the trailing edge time of half-sine edge pulse

Setting parameter

<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 parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:HSEPulse:TE 20PCT
Sets the trailing edge time of the half-sine edge pulse of CH1 to 20%

2.3.2.5.6.8 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 the duty of half-sine edge pulse

Setting parameter

<duty>|MINimum|MAXimum
<duty> ::= <REAL>[<units>]
<REAL> → Duty :0.00 % to 100.00 %,
Resolution : 0.01 %
<units> ::= PCT
MINimum → 0.00%
MAXimum → 100.00%

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:HSEPulse:DCYCle 20PCT
Sets the duty of the half-sine edge pulse of CH1 to 20%

2.3.2.5.6.9 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 the symmetry of bottom-referenced ramp wave

Setting parameter

<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 parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FUNCtion:BRRAMp:SYMMetry 20PCT
Sets the symmetry of the bottom-referenced ramp wave of CH1 to 20%

2.3.2.6 Arbitrary waveform

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

■[:SOURce[1|2]]:FUNCtion:USER

□[:SOURce[1|2]]:FUNCtion:USER?

Description

Selects/queries arbitrary waveform

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 0 to 128

Query parameter

None

Response format

<NR1>

Setting example

:SOURce1:FUNCtion:USER 3
Sets the data of memory number 3 to the arbitrary waveform of CH1

Remarks

† Memory number 0 is the edit memory.

2.3.2.6.2 Arbitrary waveform data read/write {:TRACe|:DATA}[:DATA]

■{:TRACe|:DATA}[:DATA]

□{:TRACe|:DATA}[:DATA]?

Description

Reads/writes the arbitrary wave data
† When writing the data, write the arbitrary wave data <data> with the arbitrary wave name <name> to the memory number <memory> as described below.
† When reading the data, select the name and data of the arbitrary wave stored in the memory number <memory> as described below.

Setting parameter

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

<memory> ::= <INT>
<INT> → Memory number : 0 to 128
<name> ::= <STR>
<STR> → Arbitrary wave name (20 characters or less)
† Optional (If omitted, the setting is not 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> → Data format of arbitrary wave data is as follows:

○Array format

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

→ Start of binary data
<digit> → Number other than "0", which indicates the number of digits of the subsequent <byte>
<byte> → Numeric string which indicates the number of byte of the subsequent data
<format> → The data format (4 bytes) array is specified by 0
<number> → The second power of the number of data (4 byte) 4096 to 1048576 is specified
<data[i]> → The i-th value (2 byte)

○ Control point format

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

→ Start of binary data
<digit> → Number other than "0", which indicates the number of digits of the subsequent <byte>
<byte> → Numeric string which indicates the number of byte of the subsequent data
<format> → The data format (4 byte) control point is specified by 1
<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)

Query parameter

<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 parameter

Remarks

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

(2) <data[i]> 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 exceeding the setting range is included, it is handled 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 representing 0 is H'0000.
-32768 (H'8000) is set as -32767 (H8001).

If the amplitude width of actual signal output is ±1.0Vp-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 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.

2.3.2.6.3 Memory operations

No command is available to operate USB memory.

2.3.2.6.3.1 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 parameter

<memory>,<name>

<memory> ::= <INT>

<INT> → Memory number of location to save: 1 to 128

<name> ::= <STR>

<STR> → Arbitrary wave name (20 characters or less)

† Optional (If omitted, the setting is not changed)

† If the arbitrary wave name is less than 20 characters, the remaining characters are filled with spaces (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

2.3.2.6.3.2 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 parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number of calling source : 1 to 128

Setting example

:TRACe:RECall 2

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

2.3.2.6.3.3 Copy
{:TRACe|:DATA}:COPY

■{:TRACe|:DATA}:COPY

Description

Copies the arbitrary wave data.
† This command writes the waveform, which is set to the specified channel, into the specified memory number

Setting parameter

<memory>,[<name>],<chan>,<wave>

<memory> ::= <INT>

<INT> → Memory number : 0 to 128

<name> ::= <STR>

<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 (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
EFAL	→	Exponential fall
SOLStep	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation
OSURge	→	Oscillation surge
PSURge	→	Pulse surge
TOFFset	→	Trapezoid wave 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 memory number 0 is "<Edit Memory>" (20 characters).

(3) When copying the arbitrary wave, the arbitrary wave data of the memory selected in "[:SOURce[1|2]]:FUNCtion:USER" is copied.

2.3.2.6.3.4 delete {:TRACe|:DATA}:DELete

■{:TRACe|:DATA}:DELete

Description

Deletes the arbitrary wave memory

Setting parameter

<memory>

<memory> ::= <INT>

<INT> → 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.

2.3.2.6.3.5 information acquisition {:TRACe|:DATA}:INFormation?

□{:TRACe|:DATA}:INFormation?

Description

Acquires the information of arbitrary wave memory

Query parameter

<memory> ::= <INT>
<INT> → Memory number : 0 to 128

Response format

<name>,<format>,<number>
<name> ::= <STR>
<STR> → Arbitrary wave name (20 characters)
<format> ::= <INT>
<INT> → Data format
0 → Array format
1 → Control point format
<number> ::= <INT>
<INT> → The number of data points

2.3.3 Output Signal Setting

2.3.3.1 Frequency

2.3.3.1.1 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 the main oscillator

Setting parameter

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → Frequency : 0.01 µHz to 200 MHz
Resolution : 0.01 µHz (< 50 MHz),
0.1 µHz(≧ 50 MHz)
† The setting range varies depending on the waveform and oscillation mode.
<eunits> ::= M (mega) K|U|N
† Note that when the unit is frequency, M is used to mean "10^6"
<units> ::= HZ|USER

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

Query parameter

[MINimum|MAXimum]

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

Response format

<NR3>

Setting example

:SOURce1:FREQuency:CW 1MHZ
Sets the frequency of CH1 to 1MHz

Remarks

† This command cannot set/query the frequency of sequence.

2.3.3.1.2 Unit selection/query [:SOURce[1|2]]:FREQuency:UNIT

■[:SOURce[1|2]]:FREQuency:UNIT

□[:SOURce[1|2]]:FREQuency:UNIT?

Description

Selects/queries the unit of frequency

Setting parameter

HZ|USER

HZ → Hz
USER → User-defined unit

Query parameter:

None

Response format

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

Setting example

:SOURce1:FREQuency:UNIT HZ
Sets the unit of the frequency 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.

2.3.3.1.3 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 parameter

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

<name> ::= <STR>

<STR> → Name of user-defined unit (maximum 4 letters)

† Optional (If omitted, the setting is not changed)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Log

† Optional (If omitted, the setting is not changed)

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

<REAL> → m (scale)

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

† Optional (If omitted, the setting is not changed)

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

<REAL> → n (offset)

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

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

<name> ::= <STR>

<form> ::= LIN|LOG

<m> ::= <NR3>

<n> ::= <NR3>

† 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 the frequency of CH1 to "kHz"

2.3.3.1.4 External synchronization oscillation mode (Synclator)

2.3.3.1.4.1 selection/query [:SOURce[1|2]]:FREQuency:SYNC

■[:SOURce[1|2]]:FREQuency:SYNC

□[:SOURce[1|2]]:FREQuency:SYNC?

Description

Selects/queries the external synchronization oscillation mode (Synclator function)

Setting parameter

<state> ::= <BOL>

<BOL> →0/OFF : Cancels the external synchronization oscillation mode

1/ON : Sets to the external synchronization oscillation mode

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Canceling the external synchronization oscillation mode

1 : In the external synchronization oscillation mode

Setting example

:SOURce1:FREQuency:SYNC OFF

Cancels the external synchronization oscillation mode of CH1

2.3.3.1.4.2 Synchronization source selection/query [:SOURce[1|2]]:FREQuency:SYNC:SOURce

■[:SOURce[1|2]]:FREQuency:SYNC:SOURce

□[:SOURce[1|2]]:FREQuency:SYNC:SOURce?

Description

Selects/queries the synchronization source of the external synchronization oscillation mode (Synclator function)

Setting parameter

EXTernal|CH1

EXTernal → Specifies the external trigger input terminal of the external: designated channel

CH1 → Specifies the external trigger input terminal of CH1

(Only CH2 of the 2-channel equipment (WF1968) can be selected)

Query parameter

None

Response format

EXT|CH1

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

Setting example

:SOURce1:FREQuency:SYNC:SOURce EXTernal

Sets the synchronization source of the external synchronization oscillation mode (Synclator function) of CH1 to external

2.3.3.1.4.3 Signal polarity of synchronization source selection/query [:SOURce[1|2]]:FREQuency:SYNC:SLOPe

■[:SOURce[1|2]]:FREQuency:SYNC:SLOPe

□[:SOURce[1|2]]:FREQuency:SYNC:SLOPe?

Description

Selects/queries the polarity of synchronization source of the external synchronization oscillation mode (Synclator function)

Setting parameter

POSitive|NEGative

POSitive → Positive polarity

NEGative → Negative polarity

Query parameter

None

Response format

POS|NEG

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

Setting example

:SOURce1:FREQuency:SYNC:SLOPe NEGative

Sets the polarity of synchronization source of the external synchronization oscillation mode (Synclator function) of CH1 to negative polarity

2.3.3.2 Phase

2.3.3.2.1 setting/query [:SOURce[1|2]]:PHASe[:ADJust]

■[:SOURce[1|2]]:PHASe[:ADJust]

□[:SOURce[1|2]]:PHASe[:ADJust]?

Description

Sets/queries the phase of the oscillator

Setting parameter

<phase>|MINimum|MAXimum

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

<REAL> → Phase : -1800.000° to 1800.000°

Resolution : 0.001°

<units> ::= DEG|USER

MINimum → -1800.000°

MAXimum → 1800.000°

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:SOURce1:PHASe:ADJust 90DEG

Sets the phase of CH1 to 90°

2.3.3.2.2 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 parameter

DEG|USER

DEG → °

USER→ User-defined unit

Query parameter

None

Response format

DEG|USER

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

Setting example

:SOURce1:PHASe:UNIT DEG

Sets the unit of the 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.

2.3.3.2.3 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 parameter

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

<name> ::= <STR>

<STR> → Name of user-defined unit (maximum 4 letters)

† Optional (If omitted, the setting is not changed)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Logarithmic

† Optional (If omitted, the setting is not changed)

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

<REAL> → m (scale)

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

† Optional (If omitted, the setting is not changed)

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

<REAL> → n (offset)

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

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

<name> ::= <STR>

<form> ::= LIN|LOG

<m> ::= <NR3>

<n> ::= <NR3>

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

Setting example

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

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

2.3.3.3 Amplitude

2.3.3.3.1 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 parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Amplitude : 0Vp-p to 20Vp-p/open,
: 0 Vp-p to 10 Vp-p/50Ω,
: -Inf, -89.03 to +16.98dBV/open,
: -Inf, -82.04 to +23.97 dBm/50Ω
Resolution : 4 digits or 0.1mVp-p
(999.9mVp-p or less),
: 5 digits or 1mVp-p (1Vp-p or more)
: 0.01 (Unit is DBV/DBM)

† Inf: Infinity

† The setting range varies depending on the waveform, frequency, and DC offset.

<eunits> ::= M (milli)

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

† The available unit varies depending on the waveform.

MINimum → 0 Vp-p

MAXimum → 20Vp-p/open, 10Vp-p/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 10Vp-p

Remarks

† This command cannot set/query the amplitude of sequence.

2.3.3.3.2 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 parameter

VPP|VPK|VRMS|DBV|DBM|USER

VPP → Vp-p
VPK → Vpk
VRM → Vrms
DBV → dBV
DBM → dBm
USER→ User-defined unit
† Available unit varies depending on the waveform.

Query parameter

None

Response format

VPP|VPK|VRMS|DBV|DBM|USER
† For the meaning of each response data, see the setting parameter

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.

2.3.3.3.3 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 parameter

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

<name> ::= <STR>

<STR> → Name of user-defined unit (maximum 4 letters)

† Optional (If omitted, the setting is not changed)

<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Log
† Optional (If omitted, the setting is not changed)

<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

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

<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR3>

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

Setting example

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

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

2.3.3.4 DC offset

2.3.3.4.1 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 parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10V/open, ±5V/50Ω,
Resolution : 4 digits or 0.1mV (±499.9mV or less),

: 5 digits or 1mV (±0.5V or more),

† The setting range varies depending on the amplitude setting.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → -10V/open, -5V/50Ω
(This is the settable lower limit with the current setting)

MAXimum → 10V/open, 5V/50Ω
(This is the settable upper limit with the current setting)

Query parameter

[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 2.5V

2.3.3.4.2 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 parameter

V|USER

V → V

USER→ User-defined unit

Query parameter

None

Response format

V|USER

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

Setting example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:UNIT V

Sets the unit of 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.

2.3.3.4.3 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 offset

Setting parameter

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

<name> ::= <STR>
<STR> → Name of user-defined unit (maximum 4 letters)
† Optional (If omitted, the setting is not changed)

<form> ::= LINear|LOGarithmic
LINear → Linear
LOGarithmic → Log
† Optional (If omitted, the setting is not changed)

<m> ::= <REAL>|MINimum|MAXimum
<REAL> → m (scale)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

<n> ::= <REAL>|MINimum|MAXimum
<REAL> → n (offset)
MINimum → Sets the minimum value
MAXimum → Sets the maximum value
† Optional (If omitted, the setting is not changed)

Query parameter

None

Response format

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

<name> ::= <STR>
<form> ::= LIN|LOG
<m> ::= <NR3>
<n> ::= <NR3>

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

Setting example

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

2.3.3.5 Upper and lower limit voltage

2.3.3.5.1 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 parameter

<high>|MINimum|MAXimum

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

<REAL> → High level

† The setting range varies depending on the state.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

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

Setting the high level of CH1 to 5V

2.3.3.5.2 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 unit of high level

Setting parameter

V|USER

V → V

USER→ User-defined unit

Query parameter

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 the high level of CH1 to "V"

Remarks

† The user-defined unit is the same as the one for 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.

2.3.3.5.3 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 parameter

<low>|MINimum|MAXimum

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

<REAL> → Low level

† The setting range varies depending on the status.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[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 0V

2.3.3.5.4 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 unit of low level

Setting parameter

V|USER

V → V

USER→ User-defined unit

Query parameter

None

Response format

V|USER

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

Setting example

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

Sets the unit of the low level of CH1 to "V"

Remarks

† The user-defined unit is the same as the one for 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.

2.3.3.6 Subchannel operation

2.3.3.6.1 Amplitude setting/query [:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate][:AMPLitude]

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

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

Description

Sets/queries the amplitude of subchannel output

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Amplitude : 0Vp-p to 6Vp-p/open,

Resolution : 1mVp-p
<eunits> ::= M (milli)
<units> ::= VPP
MINimum → 0 Vp-p
MAXimum → 6Vp-p/open

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:SCHannel:VOLTage:LEVel:IMMediate:AMPLitude 3VPP
Sets the amplitude of the subchannel output of CH1 to 3Vp-p

2.3.3.6.2 Offset setting/query [:SOURce[1|2]]:SCHannel:VOLTage[:LEVel][:IMMediate]:OFFSet

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

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

Description

Sets/queries the DC offset of subchannel output

Setting parameter

<offset>|MINimum|MAXimum
<offset> ::= <REAL>[<eunits>][<units>]
<REAL> → DC offset : ±3V/open
Resolution : 1mV
<eunits> ::= M (milli)
<units> ::= V
MINimum → -3V/open
MAXimum → 3V/open

Query parameter

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

Response format

<NR3>

Setting example

:SOURce1:SCHannel:VOLTage:LEVel:IMMediate:OFFSet 2.5V
Sets the DC offset of the subchannel output of CH1 to 2.5V

2.3.4 Signal Output Operation

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

■:OUTPut[1|2][:STATe]

□:OUTPut[1|2][:STATe]?

Description

Selects/queries the on/off of the output

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Output Off

1/ON : Output On

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Output Off

1 : Output On

Setting example

:OUTPut1:STATe ON

Sets the output of CH1 to On

Remarks

To set the SYNC/SUB OUT output to Off, use one of the following commands according to the oscillation mode

Continuous or modulated oscillation mode	:OUTPut[1|2]:SYNC:TYPE OFF
Burst oscillation mode	:OUTPut[1|2]:SYNC:BURSt:TYPE OFF
Sweep oscillation mode	:OUTPut[1|2]:SYNC:SWEep:TYPE OFF

2.3.4.2 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 at power-on operation

Setting parameter

ON|OFF|LAST

ON → Output On

OFF → Output Off

LAST→ Setting from the previous power off operation

(Turning Off→On without using the power switch sets the output Off)

Query parameter

None

Response format

ON|OFF|LAST

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

Setting example

:OUTPut1:PON ON

Sets the output of CH1 at power-on to On

2.3.4.3 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 auto range on/off

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Auto range off

1/ON : Auto range on

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Auto range off

1 : Auto range on

Setting example

:SOURce1:VOLTage:RANGe:AUTO ON

Sets the auto range of CH1 to On

2.3.4.4 Reference phase initialization [:SOURce[1|2]]:PHASe:INITiate

■[:SOURce[1|2]]:PHASe:INITiate

Description

Executes the reference phase initialization. WF1968 is performed both channel regardless of the this specification of [1|2] (It is not possible to be initialized separately).

Setting parameter

None

2.3.4.5 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 parameter

OFF| X0.4|X2|X10

OFF → Disables the external addition
X0.4 → Adds 0.4 times of the external addition
X2 → Adds 2 times of the external addition
X10 → Adds 10 times of the external addition

Query parameter

None

Response format

OFF|X0.4|X2|X10

Setting example

:SOURce1:COMBine:FEED X2
Adds 2 times of the external addition to the output of CH1

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

■:OUTPut[1|2]:LOAD

□:OUTPut[1|2]:LOAD?

Description

Sets/queries the load impedance

Setting parameter

<load>|MINimum|MAXimum|INFinity

<load> ::= <INT>[<eunits>][<units>]
<INT> → Load impedance : 1Ω to 10kΩ, Resolution: 1Ω
<eunits> ::= K
<units> ::= OHM

MINimum → 1 Ω
MAXimum → 10kΩ
INFinity → High-Z

Query parameter

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

Response format

<NR1>|INF

Setting example

:OUTPut1:LOAD 50OHM
Sets the load impedance of CH1 to 50Ω

2.3.5 Trigger Operation

2.3.5.1 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 trigger source at the time of sweep

Setting parameter

TIMer|EXTernal|CH1
TIMer → Trigger according to the internal trigger cycle
EXTernal → External trigger
CH1 → Trigger of CH1 (Only CH2 can be selected)

Query parameter

None

Response format

TIM|EXT|CH1
† For the meaning of each response data, see the setting parameter

Setting example

:TRIGger2:SWEep:SOURce EXT
Sets the trigger source of CH2 at the time of sweep to external

2.3.5.2 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 trigger cycle at the time of sweep

Setting parameter

<period>|MINimum|MAXimum

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

<REAL> → Cycle : 100.0 µs to 10,000 s,
Resolution : 5 digits or 0.1µs

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

<units> ::= S

MINimum → 100.0 µs

MAXimum → 10,000 s

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:TRIGger1:SWEep:TIMer 1MS

Sets the internal trigger cycle of CH1 at the time of sweep to 1ms

2.3.5.3 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 trigger polarity at the time of sweep

Setting parameter

POSitive|NEGative|OFF

POSitive → Rising

NEGative → Falling

OFF → Disabled

Query parameter

None

Response format

POS|NEG|OFF

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

Setting example

:TRIGger:SWEep:SLOPe NEGative

Sets the external trigger polarity at the time of sweep to falling

2.3.5.4 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 trigger source at the time of burst

Setting parameter

TIMer|EXTernal|CH1

TIMer → Trigger according to the internal trigger cycle
EXTernal → External trigger
CH1 → External trigger of CH1 (Only CH2 can be selected)

Query parameter

None

Response format

TIM|EXT|CH1

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

Setting example

:TRIGger2:BURSt:SOURce EXT

Sets the trigger source of CH2 at the time of burst to external

2.3.5.5 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 trigger cycle at the time of burst

Setting parameter

<period>|MINimum|MAXimum

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

<REAL> → Cycle : 1.0 µs to 1,000 s,
Resolution : 5 digits or 0.1µs
<eunits> ::= MA (mega) |K|M (milli) U|N
<units> ::= S
MINimum → 1.0µs
MAXimum → 1,000s

Query parameter

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

Response format

<NR3>

Setting example

:TRIGger1:BURSt:TIMer 1MS
Sets the internal trigger cycle of CH1 at the time of burst to 1ms

2.3.5.6 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 trigger polarity at the time of burst

Setting parameter

POSitive|NEGative|OFF
POSitive → Rising (at the time of trigger burst/triggered gate)
Positive polarity (at the time of gate)
NEGative → Falling (at the time of trigger burst/triggered gate)
Negative polarity (at the time of gate)
OFF → Disabled

Query parameter

None

Response format

POS|NEG|OFF
† For the meaning of each response data, see the setting parameter

Setting example

:TRIGger:BURSt:SLOPe NEGative
Sets the external trigger polarity at the time of burst to falling

2.3.5.7 Manual trigger (TRIG key operation) *TRG

■*TRG

Description

Performs the same action as the trigger execution with the [TRIG] button being pressed

Setting parameter

None

Remarks

† Channel cannot be specified. Trigger is targeted to CH1.
† This command may not be used depending on the oscillation mode (See Table 2.3).

2.3.5.8 Manual trigger (TRIG key operation) :TRIGger[1|2][:SEQuence][:IMMediate]

■:TRIGger[1|2][:SEQuence][:IMMediate]

Description

Performs the same action as with the trigger execution when the [TRIG] button is pressed

Setting parameter

None

Remarks

† This command may not be used depending on the oscillation mode (See Table 2.3).

2.3.5.9 Execution control setting :TRIGger[1|2]:SELected:EXECute

■:TRIGger[1|2]:SELected:EXECute

Description

Controls the oscillation modes

Setting parameter

○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

STAR → Start
STOP → Stop
ISTop → Forced termination
HOLD → Hold
RESume → Resume
EBRanch → Event branch

Remarks

† In the sequence mode, whether or not "[1|2]" is specified does not affect the operation.

† This command cannot be used in the burst oscillation mode.

2.3.6 Setting Memory Operations

For the arbitrary waveform memory operation and sequence memory operation, see "2.3.2.6.3 Waveform/arbitrary waveform/memory operation" and "2.3.9.6 Sequence/memory operation." No command is available to operate USB memory.

2.3.6.1 clear
:MEMory:STATe:DELete

■:MEMory:STATe:DELete

Description

Clears the setting memory

Setting parameter

<memory>|MINimum|MAXimum

<memory> ::= <INT>
<INT> → Memory number : 1 to 10
MINimum → 1
MAXimum → 10

2.3.6.2 Store
*SAV

■*SAV

Description

Stores to the set memory

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

2.3.6.3 Recall
*RCL

■***RCL**

Description

Recalls from the set memory

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

2.3.7 Status operations

2.3.7.1 Status register and related queue clear
*CLS

■***CLS**

Description

Clears event register and error queue

Setting parameter

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
- CH1 Questionable data status event register
- CH2 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).

2.3.7.2 Status reporting related preset setting
:STATus:PRESet

■**:STATus:PRESet**

Description

Presets the registers

Setting parameter

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
- CH1 questionable data status transition filter (negative)
- CH1 questionable data status transition filter (positive)
- CH1 questionable data status enable register
- CH2 questionable data status transition filter (negative)
- CH2 questionable data status transition filter (positive)
- CH2 questionable data status enable register
- Warning event enable register
- CH1 warning event enable register
- CH2 warning event enable register

2.3.7.3 Status register at power-on clear flag setting/query *PSC

■*PSC

□*PSC?

Description

Sets/queries the power-on status clear flag

Setting parameter

<state> ::= <INT>

<INT> → 0 : OFF
1 : ON

Query parameter

None

Response format

<NR1>

Setting example

*PSC 1

Enables the automatic clear at the power-on of the enable register, etc.

2.3.7.4 Status byte register query *STB?

□*STB?

Description

Queries the status byte register

Query parameter

None

Response format

<NR1>

2.3.7.5 Service request enable register setting/query *SRE

■*SRE

□*SRE?

Description

Sets/queries the service request enable register

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

*SRE 8

Sets 8 to the service request enable register

2.3.7.6 Standard event status register query *ESR?

□*ESR?

Description

Queries the standard event status register

Query parameter

None

Response format

<NR1>

2.3.7.7 Standard event status enable register setting/query *ESE

■***ESE**

□***ESE?**

Description

Sets/queries the standard event status enable register

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

*ESE 8

Sets 8 to the standard event status enable register.

2.3.7.8 Operation Status Register Group

The operation status register group of this equipment has three register sets (common/CH1/CH2).
However, CH2 is available only in the 2-channel equipment (WF1968). Each register can be accessed by using the following command sets.

2.3.7.8.1 Condition register query :STATus:OPERation[:CH1|:CH2]:CONDition?

□**:STATus:OPERation[:CH1|:CH2]:CONDition?**

Description

Queries the operation status condition register of common/CH1/CH2

Query parameter

None

Response format

<NR1>

2.3.7.8.2 Transition filter register (negative) setting/query :STATus:OPERation[:CH1|:CH2]:NTRansition

■:STATus:OPERation[:CH1|:CH2]:NTRansition

□:STATus:OPERation[:CH1|:CH2]:NTRansition?

Description

Sets/queries the operation status transition filter (negative) of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:OPERation:NTRansition 512

Sets 1 in the bit 9 of the common operation status transition filter (negative)

2.3.7.8.3 Transition filter register (positive) setting/query :STATus:OPERation[:CH1|:CH2]:PTRansition

■:STATus:OPERation[:CH1|:CH2]:PTRansition

□:STATus:OPERation[:CH1|:CH2]:PTRansition?

Description

Sets/queries the operation status transition filter (positive) of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:OPERation:CH1:PTRansition 512

Sets 1 in the bit 9 of the CH1 operation status transition filter (positive)

2.3.7.8.4 Event register query :STATus:OPERation[:CH1|:CH2][:EVENt]?

□:STATus:OPERation[:CH1|:CH2][:EVENt]?

Description

Queries the operation status event register of common/CH1/CH2

Query parameter

None

Response format

<NR1>

Setting example

:STATus:OPERation:EVENt?
Queries the common operation status event register

2.3.7.8.5 Event enable register setting/query :STATus:OPERation[:CH1|:CH2]:ENABle

■:STATus:OPERation[:CH1|:CH2]:ENABle

□:STATus:OPERation[:CH1|:CH2]:ENABle?

Description

Sets/queries the operation status event enable register of common/CH1/CH2

Setting parameter

<value> ::= <INT>
<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:OPERation:CH1:ENABle 512
Sets 1 in the bit 9 of the CH1 operation status event enable register

2.3.7.9 Questionable data status register group

The questionable data status register group of this equipment has three register sets (common/CH1/CH2). However, CH2 is available only in the 2-channel equipment (WF1968). Each register can be accessed by using the following command sets.

2.3.7.9.1 Condition register query :STATus:QUEStionable[:CH1|:CH2]:CONDition?

□:STATus:QUEStionable[:CH1|:CH2]:CONDition?

Description

Queries the questionable data status condition register of common/CH1/CH2

Query parameter

None

Response format

<NR1>

2.3.7.9.2 Transition filter register (negative) setting/query :STATus:QUEStionable[:CH1|:CH2]:NTRansition

■:STATus:QUEStionable[:CH1|:CH2]:NTRansition

□:STATus:QUEStionable[:CH1|:CH2]:NTRansition?

Description

Sets/queries the questionable data status transition filter (negative) of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:QUEStionable:NTRansition 16

Sets 1 in the bit 4 of the common questionable data status transition filter (negative)

2.3.7.9.3 Transition filter register (positive) setting/query :STATus:QUEStionable[:CH1|:CH2]:PTRansition

■:STATus:QUEStionable[:CH1|:CH2]:PTRansition

□:STATus:QUEStionable[:CH1|:CH2]:PTRansition?

Description

Sets/queries the questionable data status transition filter (positive) of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:QUEStionable:CH1:PTRansition 16

Sets 1 in the bit 4 of the CH1 questionable data status transition filter (positive)

2.3.7.9.4 Event register query :STATus:QUEStionable[:CH1|:CH2][:EVENt]?

□:STATus:QUEStionable[:CH1|:CH2][:EVENt]?

Description

Queries the questionable data status event register of common/CH1/CH2

Query parameter

None

Response format

<NR1>

2.3.7.9.5 Event enable register setting/query :STATus:QUEStionable[:CH1|:CH2]:ENABle

■:STATus:QUEStionable[:CH1|:CH2]:ENABle

□:STATus:QUEStionable[:CH1|:CH2]:ENABle?

Description

Sets/queries the questionable data status event enable register of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:QUEStionable:ENABle 16

Sets 1 in the bit 4 of the common questionable data status event enable register

2.3.7.10 Warning event register group

The warning event register group of this equipment has three register sets (common/CH1/CH2). However, CH2 is available only in the 2-channel equipment (WF1968). Each register can be accessed by using the following command sets.

2.3.7.10.1 Event register query :STATus:WARNing[:CH1|:CH2][:EVENt]?

□:STATus:WARNing[:CH1|:CH2][:EVENt]?

Description

Queries the warning event register of common/CH1/CH2

Query parameter

None

Response format

<NR1>

2.3.7.10.2 Event enable register setting/query :STATus:WARNing[:CH1|:CH2]:ENABle

■:STATus:WARNing[:CH1|:CH2]:ENABle

□:STATus:WARNing[:CH1|:CH2]:ENABle?

Description

Sets/queries the warning event enable register of common/CH1/CH2

Setting parameter

<value> ::= <INT>

<INT> → For setting values, see "3. Status System."

Query parameter

None

Response format

<NR1>

Setting example

:STATus:WARNing:CH1:ENABle 16

Sets 1 in the bit 4 of the CH1 warning event enable register

2.3.8 2-channel operation

These commands are only enabled for the 2-channel equipment (WF1968)

2.3.8.1 2-channel mode setting/query :CHANnel:MODE

■:CHANnel:MODE

□:CHANnel:MODE?

Description

Selects/queries the channel mode

Setting parameter

INDependent|PHASe|TONE|RATio|DIFFerential|DIF2

INDependent	→	Independent
PHASe	→	2 phase
TONE	→	Constant frequency difference
RATio	→	Constant frequency ratio
DIFFerential	→	Differential output 1
DIF2	→	Differential output 2

Query parameter

None

Response format

IND|PHAS|TONE|RAT|DIFF|DIF2

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

Setting example

:CHANnel:MODE INDependent

Sets the channel mode to independent

Remarks

† This command is available only for the 2-channel equipment(WF1968)

2.3.8.2 Constant frequency difference mode: frequency difference setting/query :CHANnel:DELTa

■:CHANnel:DELTa

□:CHANnel:DELTa?

Description

Sets/queries the frequency difference in the constant frequency difference mode

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Frequency difference : (CH2 frequency – CH1 frequency)

Resolution : 0.01µHz

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

† Note that when the unit is frequency, M is used to mean "10^6"

<units> ::= HZ

MINimum → Sets the minimum value

MAXimum → Sets the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Queries the minimum value

MAXimum → Queries the maximum value

Response format

<NR3>

Setting example

:CHANnel:DELTa 1KHZ

Set the frequency difference to 1kHz

Remarks

† This command is available only for the 2-channel equipment

2.3.8.3 Constant frequency ratio mode: frequency ratio setting/query :CHANnel:RATio

■:CHANnel:RATio

□:CHANnel:RATio?

Description

Sets/queries the frequency ratio in the constant frequency ratio mode

Setting parameter

<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 parameter

None

Response format

<NR1>,<NR1>

Setting example

:CHANnel:RATio 2,3

Sets the frequency ratio to 2:3

Remarks

† This command is available only for the 2-channel equipment

2.3.8.4 2-channel equivalence operation setting/query :INSTrument:COUPle

■:INSTrument:COUPle

□:INSTrument:COUPle?

Description

Selects/queries the 2-channel equivalence setting state

Setting parameter

ALL|NONE

ALL → Equivalence setting On

NONE → Equivalence setting Off

Query parameter

None

Response format

ALL|NONE

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

Setting example

:INSTrument:COUPle ALL

Sets to use the 2-channel equivalence setting function

Remarks

† This command is available only for the 2-channel equipment

2.3.9 Sequence Mode

Starting/stopping/forced termination/hold/resume/event branch of sequence can be performed by ":TRIGger[1|2]:SELected:EXECute" described in "2.3.5.9 Trigger operation/execution control."

2.3.9.1 Sequence selection [:SOURce[1|2]]:SEQuence:STATe

■[:SOURce[1|2]]:SEQuence:STATe

□[:SOURce[1|2]]:SEQuence:STATe?

Description

Switches the oscillation mode to sequence
Queries whether or not the oscillation mode is sequence

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Disabled
1/ON : Enabled

Query parameter

None

Response format

<NBOL>

Setting example

:SOURce1:SEQuence:STATe ON
Sets the oscillation mode to sequence

2.3.9.2 Sequence data I/O {:TRACe|:DATA}:SEQuence

■{:TRACe|:DATA}:SEQuence

□{:TRACe|:DATA}:SEQuence?

Description

Performs the input and output of the sequence data

Setting parameter

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

<memory> ::= <INT>
<INT> → Memory number : 0 to 10
<name> ::= <STR>
<STR> → Sequence name (20 characters or less)
† Optional (If omitted, the setting is not changed)
† If the sequence name is less than 20 characters, the remaining characters are filled with spaces (ASCII code 32)
<data> ::= <BLK>
<BLK> → Sequence data
(See "2.4 Specification of I/O Data of Sequence")

Query parameter

<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> → Number other than "0", which indicates the number of digits of the subsequent <byte>
<byte> → Numeric string which indicates the number of byte of the subsequent <data>
<data> → Sequence data
(See "2.4 Specification of I/O Data of Sequence")

Remarks

(1) Sequence data is in text format.
(2) Memory number 0 is the current memory.
(3) The sequence name of memory number 0 is "<Current Memory>" (20 characters).
† 1 channel equipment (WF1967) can import the sequence data obtained by the 2 channel equipment (WF1968). In this case, however, the data of CH2 is ignored.
† 2 channel equipment (WF1968) can import the sequence data obtained by the 1 channel equipment (WF1967). In this case, however, the sequence of CH2 is considered as the initial data.
† The sequence data read out from the WF1973/WF1974 can be imported to WF1967/WF1968 for use. The sequence data read out from the WF1967/WF1968, however, cannot be imported to WF1973/WF1974 (cannot be used).

2.3.9.3 Compilation of sequence data :TRIGger[1|2]:COMPile[:IMMediate]

■:TRIGger[1|2]:COMPile[:IMMediate]

Description

Compiles the sequence data

Setting parameter

None

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

2.3.9.4 Acquisition of current step number [:SOURce[1|2]]:SEQuence:CSTep?

□[:SOURce[1|2]]:SEQuence:CSTep?

Description

Queries the current step of the sequence

Query parameter

None

Response format

<NR1>

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

2.3.9.5 Initialization of sequence data {:TRACe|:DATA}:SEQuence:CLEar

■{:TRACe|:DATA}:SEQuence:CLEar

Description

Initializes the sequence data

Setting parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number : 0 to 10

Remarks

† Memory number 0 is the current memory.

2.3.9.6 Memory operations

No command is available to operate USB memory.

2.3.9.6.1 Sequence store {:TRACe|:DATA}:SEQuence:STORe

■{:TRACe|:DATA}:SEQuence:STORe

Description

Stores the sequence data

Setting parameter

<memory>,<name>

<memory> ::= <INT>

<INT> → Memory number of location to save : 1 to 10

<name> ::= <STR>

<STR> → Sequence name (20 characters or less)

† Optional (If omitted, the setting is not changed)

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

Setting example

:TRACe:SEQuence:STORe 2,"name"

Saves the sequence data with the sequence name "name" in the memory number 2

2.3.9.6.2 Sequence recall {:TRACe|:DATA}:SEQuence:RECall

■{:TRACe|:DATA}:SEQuence:RECall

Description

Reads out the sequence data

Setting parameter

<memory>|MINimum|MAXimum

<memory> ::= <INT>

<INT> → Memory number : 1 to 10

MINimum → 1

MAXimum → 10

Setting example

:TRACe:SEQuence:RECall 2

Imports the sequence data of memory number 2

2.3.9.7 Sequence automatic execution at power on setting/query [:SOURce[1|2]]:SEQuence:PON

■[:SOURce[1|2]]:SEQuence:PON

□[:SOURce[1|2]]:SEQuence:PON?

Description

Selects/queries the sequence automatic execution on/off at power-on operation

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

Setting parameter

ON|OFF|LAST

ON → Sequence automatic execution On
OFF → Sequence automatic execution Off
LAST→ Setting from the previous power-off operation
(Turning Off -> On without using the power switch sets the sequence automatic execution Off)

Query parameter

None

Response format

ON|OFF|LAST
† For the meaning of each response data, see the setting parameter

Setting example

:SEQuence:PON ON
Sets the sequence automatic execution at power-on operation to On

2.3.10 Other Operations

2.3.10.1 Equipment-specific information query *IDN?

□*IDN?

Description

Reads out the device ID

Query parameter

None

Response format

<corporation>,<model>,<serial>,<firmware>

<corporation> → Manufacturer :NF Corporation

<model>	→	Model	: (Example) WF1967
<serial>	→	Serial number	: (Example) 1234567
<firmware>	→	Firmware version	: (Example) Ver1.00

2.3.10.2 Error message query :SYSTem:ERRor?

□:SYSTem:ERRor?

Description

Queries the error

Query parameter

None

Response format

<code>,<message>

<code> ::= <INT>

<INT> → Error code

<message> ::= <STR>

<STR> → Error message

2.3.10.3 Initialization of setting *RST

■*RST

Description

Initializes the setting

† This does not clear the status registers, etc.

Setting parameter

None

2.3.10.4 Operation completion event bit setting *OPC

■*OPC

Description

Sets 1 to the OPC bit at the previous termination of all commands

Setting parameter

None

2.3.10.5 Setting output queue to 1 at operation completion *OPC?

□*OPC?

Description

Sets 1 to the output buffer at the previous termination of all commands

Query parameter

None

2.3.10.6 Waiting for command, query execution *WAI

■*WAI

Description

Waits for the termination of all previous commands

Setting parameter

None

2.3.10.7 Self diagnosis result query *TST?

□*TST?

Description

Queries the self diagnosis result

Query parameter

None

Response format

<NR1> → 0

Remarks

(1) This equipment always returns 0.
(2) Remote control cannot check the internal status. Execute this query by the panel operation.

2.3.10.8 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 parameter

INTernal|EXTernal

INTernal → Internal clock

EXTernal → External reference frequency input

Query parameter

None

Response format

INT|EXT

Setting example

:SOURce:ROSCillator:SOURce INTernal

Sets the reference frequency source to the internal clock

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

2.3.10.9 External reference frequency output setting/query [:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]

■[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]

□[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]?

Description

Sets/queries the reference frequency output

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Output Off

1/ON : Output On

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Output Off

1 : Output On

Setting example

:ROSCillator:OUTPut[:STATe] ON

Sets the reference frequency output to On

Remarks

† Whether or not "[1|2]" is specified does not affect the operation.

2.4 Specification of I/O Data of Sequence

The data handled by the I/O command of sequence "{:TRACe|:DATA}:SEQuence" is in INI file format. This section describes the sections and keys of the INI file.

2.4.1 Section [FILE]

This sets the parameter related to the file format. This section is mandatory.

(1) File version.

VERSION = <version>

<version> ::= <STR>

<STR> → Version of the file

† Specify "1.00" as the file version.

2.4.2 Section [SYSTEM]

This section specifies the system information on the equipment side. This section is mandatory.

(1) Model name

MODEL = <mod>

<mod> ::= <STR>

<STR> → Model name

(2) Number of channel

NCHAN = <chan>

<chan> ::= <INT>

<INT> → Number of channel

(3) Firmware version

VERSION = <version>

<version> ::= <STR>

<STR> → Version of the firmware

† Specify "1.00" as the firmware version.

2.4.3 Section [DATA]

(1) Sequence

This section sets the data related to the entire sequence.

SEQ = <stsstp>,<syncout>,<dctrl>,<dctrl_mode>,<trgslp>

<stsstp> ::= <INT>
<INT> → Start step (1 to 255)

<syncout> ::= <DISC>
<DISC> → Synchronization 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> → How to use the digital control (STAR: Start, SBR: State branch)

<trgslp> ::= <DISC>
<DISC> → Trigger polarity (POS: Positive, NEG: Negative, OFF: Disabled)

(2) Noise bandwidth

This sets the bandwidth of noise.

NOISEBW#<chan> = <BW>
<chan> ::= <INT>
<INT> → Channel number (1 to 2)
<BW> ::= <INT>
<INT> → Noise bandwidth number (1 to 7)

(3) Step

This sets 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 255)

<time> ::= <REAL>
<REAL> → Step time

<sterm> ::= <DISC>

<DISC> → Step termination (CONT: Continues, STOP: Stops)

<auto_hold> ::= <BOL>
<BOL> → Auto hold ON/OFF (0 / OFF : OFF, 1 / ON : ON)

<scode> ::= <INT>
<INT> → Step code

<stbra_sw> ::= <BOL>
<BOL> → State branch step ON/OFF (0 / OFF : OFF, 1 / ON : ON)

<stbra> ::= <INT>
<INT> → State branch step (0 to 255)

<evbra_sw> ::= <BOL>
<BOL> → Event branch step ON/OFF (0 / OFF : OFF, 1 / ON : ON)

<evbra> ::= <INT>
<INT> → Event branch step (0 to 255)

<jpstp_sw> ::= <BOL>
<BOL> → Jump step ON/OFF (0 / OFF : OFF, 1 / ON : ON)

<jpstp> ::= <INT>
<INT> → Jump step (0 to 255)

<jpcnt_sw> ::= <DISC>
<DISC> → Number designation of jumps (INF: Infinite number, ON: Number of jumps as designated)

<jpcnt> ::= <INT>
<INT> → Number of jumps (1 to 9999)

<sphase_sw> ::= <BOL>
<BOL> → Termination phase ON/OFF (0 / OFF : OFF, 1 / ON : ON)

<sphase> ::= <REAL>
<REAL> → Termination phase

(4) Channel data

This sets the data related to each channel.

CHAN#<step>#<chan> = <wf_type>,<wf_arb_no>,<wf_polarity>,<wf_scale>,<wf_squex>,
<freq_val>,<freq_actn>,<amptd_val>,<amptd_actn>,<ofs_val>,
<ofs_actn>,<ph_val>,<ph_actn>,<dy_val>,<dy_actn>

<step> ::= <INT>
<INT> → Step number (0 to 255)

<chan> ::= <INT>
<INT> → Channel number (1 to 2)

<wf_type> ::= <DISC>
<DISC> → Waveform (DC: DC, NOIS: Noise, SIN: Sine wave,
SQU: Square wave, USER: Arbitrary wave)

<wf_arb_no> ::= <INT>
<INT> → Arbitrary wave number (0 to 128)

<wf_polarity> ::= <DISC>
<DISC> → Waveform polarity (NORM: Normal, INV: Inverted)

<wf_scale> ::= <DISC>
<DISC> → Waveform amplitude range (PFS: 0 / +FS, FS: ±FS, MFS: -FS / 0)

<wf_squex> ::= <BOL>
<BOL> → Square wave extension ON/OFF (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

WF1967/WF1968 provide the commands to trigger from the remote control (GET (Group Execute Trigger), "*TRG", and ":TRIGger[1|2][:SEQuence][:IMMediate]") and the command to control the oscillation status (:TRIGger[1|2]:SELected:EXEcute").

As shown in Table 2.3, some of these commands are not available depending on the oscillation mode. Invalid command will be ignored.

Table 2.3 Availability of Trigger/Oscillation Status Control Commands for Each Oscillation Mode

Oscillation Mode	GET/*TRG/ :TRIGger[1|2][:SEQuence][:IMMediate]	:TRIGger[1|2]:SELected:EXEcute
Continuous	Disabled	Disabled
Modulation	Disabled	Enabled
Sweep		
Continuous	Disabled	Enabled
Single	Enabled	Enabled
Gated single	Enabled	Enabled
Burst		
Auto burst	Disabled	Disabled
Trigger burst	Enabled	Disabled
Gate	Disabled	Disabled
Triggered gate	Enabled	Disabled
Sequence	Disabled	Enabled

In above commands, since GET and "*TRG are designated for CHI, channel cannot be specified. However, when the 2-channel equivalence setting is on, CH1 and CH2 can be specified (WF1968 only).

2.6 System Unit

The system unit is assumed to be a default unit in the setting/query of parameters such as the frequency and amplitude with the remote control. Changing the system unit is not reflected on this device screen. If you omit the unit in the parameter setting, the system unit is assumed to be the unit when executing a command. When you query parameters, the response message is returned based on the system unit.
For example, when the system unit of amplitude is Vrms, this equipment sets the amplitude as shown below.

When the unit is specified as Vp-p:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 1.0Vpp
→ Sets the amplitude to 1.0Vp-p because this equipment interprets the command in the specified unit.

When the unit is omitted:
:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 1.0
→ Sets the amplitude to 1.0Vrms because this equipment interprets the command by using the system unit as the unit.

The following commands are used to set the system unit:

Setting of system unit for frequency:
[:SOURce[1|2]]:FREQuency:UNIT

Setting of system unit for amplitude:
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:AMPLitude:UNIT

Setting of system unit of DC offset, high level, and low level:
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:UNIT
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH:UNIT
[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW:UNIT

† One system unit is shared with DC offset, high level, and low level. The above three commands have the same function.

Setting of system unit for phase:
[:SOURce[1|2]]:PHASe:UNIT

Setting of system unit for the duty of square wave/pulse:

[:SOURce[1|2]]:PULSe:DCYCle:UNIT

Setting of system unit for cycle:

[:SOURce[1|2]]:PULSe:PERiod:UNIT

3. Status System

WF1967/WF1968 provide the status reporting function defined in IEEE488.2.

3.1 Status Byte Register and Service Request Enable Register

The configuration of the status byte register and the service request enable register is shown in Figure 3.1.

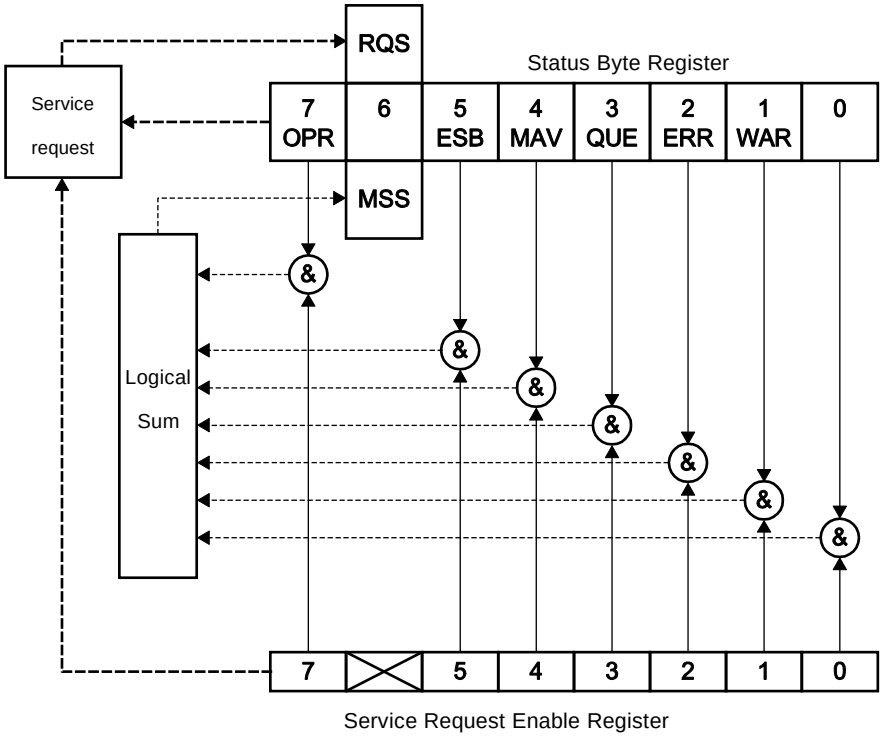


Figure 3.1 Status Byte Register and Service Request Enable Register

3.1.1 Status Byte Register

Each bit of the status byte register is described in Table 3.1.

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 when a *CLS command is received.

3.1.2 Service Request Enable Register

The service request enable register is used to select the summary bit within the status byte register that generates service requests shown in Figure 3.1.
The service request enable register is cleared when the power is turned on while the power on status clear flag (*set in PSC) is set to TRUE.

3.2 Standard Event Status Register Group

The standard event status register group is shown in Figure 3.2.

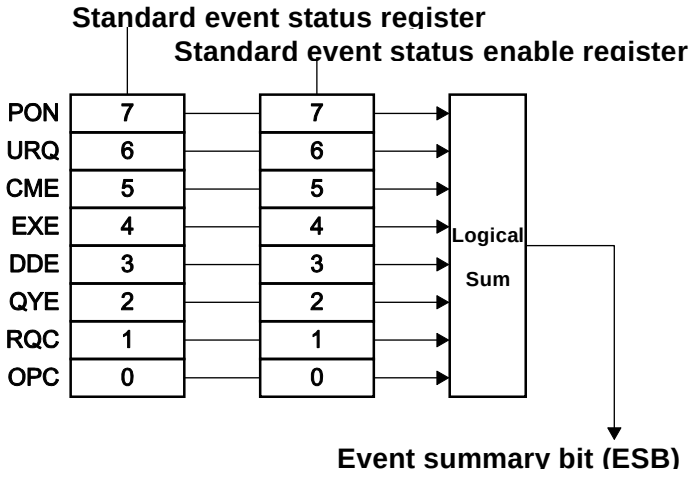


Figure 3.2 Standard Event Status Register Group

3.2.1 Standard Event Status Register

Content of each bit of the standard event status register is shown in Table 3.2.

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	Equipment-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 when the *ESR? query or *CLS command is received.

3.2.2 Standard Event Status Enable Register

The standard event status enable register is used to select the bit of the standard event status register as shown in Figure 3.2, and reflect the status of the selected bit to the ESB of the status byte register.

The standard event status enable register is cleared when the power is turned on while the power on status clear flag (set in *PSC) is set to TRUE.

3.3 Operation status register group / Questionable data status register group

The configuration of the operation status register group and the questionable data status register group is shown in Figure 3.3.

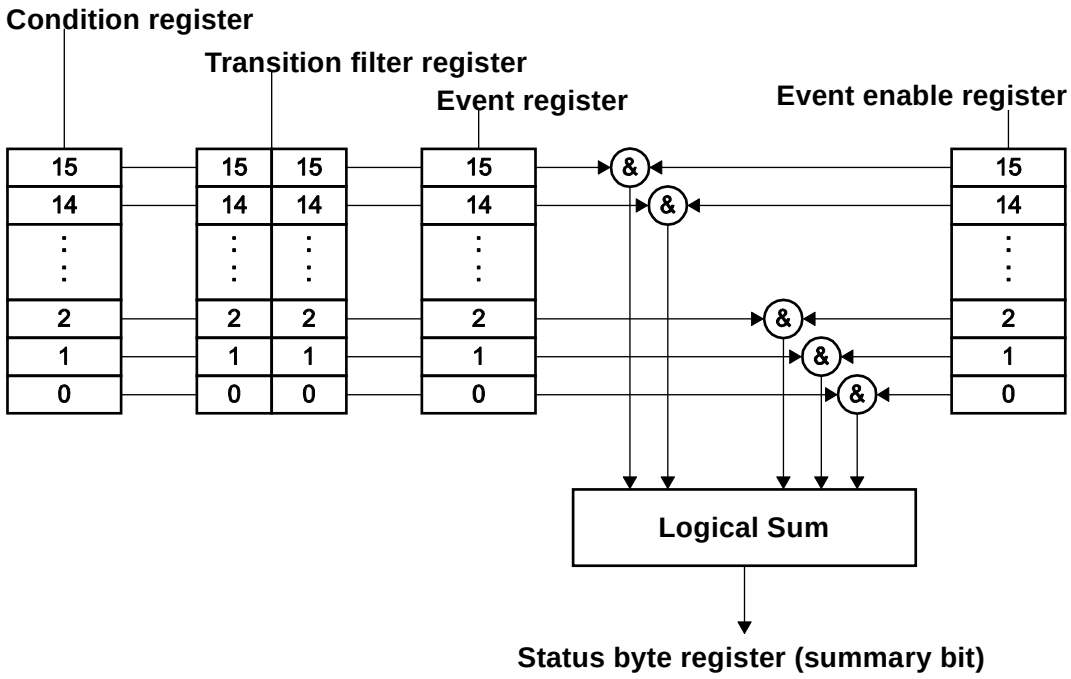


Figure 3.3 Operation Status Register Group/Questionable Data Status Register Group

3.3.1 Overview of Registers

3.3.1.1 Condition register

The condition register shows the current status of WF1967/WF1968. This register is not cleared even when a query addressed to the condition register is received.

3.3.1.2 Transition filter register

The transition filter register is used to determine the event bit transition. The relationship between the transition filter setting and the event register transition is shown in Table 3.3.

Table 3.3 Transition Filter and Event Register Transition

Each bit setting of positive transition filter	Each bit setting of negative transition filter	Transition of condition register to make each bit of event register 1
1	0	0 → 1
0	1	1 → 0
1	1	0 → 1 or 1 → 0
0	0	Each bit of event register bit is not made 1.

The transition filter register is cleared when :STATus:PRESet command is received or when the power is turned on while the power on status clear flag (set in *PSC) is set to TRUE .

3.3.1.3 Event register

The event register is a register that reflects the changes of the condition register according to the setting of the transition filter register. The event register is cleared upon reception of a query addressed to the event 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 is used to select the bit of the event register as shown in Figure 3.3, and reflect the status of the selected bit to the summary bit of the status byte register.
The event enable register is cleared when :STATus:PRESet command is received or when the power on is turned on while the power on status clear flag (set in *PSC) is set to TRUE.

3.3.2 Operation Status Register Group

The operation status register group is shown in Figure 3.3. This register group has one register set for each channel and one register set to summarize their sets. Content of each operation status register is described in Table 3.4 and Table 3.5.

Table 3.4 Operation Status Register

Bit	Weight	Description
0		(Non-use)
1		(Non-use)
2		(Non-use)
3		(Non-use)
4		(Non-use)
5		(Non-use)
6		(Non-use)
7		(Non-use)
8		(Non-use)
9	512	CH1 operation status register summary
10	1024	CH2 operation status register summary
11		(Non-use)
12		(Non-use)
13		(Reserved)
14		(Reserved)
15		Always 0

Table 3.5 CH1 (CH2) Operation Status Register

Bit	Weight	Description
0	1	Sequence: EDIT Shows the Edit status.
1	2	Sequence: READY Shows the Ready status.
2	4	Sequence: RUN Shows the Run status or Hold status.
3	8	Sequence: HOLD Shows the Hold status.
4		(Unused)
5		(Unused)
6	64	Modulation: RUN Shows that modulation function is working. This bit shows the status of modulation function also in the sweep/burst oscillation mode.
7	128	Modulation/sweep/burst: STOP Shows the status such as the Stop and Conflict statuses in which the primary oscillation mode is not made. Even if the status is Run, this bit is set to 1 during the trigger delay period in the trigger burst. The triggered gate is closed.
8	256	Continuous oscillation/modulation/sweep/burst: RUN Shows the Run status and Hold status. (This does not show the status of modulation in the sweep/burst oscillation mode)
9	512	Sweep: HOLD Shows the Hold status in the sweep oscillation mode.
10	1024	Sweep/burst: TRIGGER WAIT Shows the TrigWait status in the sweep/burst oscillation mode.
11	2048	Modulation/sweep/burst: CONFLICT Shows the Conflict status.
12	4096	Synchlator: UnLock Shows the UnLock status.
13		(Unused)
14		(Unused)
15		Always 0

The relationship between each bit in Table 3.5 and the output waveform is shown below.

3.3.2.1 Continuous oscillation

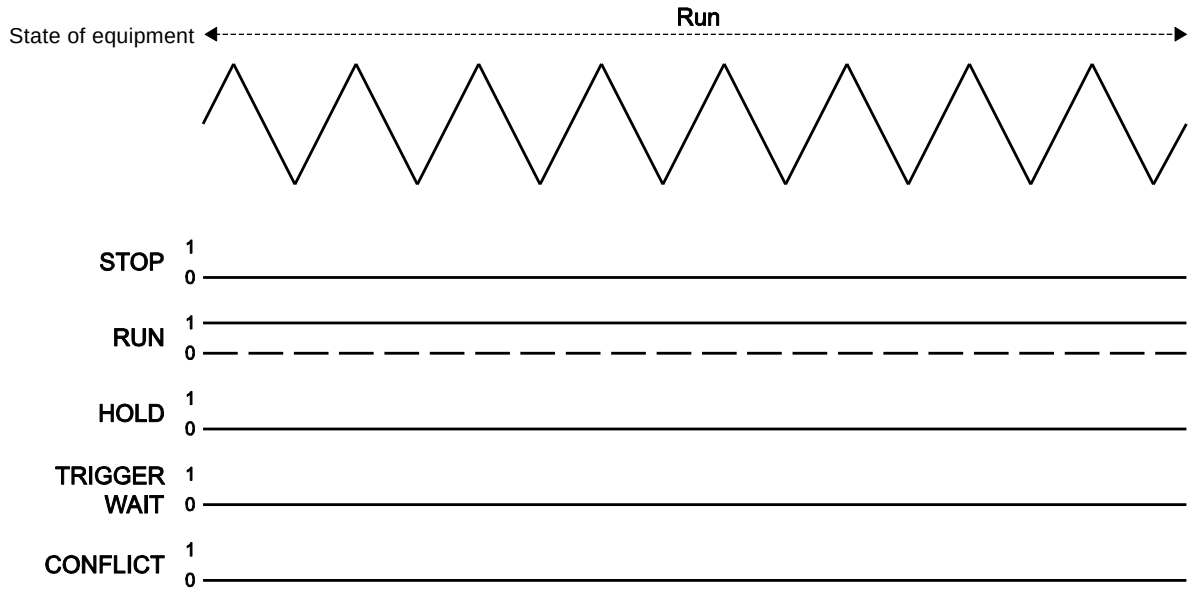


Figure 3.4 Relationship between Output and Operation Status Register (Bit 7-11) at Continuous Oscillation

3.3.2.2 Modulation

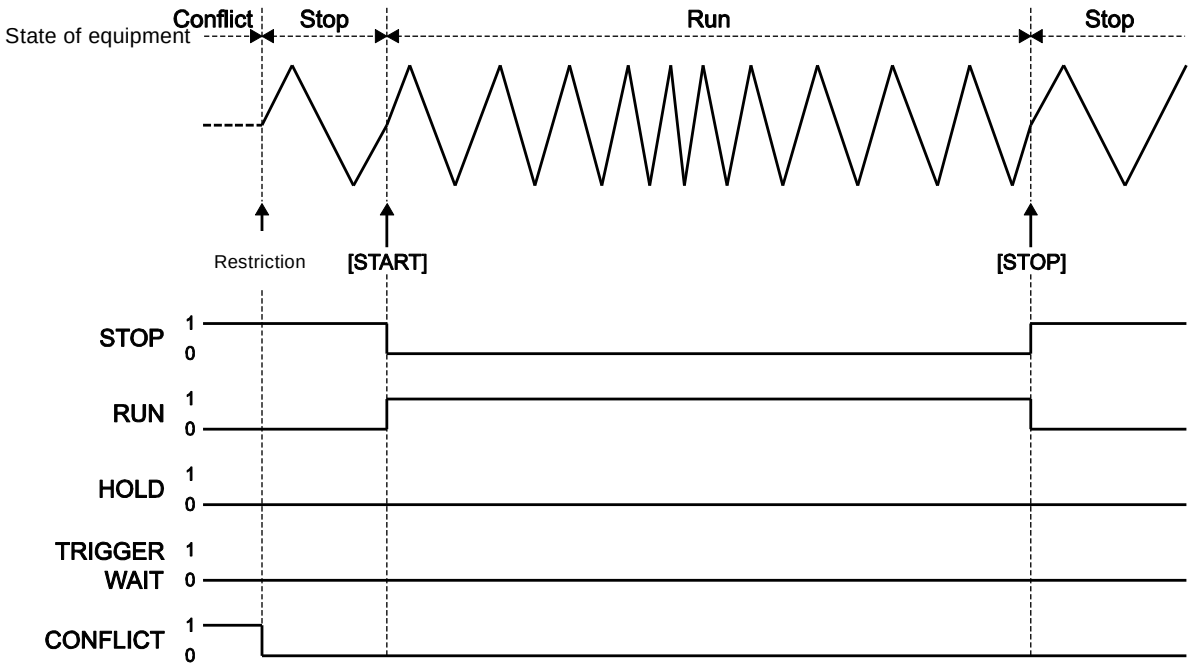


Figure 3.5 Relationship between Output and Operation Status Register (Bit 7-11) at Modulation

3.3.2.3 Sweep

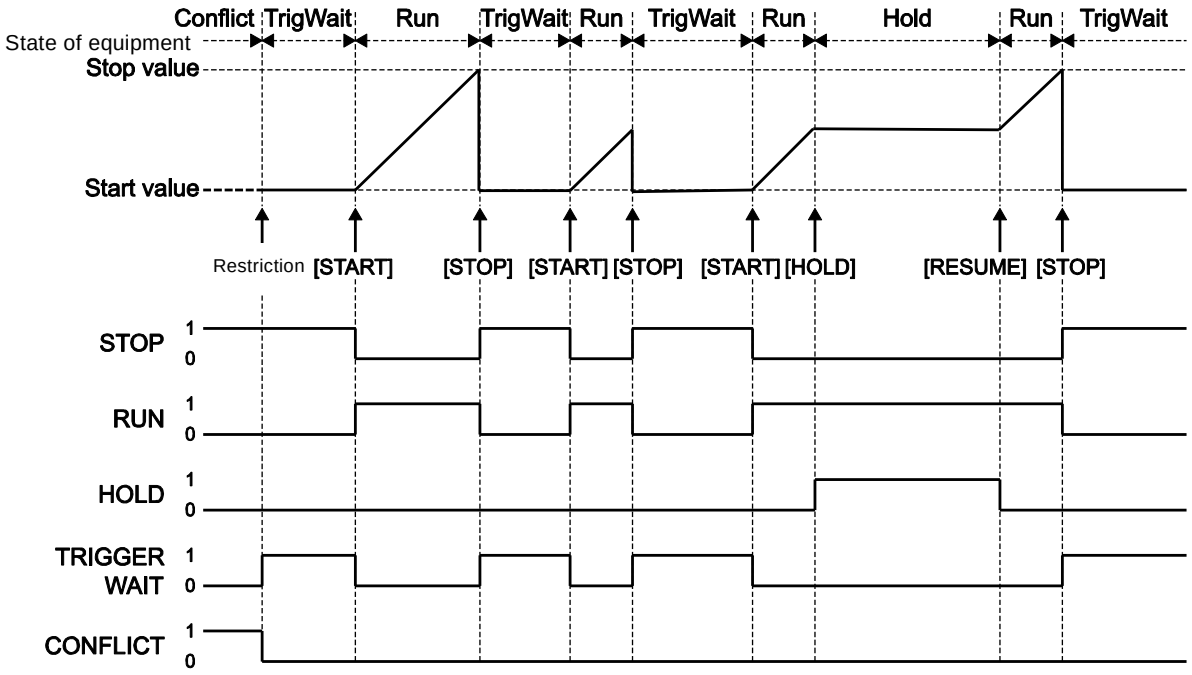


Figure 3.6 Relationship between Output and Operation Status Register (Bit 7 to 11) in Case of Single-Shot Sweep or Gated Single-Shot Sweep

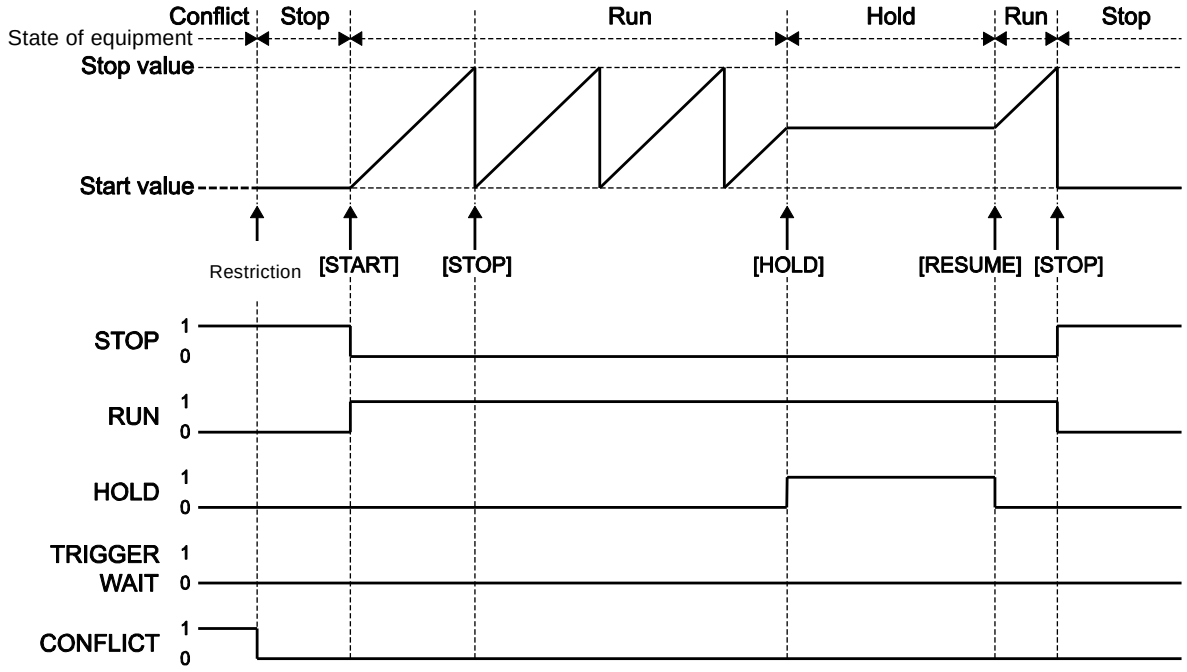


Figure 3.7 Relationship between Output and Operation Status Register (Bit 7-11) at Continuous Sweep

3.3.2.4 Burst

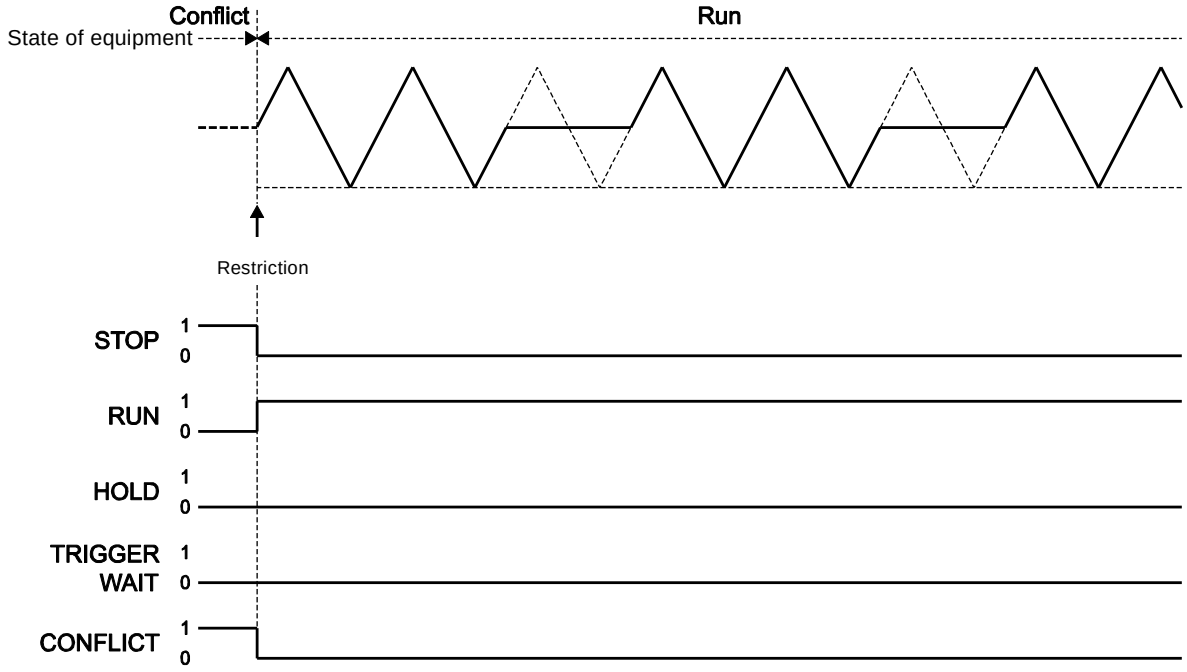


Figure 3.8 Relationship between Output and Operation Status Register (Bit 7-11) at Auto Burst

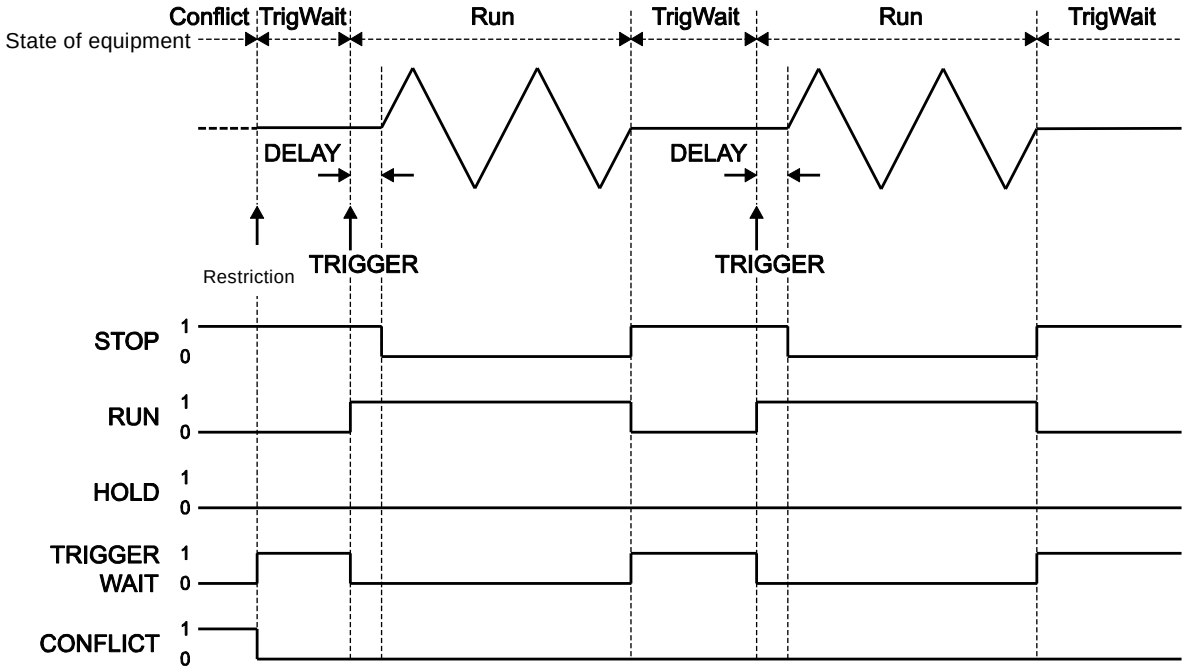


Figure 3.9 Relationship between Output and Operation Status Register (Bit 7-11) at Trigger Burst

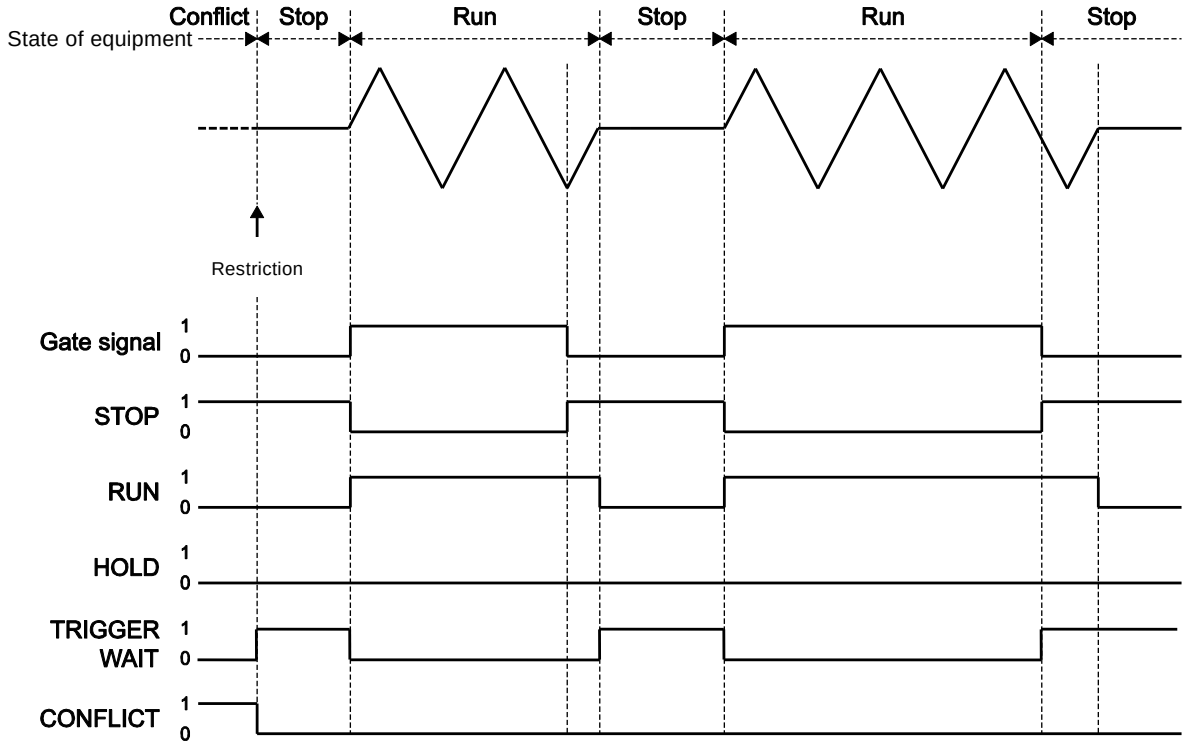


Figure 3.10 Relationship between Output and Operation Status Register (Bit 7 to 11) at Gate

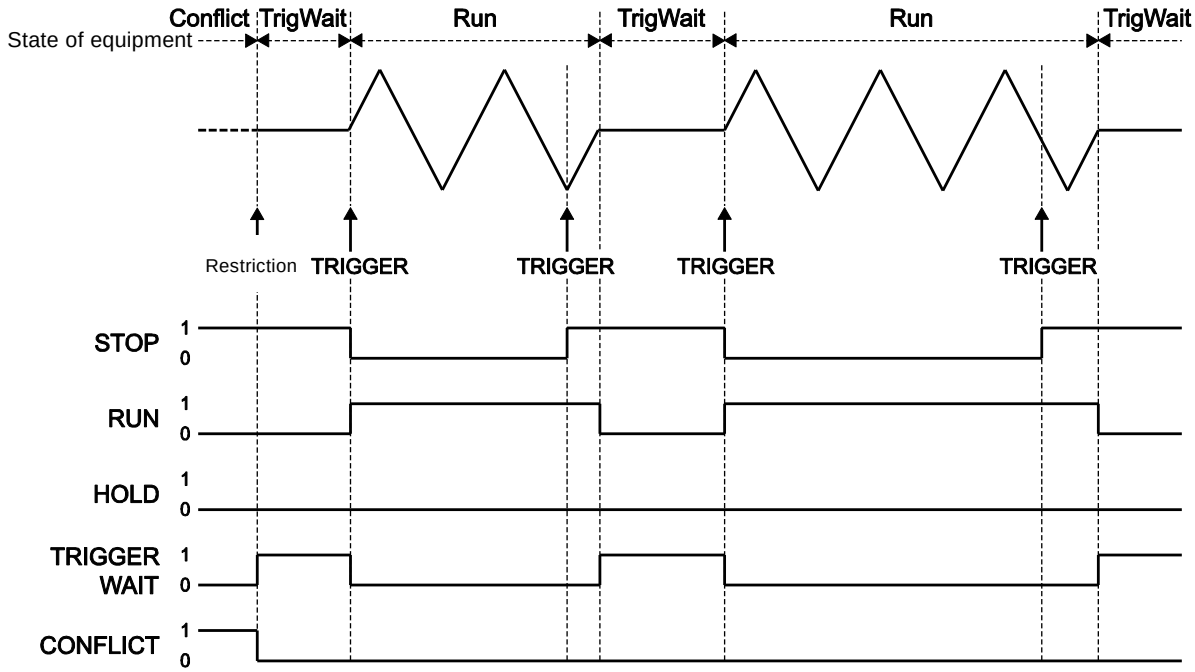


Figure 3.11 Relationship between Output and Operation Status Register (Bit 7 to 11) at Triggered Gate

3.3.2.5 Sequence

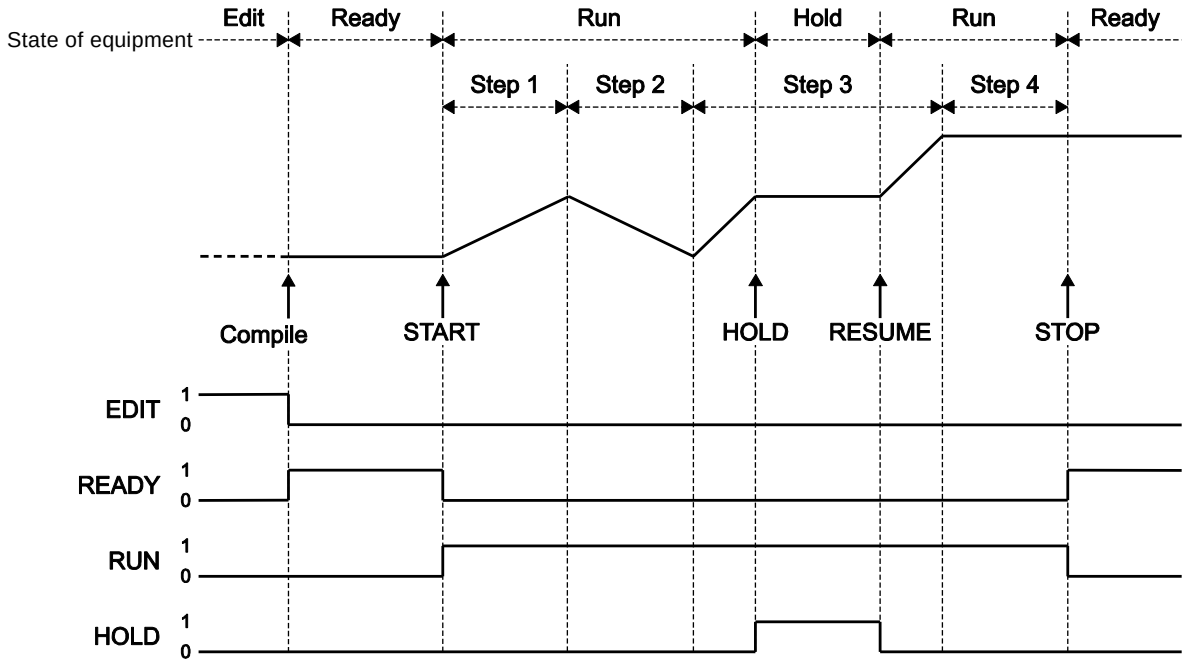


Figure 3.12 Relationship between Output and Operation Status Register (Bit 0 to 3) at Sequence

3.3.3 Questionable Data Status Register Group

The contents of the questionable data status register is shown in Table 3.6.

Table 3.6 Questionable Data Status Register

Bit	Weight	Description
0	1	CH1 overload register summary
1		(Unused)
2		(Unused)
3		(Unused)
4	16	Overheat detection
5		(Unused)
6	64	No external reference clock
7		(Unused)
8	256	Shows that the calibration is not completed.
9		(Unused)
10	1024	CH2 overload register summary
11		(Unused)
12		(Unused)
13		(Unused)
14		(Unused)
15		Always 0

Content of CH1 and CH2 overload register is described in Table 3.7.

Table 3.7 CH1 and CH2 Overload Register

Bit	Weight	Description
0	1	Main output overload
1	2	Sub output overload
2		(Unused)
3		(Unused)
4		(Unused)
5		(Unused)
6		(Unused)
7		(Unused)
8		(Unused)
9		(Unused)
10		(Unused)
11		(Unused)
12		(Unused)
13		(Unused)
14		(Unused)
15	32768	Always 0

3.4 Warning Event Register Group

The warning event register group is shown in Table 3.8. This register group configures three register sets: one register set for each channel and one register set to summarize their sets.

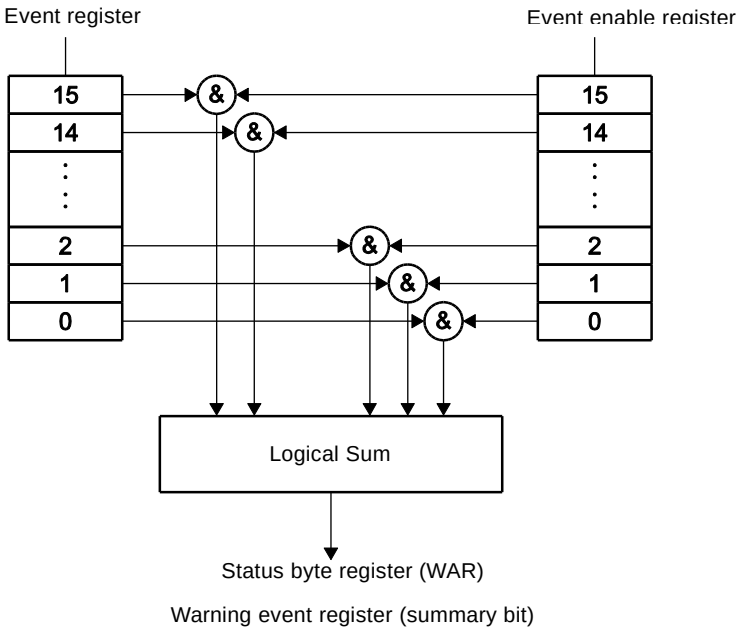


Figure 3.13 Warning Event Status Register Group Model

3.4.1 Event Register

Content of each bit of the warning event register and the CH1 (CH2) warning event register is shown in Table 3.8 and Table 3.9.

The meaning of terms in Table 3.9 is as follows:

Channel mode parameters:

Means the frequency difference and frequency ratio.

Waveform parameters:

Means the duty variable range, waveform polarity, amplitude range, ramp wave symmetry, and parameter variable waveform-specific parameter.

Basic parameters:

Means the frequency, period (cycle), phase, amplitude, DC offset, high level, low level, duty, pulse width, and rising/falling time.

Other parameters:

Means the channel mode, channel mode parameter, waveform, waveform parameter, basic parameter, and parameters other than system unit.

The warning event register shows the status change of the equipment due to the remote control and does not show the status change of the equipment due to the panel operation.

Table 3.8 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	32768	Always 0

Table 3.9 CH1 (CH2) Warning Event Register

Bit	Weight	Description
0	1	The waveform or waveform parameter is changed due to the change of channel mode or channel mode parameter.
1	2	The basic parameter is changed due to the change of channel mode or channel mode parameter.
2	4	The oscillation mode is changed due to the change of channel mode or channel mode
3	8	Other parameters are changed due to the change of channel mode or channel mode parameter.
4	16	The channel mode or channel mode parameter is changed due to the change of waveform
5	32	The basic parameter is changed due to the change of waveform or waveform
6	64	The oscillation mode is changed due to the change of waveform or waveform
7	128	Other parameters are changed due to the change of waveform or waveform parameter.
8	256	Other basic parameters are changed due to the change of basic parameters (frequency, period (cycle), phase, amplitude, DC offset, high level, and low level).
9	512	Other basic parameters are changed due to the change of basic parameters (duty and pulse width).
10	1024	Other basic parameters are changed due to the change of basic parameters (rising time and falling time).
11	2048	Other parameters are changed due to the change of basic parameters.
12	4096	System unit is changed.
13		(Unused)
14	16384	Other parameters are changed.
15	32768	Always 0

The event register is cleared upon reception of a query addressed to the event register or the *CLS command.

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 when :STATus:PRESet command is received or when the power on is turned on while the power on status clear flag (set in *PSC) is set to TRUE.

3.5 Others

WF1967/WF1968 provide the error queue and error message queue.

4. Error messages

If an error occurs when the remote control is performed, the error number is stored in the error queue. The error numbers and their corresponding messages and error contents are shown in Table 4.1. You can query the error number and message using ":SYSTem:ERRor?".

Table 4.1 Error Numbers, Messages, and their Contents

Error No.	Message	Contents (numbers in parentheses are error codes displayed in the screen)
-102	Syntax error	The received string contains an incorrect syntax.
-108	Parameter not allowed	There are too many parameters.
-109	Missing parameter	One or more parameters are missing.
-110	Command header error	There is an error in the header.
-111	Header separator error	There is an error in the keyword separator of the header.
-113	Undefined header	The received string contains an invalid header.
-120	Numeric data error	There is an error in the numerical parameter.
-130	Suffix error	There is an error in the suffix of the numerical parameter.
-140	Character data error	There is an error in the discrete parameter.
-150	String data error	There is an error in the string parameter.
-160	Block data error	There is an error in the block parameter.
-200	Execution error	The command cannot be executed. The relevant error occurs in the following cases: ・ When "*CLS" cannot be executed due to the status of equipment ・ When "*RST" cannot be executed due to the status of equipment ・ When sequence cannot be changed to other oscillation mode due to the status of equipment ・ When other commands cannot be executed.
-211	Trigger ignored	GET (Group Execute Trigger), "*TRG", and other commands relating to the trigger are ignored. The relevant error occurs in the following cases: ・ When the compilation command is ignored because the equipment is not in the sequence Edit status ・ When the trigger from remote is ignored because the equipment is not in the sequence Ready status ・ When the control command is ignored due to the status of equipment
-220	Parameter error	There is an error in the parameter. The relevant error occurs in the following cases: ・ When there is an error in the prefix/unit of the numerical parameter ・ When the specified unit cannot be used due to the status of equipment ・ When the name of arbitrary waveform exceeds 20 characters ・ When the name of arbitrary waveform contains a double quotation mark (") ・ When the number of data points for the arbitrary waveform is incorrect ・ When the compilation of sequence fails due to one of the following reasons: - When the number of used waveforms exceeds 128 or the total amount exceeds 512 KW - When the sequence setting is too complicated and cannot be checked

Error No.	Message	Contents (numbers in parentheses are error codes displayed in the screen)
-221	Settings conflict	The correct syntax parameter is received but the command cannot be executed due to the status of equipment. The relevant error occurs in the following cases: ・ When the sweep function cannot be set in the log because the equipment is not a frequency sweep ・ When arbitrary waveform data in the array format is set in the arbitrary waveform edit memory ・ When the specification of array/control point format of the arbitrary waveform data is incorrect ・ When the specified channel setting cannot be set in 2-channel equivalence setting due to another channel's restriction (22039) ・ When the compilation of sequence is not successful due to one of the following reasons: - When The frequency is beyond the upper frequency of the current waveform in the relationship between two steps (23121) - When the amplitude and offset do not meet the mutual restriction in the relationship between two steps (23122) - When the frequency and duty of square wave do not meet the mutual restriction in the relationship between two steps (23123) ・ When the external modulation/addition input connector cannot be used for the external modulation because it is used for the external addition (23129) ・ When the external modulation/addition input connector cannot be used for the external addition because it is used for the external modulation (23130)
-222	Data out of range	The correct syntax parameter is received but the command cannot be executed due to the value out of range. The relevant error occurs in the following cases: ・ When a value out of range is set for each register of the status system ・ When 0 is set for the frequency ratio N/M ・ When a value out of range is set for the user-defined unit, m/n ・ When the standard waveform of CH2 in the 1-channel machine is copied to the memory ・ When a value out of the setting range is set (23045)
-225	Out of memory	Memory required for execution is insufficient. The relevant error occurs in the following cases: ・ When arbitrary waveform data cannot be saved due to insufficient memory
-290	Memory use error	Command cannot be executed because an error occurs relating to memory. The relevant error occurs in the following cases: ・ When empty memory is specified for the arbitrary waveform number ・ When the compilation of sequence is not successful because empty memory is specified for the arbitrary waveform number (23125) ・ When the currently output or used arbitrary wave is deleted (32004)
-291	Out of memory	Specified memory does not exist. The relevant error occurs in the following cases: ・ When a value other than 0 to 128 is specified for the arbitrary wave number ・ When a value other than 0 to 10 is specified for the sequence number

Error No.	Message	Contents (numbers in parentheses are error codes displayed in the screen)
-310	System error	This is a failure of this instrument. The relevant error occurs in the following cases: ・ When arbitrary waveform cannot be read out in the compilation of sequence (23124) ・ When the internal error occurs (24135, 24136, 35005)
-350	Queue overflow	An error occurs but the error is discarded because the error cannot be entered in the error queue.
-410	Query INTERRUPTED	A new response message entered the message queue, and thus the previous response message was deleted.
-420	Query UNTERMINATED	The talker was specified, but the message queue has no response message.
-440	Query UNTERMINATED after indefinite response	Query exists after "*IDN?" in the received string ("*IDN?" must be the last query in the received string).

5. Specifications

5.1 Interface Functions

Table 5.1 Interface Functions of USB

Function	Subset	Description
Source handshake	SH1	All send handshake functions provided
Acceptor handshake	AH1	All receive handshake functions provided
Talker	T6	Basic talker functions and talker release by the MLA provided
Listener	L2	Basic listener functions provided
Service request	SR1	All service request functions provided
Remote/Local	RL1	All remote/local functions provided
Parallel poll	PP0	Parallel poll function not provided
Clear the device	DC1	All device clear functions provided
Device trigger	DT1	Device trigger function provided
Controller	C0	Controller function not provided

Table 5.2 Interface Functions of GPIB

Function	Subset	Description
Source handshake	SH1	All send handshake functions provided
Acceptor handshake	AH1	All receive handshake functions provided
Talker	T6	Basic talker functions and talker release by the MLA provided
Listener	L4	Basic listener functions and listener release by the MTA provided
Service request	SR1	All service request functions provided
Remote/Local	RL1	All remote/local functions provided
Parallel poll	PP0	Parallel poll function not provided
Clear the device	DC1	All device clear functions provided
Device trigger	DT1	All device trigger functions provided
Controller	C0	Controller function not provided

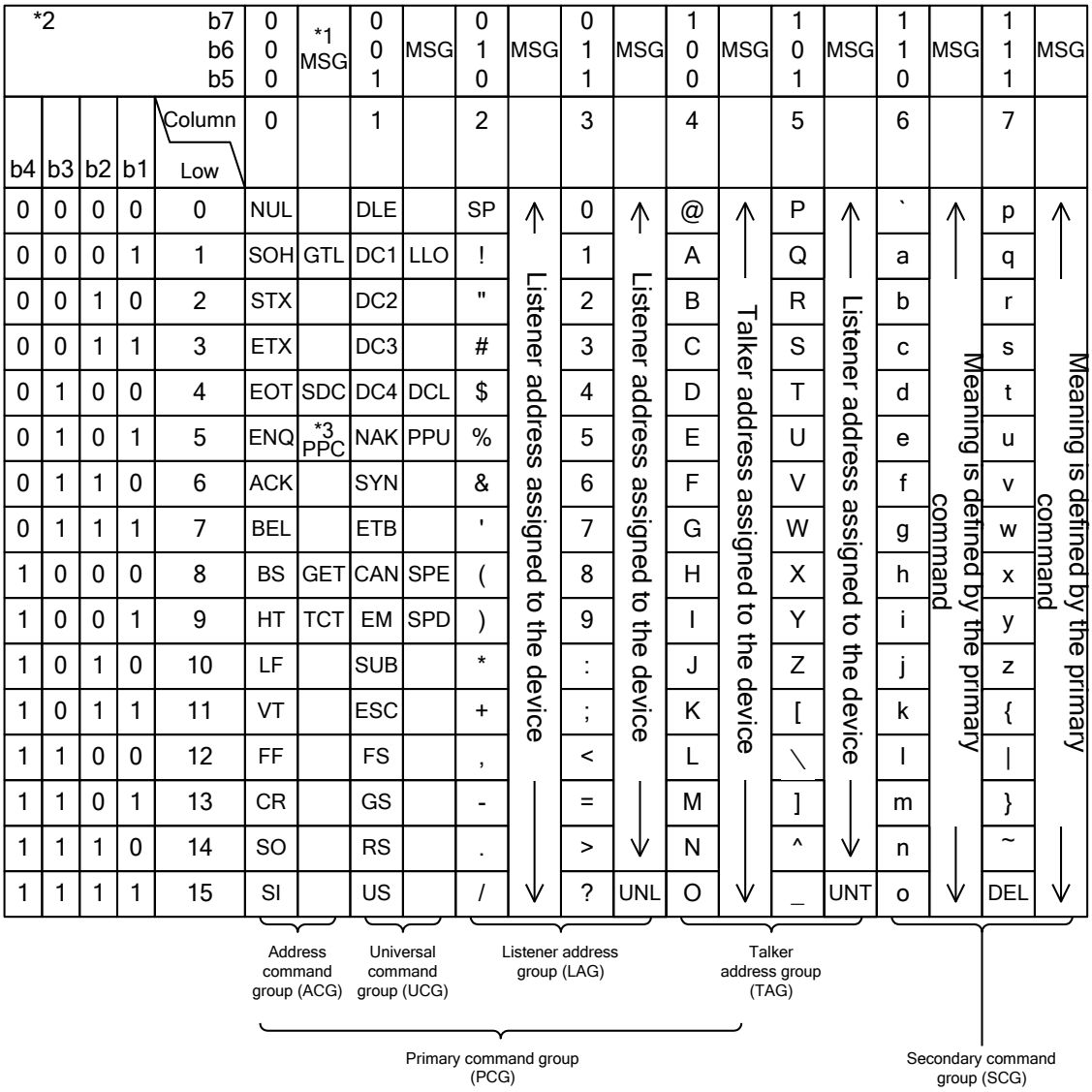
5.2 Response to Interface Message

Table 5.3 Response to Interface Message

IFC	・ Initialize the interface. ・ Release the specified listener or talker.
DCL and SDC	・ Clear the I/O buffer. ・ Clear the error. ・ Release the SRQ send and reset the error factor bits. ・ Disable the SRQ send.
LLO	・ Disable the LOCAL key (software key) operation of the panel.
GTL	・ Selects the local state.

In LAN, you can not use these features.

5.3 Multi-Line Interface Message



*2 b7 b6 b5					0 0 0	*1 MSG	0 0 1	MSG	0 1 0	MSG	0 1 1	MSG	1 0 0	MSG	1 0 1	MSG	1 1 0	MSG	1 1 1	MSG
b4	b3	b2	b1	Column / Low	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP	↑ Listener address assigned to the device	0	↑ Listener address assigned to the device	@	↑ Talker address assigned to the device	P	↑ Listener address assigned to the device	`	↑ Meaning is defined by the primary command	p	↑ Meaning is defined by the primary command
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	*3 PPC	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		\		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	

Address command group (ACG) | Universal command group (UCG) | Listener address group (LAG) | Talker address group (TAG) | Primary command group (PCG) | Secondary command group (SCG)

Note: *1 MSG means an interface message

*2 b1=DIO1・・・b7=DIO7. DIO8 is not used

*3 Accompanied by the secondary command

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

MEMO

6. Command tree

6.1 Command Tree

WABUN: (DA00046522-004)

Notes

Multifunction Generator

WF1967/WF1968

Instruction Manual (Remote Control)

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