



WAVE FACTORY

MULTIFUNCTION GENERATOR

WF198x series

Instruction Manual
(Remote Control)

DA00104786-001

MULTIFUNCTION GENERATOR

WF198x series

Instruction Manual
(Remote Control)

INTRODUCTION

This instruction manual describes the GPIB, USB and LAN interfaces of WF198x series (WF1981/WF1982/WF1983/WF1984). For operations from the panel, see the separate manual “WF1981/WF1982 Instruction Manual (Operations)” or “WF1983/WF1984 Instruction Manual (Operations).”

The GPIB, USB and LAN interfaces of WF198x series 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. (WF1981/WF1982 are equipped with only USB and LAN interfaces)

WF198x series 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 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.

Table of Contents

	Page
1. Preparation before Use	1-1
1.1 Overview of WF198x series GPIB/USB/LAN Interface.....	1-2
1.2 USB Preparations.....	1-2
1.3 GPIB Preparations	1-2
1.4 LAN Preparations.....	1-2
1.5 Interface Selection	1-3
1.6 USB Setting.....	1-4
1.7 GPIB Setting.....	1-4
1.8 LAN Setting	1-5
1.9 Cancellation of Remote State	1-5
1.10 Considerations	1-6
2. Command Explanation	2-1
2.1 Overview of Commands.....	2-2
2.2 Command List	2-14
2.3 Command Reference	2-25
2.4 Specification of Sequence I/O Data.....	2-175
2.5 Commands Available for Trigger/Oscillation State Control.....	2-181
3. Status System.....	3-1
3.1 Status Byte Register and Service Request Enable Register	3-2
3.2 Standard Event Status Register Group	3-4
3.3 Operation status register group / Questionable data status register group	3-5
3.4 Warning Event Register Group	3-14
3.5 Others.....	3-16
4. Error messages	4-1
5. Specifications.....	5-1
5.1 Interface Functions.....	5-2
5.2 Response to Interface Message	5-3
5.3 Multi-Line Interface Message.....	5-4

1. Preparation before Use

1.1	Overview of WF198x series GPIB/USB/LAN Interface	1-2
1.2	USB Preparations.....	1-2
1.3	GPIB Preparations	1-2
1.4	LAN Preparations	1-2
1.5	Interface Selection	1-3
1.6	USB Setting	1-3
1.7	GPIB Setting	1-4
1.8	LAN Setting.....	1-5
1.9	Cancellation of Remote State.....	1-5
1.10	Considerations.....	1-6

1.1 Overview of WF198x series GPIB/USB/LAN Interface

WF198x series available GPIB, USB or LAN remote interfaces. (WF1981/WF1982 only support USB and LAN interfaces)

Almost all functions can be remotely configured via the remote 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.

Regardless of which communication interface you use, you can create and use programs that use the Visual Instruments Software Architecture (VISA) library. If you do not have a license to use the VISA library, you will need to obtain one separately (usually for a fee).

1.2 USB Preparations

The USBTMC class driver must be installed on the computer to be controlled. The USBTMC class driver is included in the hardware and software products of each company that provides the VISA library.

The terminator is "LF".

1.3 GPIB Preparations

Connect via a commercially available GPIB controller.

For details, see the instruction manual for the GPIB controller you are using.

The terminator is "LF".

(WF1981/WF1982 do not support GPIB interface)

1.4 LAN Preparations

The LAN interface of WF198x series supports TCP / IP protocol communication (IPv4 only).

It does not correspond to the IP address automatic assignment by DHCP. When you connect to the network, check with your administrator in advance to set the IP address, subnet mask, please set the default gateway. Incorrect settings may interfere with communication on the connected network.

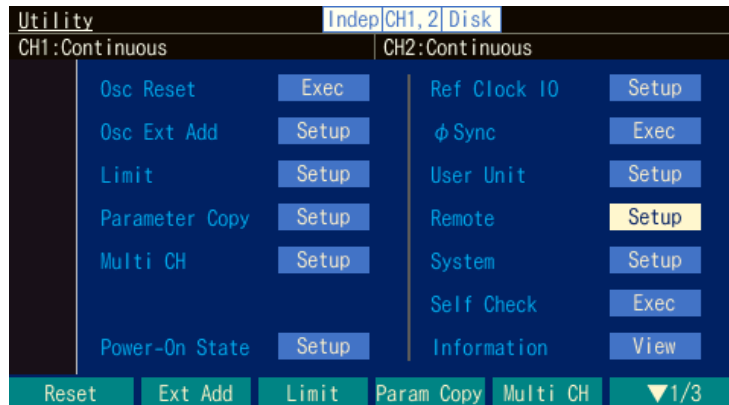
The port number is 5025 and the terminator is "LF".

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.

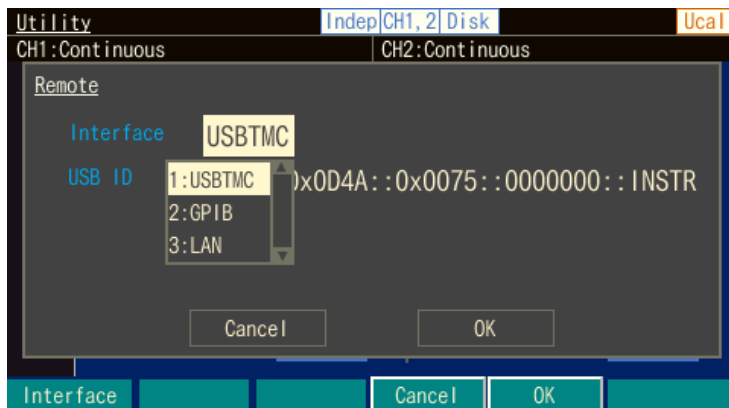
1.5 Interface Selection

You can select whether the USB, GPIB or the LAN interface is to be used. WF198x series cannot be controlled from an interface that is not selected. The selected interface is retained in the memory even when the power is turned off. When at shipping, “USBTMC” is selected.

- (1) On the “3:Utility” of Menu, select “Remote” and then press the ENTER key.



- (2) Select “Interface”, and then press the ENTER key, and select USB, GPIB or the LAN. (WF1981/WF1982 only support USB and LAN interfaces)

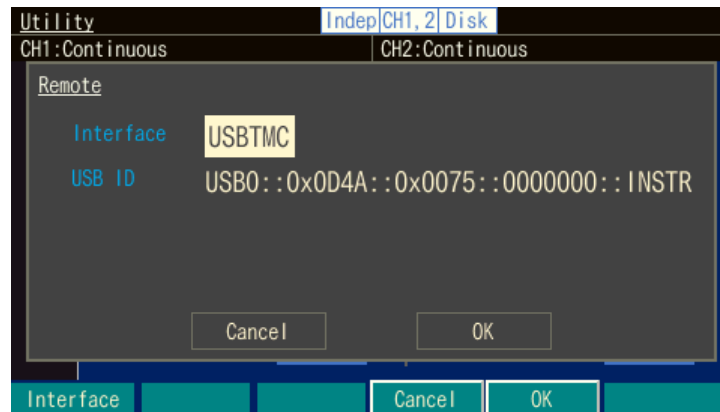


CAUTION When the computer recognizes WF198x series, switching the interface or disconnecting the cable may cause unexpected behavior depending on the computer.

1.6 USB Setting

If multiple units of WF198x series are connected within a system via USB, the following numbers are used to enable the application identify each unit.

- Vendor No. : 0x0D4A
- Product No. : 0x007D(WF1981), 0x007E(WF1982), 0x0074(WF1983), 0x0075(WF1984),
- Serial No. : Product's manufacturing number (serial number)



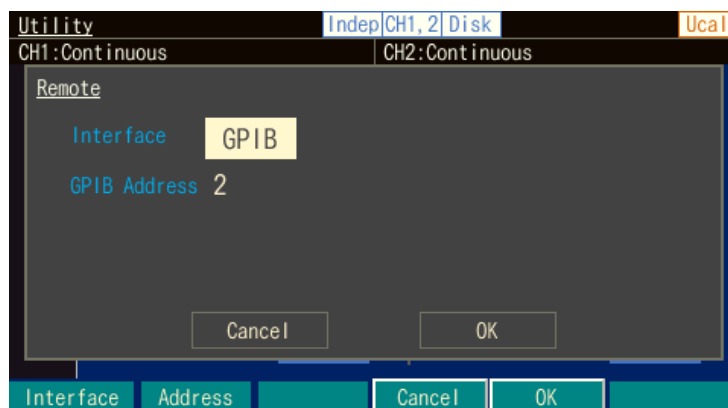
1.7 GPIB Setting

When you select the GPIB interface, (you cannot select GPIB interface in WF1981/WF1982) 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.

When at shipping, "2" is selected.

- (1) Set "Interface" to "GPIB" by operating "1.5 Interface Selection"
Select "GPIB Address" and then press the ENTER key.
Enter the GPIB address by using the numeric keypad on the panel.



1.8 LAN Setting

When the LAN option is selected, a physical(MAC) 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, both cannot be changed.

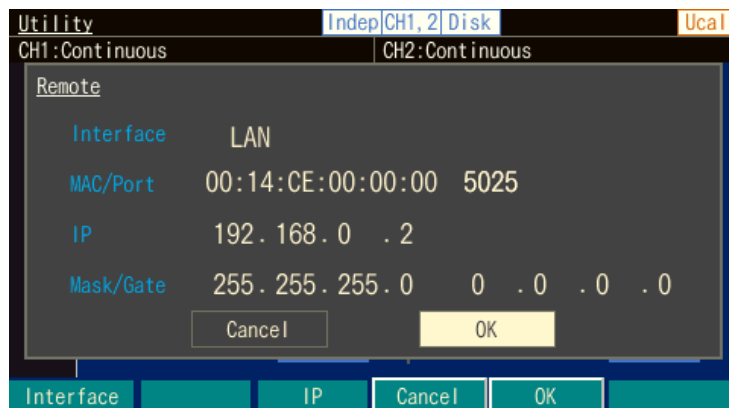
Set the IP address, subnet mask, default gateway.

Set value will be retained even if the power is turned off in memory.

When at shipping, LAN settings are below.

•IP : 192.168.0.2
•Mask/Gate : 255.255.255.0

- (1) Selected “IP”, you can set the IP address.
WF198x series does not correspond to the IP address automatic assignment by DHCP.
- (2) Selected “Mask”, you can set the subnet mask.
- (3) Selected “Gate”, you can set the default gateway.



1.9 Cancellation of Remote State

In the remote state, the “USB”, “GPIB” or “LAN” icon is appeared on the LCD, and “LOCAL” is displayed on the soft-key. When the [LOCAL] soft 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 [LOCAL] soft 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 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.

2. Command Explanation

2.1	Overview of Commands	2-2
2.2	Command List	2-14
2.3	Command Reference	2-25
2.4	Specification of Sequence I/O Data	2-175
2.5	Commands Available for Trigger/Oscillation State Control	2-181

2.1 Overview of Commands

The commands of WF198x series 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 Command Notation

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

- < > < > indicates that a parameter such as a number or string must be specified. The abbreviation for the type is placed within < >. Do not write < > in the actual program.
- [] The items enclosed in [] are optional, and can be omitted. Do not write [] in the actual program.
- {abc|xyz}
- Indicates that either “abc” or “xyz” can be used. Do not write { } in the actual program.
- [abc|xyz]
- Indicates that either “abc” or “xyz” can be used, but you can also omit it.
- 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. See “(A) Keywords”.

2.1.2 Command Syntax

The program messages of WF198x series 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.

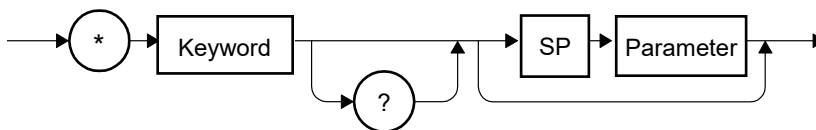


Figure 2.1 Common Command Syntax

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.

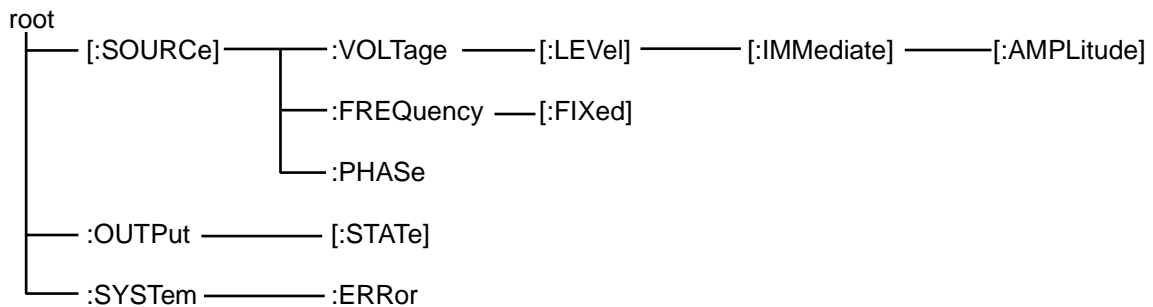


Figure 2.2 Example of Subsystem Command Tree

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 “:AMPLitude”, the path must be [:SOURce] - :VOLTage - [:LEVel] - [:IMMediate] - :AMPLitude.

(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) IEEE488.2 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 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 sent 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.

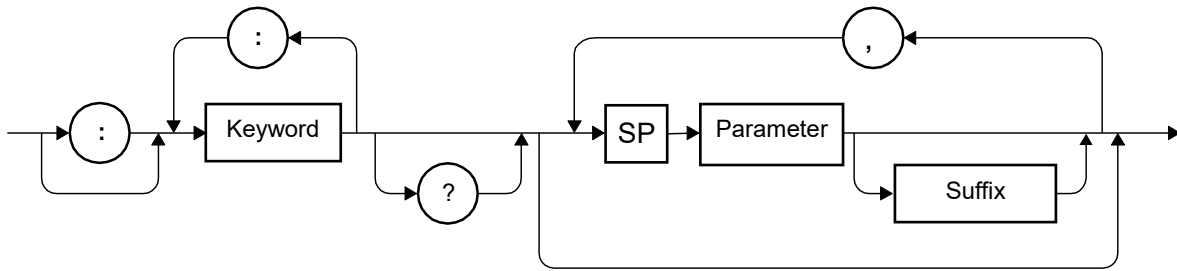


Figure 2.3 Subsystem Command Syntax

(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.

Lowercase letters are optional.

Keywords with only uppercase letters are called short form keywords, and keywords with uppercase and lowercase letters are called long form keywords. For convenience of explanation, the long form of keywords is used. 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 behaves as if it received the omitted keyword. 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.

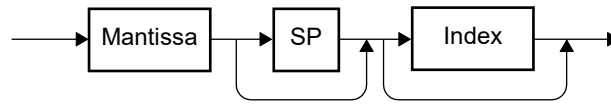


Figure 2.4 Numeric Parameter (<REAL>, <INT>) Syntax

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

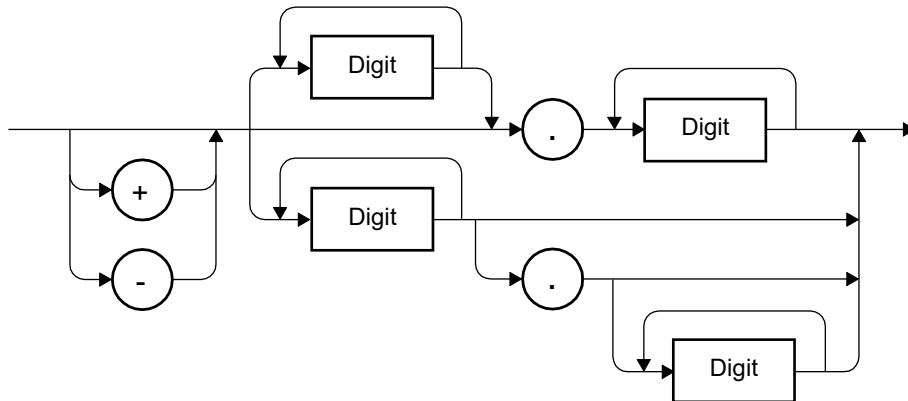


Figure 2.5 Mantissa Syntax

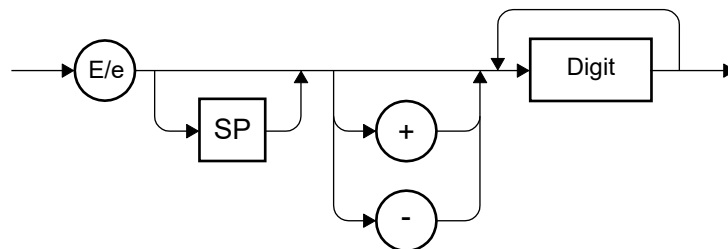


Figure 2.6 Exponent Syntax

(2) Discrete Parameter (<DISC>)

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

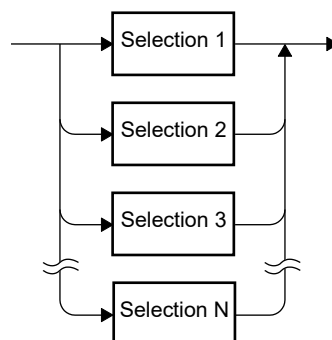


Figure 2.7 Discrete Parameter (<DISC>) Syntax

(3) Boolean Value Parameter (<BOL>)

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

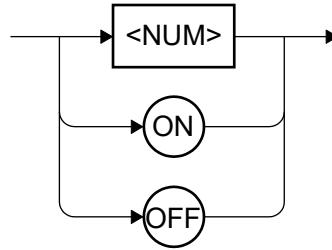


Figure 2.8 Boolean Value Parameter (<BOL>) Syntax

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.

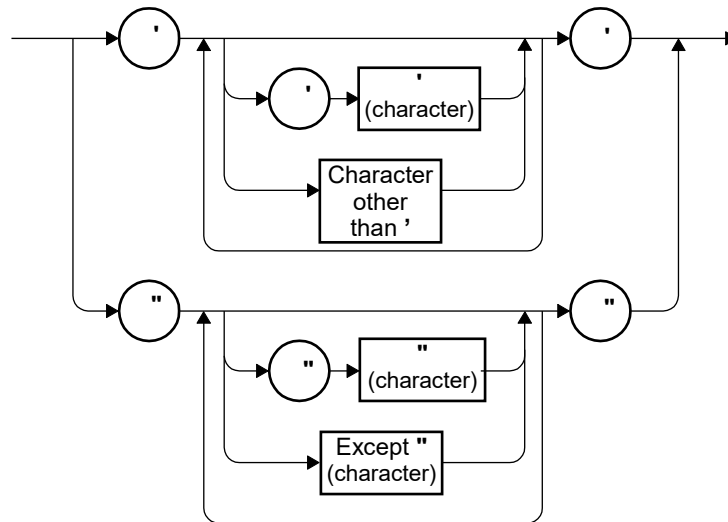


Figure 2.9 String Parameter (<STR>) Syntax

(5) Block parameter (<BLK>)

The syntax of block parameters is shown in Figure 2.10.

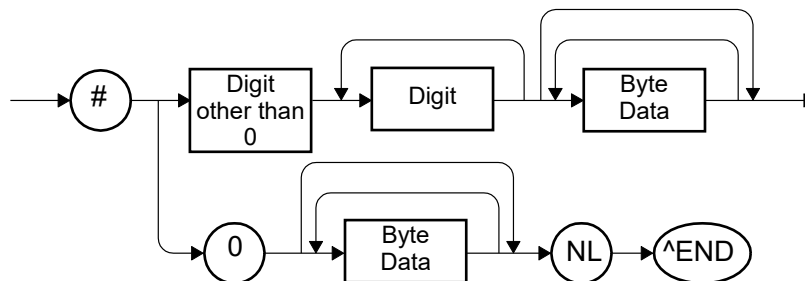


Figure 2.10 Block Parameter (<BLK>) Syntax

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.

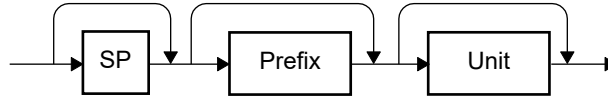


Figure 2.11 Suffix Syntax

In WF198x series, the prefix and unit attached to a parameter are valid only for that command, and do not affect other commands.

:SOURce1:VOLTage:LEVel:IMMEDIATE:AMPLitude 2.0VPP	Sets the amplitude to 2.0Vp-p
:SOURce1:VOLTage:LEVel:IMMEDIATE:AMPLitude 2.0VRMS	Sets the amplitude to 2.0Vrms
:SOURce1:VOLTage:LEVel:IMMEDIATE:AMPLitude 2.0	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.

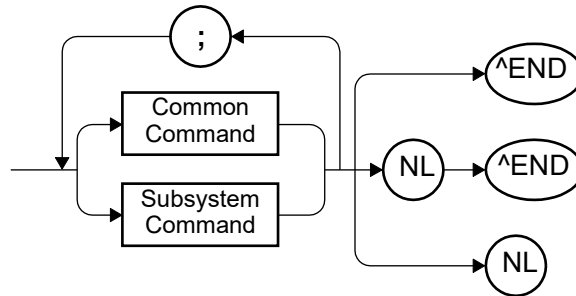


Figure 2.12 Program Message Syntax

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.

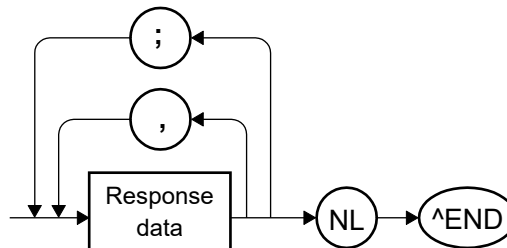


Figure 2.13 Response Message Syntax

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.

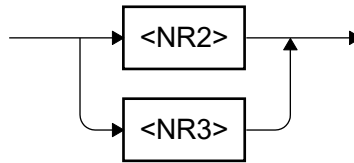


Figure 2.14 Real Number Response Data (<REAL>) Syntax

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

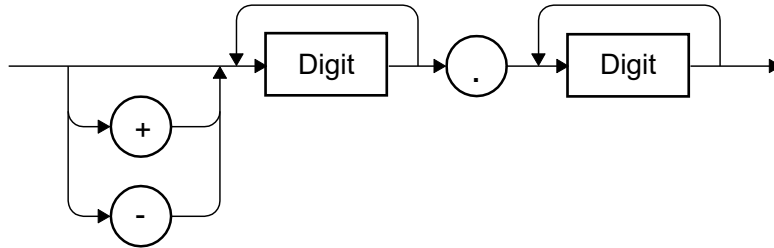


Figure 2.15 NR2 Number Response Data (<NR2>) Syntax

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

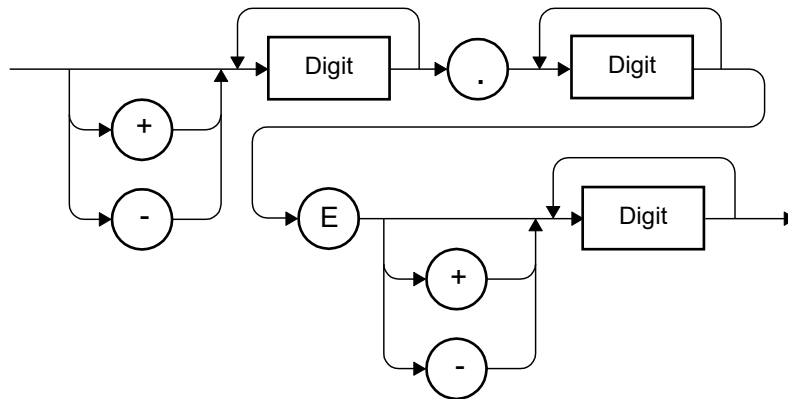


Figure 2.16 NR3 Number Response Data (<NR3>) Syntax

(2) Integer response data (<INT>)

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

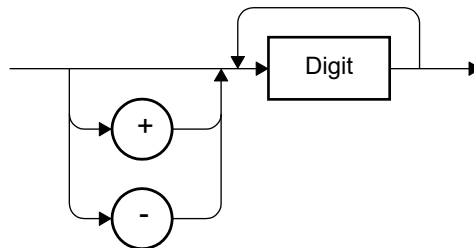


Figure 2.17 Integer Response Data (<INT>) Syntax

(3) Discrete response data (<DISC>)

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

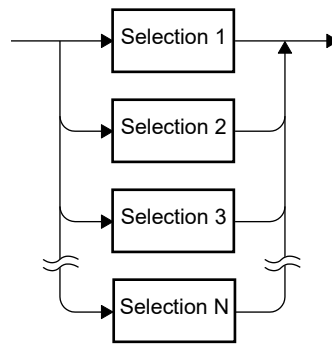


Figure 2.18 Discrete Response Data (<DISC>) Syntax

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

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

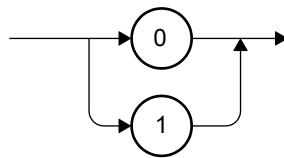


Figure 2.19 Numeric Boolean Value Response Data (<NBOL>) Syntax

(5) String response data (<STR>)

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

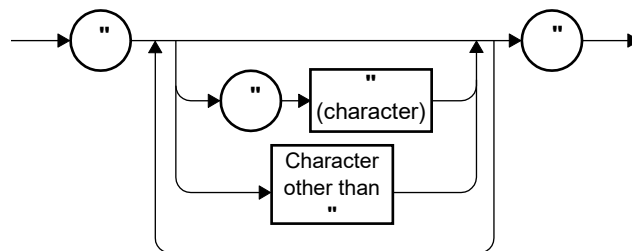


Figure 2.20 String Response Data (<STR>) Syntax

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

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

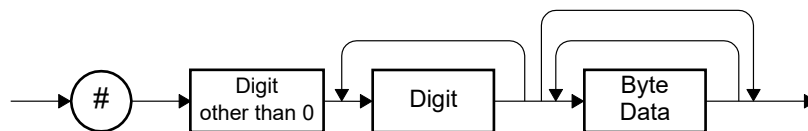


Figure 2.21 Definite Length Arbitrary Block Response Data (<DBLK>) Syntax

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

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

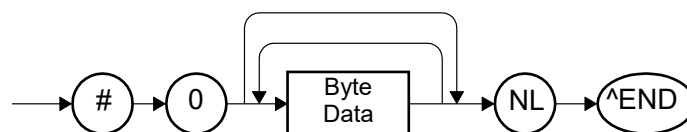


Figure 2.22 Indefinite Length Arbitrary Block Response Data (<IBLK>) Syntax

2.2 Command List

This section shows the list of the remote control commands of WF198x series.
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.
- In the table below, R stands for query, W stands for setting, and R/W stands for query and setting commands.

Table 2.2 Command List

(2.3.1 Oscillation Mode)

Function	Command	R/W	Detail
Continuous oscillation mode			
Continuous oscillation mode	[:SOURce[1|2]] :CONTInuous[:IMMediate]	W	2-25
Continuous oscillation mode	[:SOURce[1|2]] :CONTInuous :STATe?	R	2-25
Synchronization signal output	:OUTPut[1|2] :SYNC :TYPE	R/W	2-26
Modulation oscillation mode (Common setting)			
Phase of internal modulation	[:SOURce[1|2]] : {FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM} :INTernal :PHASe[:ADJust]	R/W	2-27
Frequency of internal modulation	[:SOURce[1|2]] : {FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM} :INTernal :FREQuency	R/W	2-27
Synchronization signal output	:OUTPut[1|2] :SYNC : {FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM} :TYPE	R/W	2-28
FSK/PSK (Common setting)			
Modulation source	[:SOURce[1|2]] : {FSKey|PSKey} :SOURce	R/W	2-29
Polarity of external modulation	[:SOURce[1|2]] : {FSKey|PSKey} :SLOPe	R/W	2-29
Except FSK/PSK (Common setting)			
Modulation source	[:SOURce[1|2]] : {FM|PM|AM|AMSC|OFSM|PWM} :SOURce	R/W	2-30
Internal modulation waveform	[:SOURce[1|2]] : {FM|PM|AM|AMSC|OFSM|PWM} :INTernal :FUNCTion[:SHAPE]	R/W	2-30
Arbitrary waveform for internal modulation	[:SOURce[1|2]] : {FM|PM|AM|AMSC|OFSM|PWM} :INTernal :FUNCTion :USER	R/W	2-31
Noise bandwidth for internal modulation	[:SOURce[1|2]] : {FM|PM|AM|AMSC|OFSM|PWM} :INTernal :FUNCTion :NOISe :BW	R/W	2-32
FSK (Frequency shift keying)			
FSK	[:SOURce[1|2]] :FSKey :STATe	R/W	2-33
Hop frequency	[:SOURce[1|2]] :FSKey[:FREQuency]	R/W	2-33
PSK (Phase shift keying)			
PSK	[:SOURce[1|2]] :PSKey :STATe	R/W	2-34
Deviation	[:SOURce[1|2]] :PSKey[:DEVIation]	R/W	2-34
FM (Frequency modulation)			
FM	[:SOURce[1|2]] :FM :STATe	R/W	2-35
Peak deviation	[:SOURce[1|2]] :FM[:DEVIation]	R/W	2-35

Function	Command	R/W	Detail
PM (Phase modulation)			
PM	[:SOURce[1|2]]:PM:STATe	R/W	2-36
Peak deviation	[:SOURce[1|2]]:PM[:DEVIation]	R/W	2-36
AM (Amplitude modulation)			
AM	[:SOURce[1|2]]:AM:STATe	R/W	2-37
Modulation depth	[:SOURce[1|2]]:AM[:DEPT]h	R/W	2-37
AM(DSB-SC)			
AM(DSB-SC)	[:SOURce[1|2]]:AMSC:STATe	R/W	2-38
Modulation depth	[:SOURce[1|2]]:AMSC[:DEPT]h	R/W	2-38
DC-offset modulation			
DC-offset modulation	[:SOURce[1|2]]:OFSM:STATe	R/W	2-39
Peak deviation	[:SOURce[1|2]]:OFSM[:DEVIation]	R/W	2-39
PWM (Pulse width modulation)			
PWM	[:SOURce[1|2]]:PWM:STATe	R/W	2-40
Peak deviation	[:SOURce[1|2]]:PWM[:DEVIation]:DCYClE	R/W	2-41
Sweep modulation mode (Common setting)			
Sweep mode	[:SOURce[1|2]]:SWEep:MODE	R/W	2-42
Sweep slope	[:SOURce[1|2]]:SWEep:SPACing	R/W	2-42
Sweep direction	[:SOURce[1|2]]:SWEep:INTernal:FUNCTion	R/W	2-43
Sweep time	[:SOURce[1|2]]:SWEep:TIME	R/W	2-43
Stop level value	[:SOURce[1|2]]:SWEep:SLEVel	R/W	2-44
Stop level	[:SOURce[1|2]]:SWEep:SLEVel:STATe	R/W	2-44
Oscillation stop unit	[:SOURce[1|2]]:SWEep:OSTop	R/W	2-45
Multi-connector control on/off	[:SOURce[1|2]]:SWEep:MCONnector:STATe	R/W	2-45
Synchronization output	:OUTPut[1|2]:SYNC:SWEep:TYPE	R/W	2-45
Frequency sweep setting			
Frequency sweeo	[:SOURce[1|2]]:FREQuency:MODE	R/W	2-46
Start value	[:SOURce[1|2]]:FREQuency:START	R/W	2-46
Stop value	[:SOURce[1|2]]:FREQuency:STOP	R/W	2-47
Center value	[:SOURce[1|2]]:FREQuency:CENTer	R/W	2-48
Span value	[:SOURce[1|2]]:FREQuency:SPAN	R/W	2-48
Marker value	[:SOURce[1|2]]:MARKer:FREQuency	R/W	2-49
Swap start/stop	[:SOURce[1|2]]:FREQuency:SWAP	W	2-49
Output start/stop	[:SOURce[1|2]]:FREQuency:STATe	W	2-50

Function	Command	R/W	Detail
Phase sweep setting			
Phase sweep	[[:SOURce[1|2]]:PHASe:MODE	R/W	2-50
Start value	[[:SOURce[1|2]]:PHASe:STARt	R/W	2-50
Stop value	[[:SOURce[1|2]]:PHASe:STOP	R/W	2-51
Center value	[[:SOURce[1|2]]:PHASe:CENTer	R/W	2-51
Span value	[[:SOURce[1|2]]:PHASe:SPAN	R/W	2-52
Marker value	[[:SOURce[1|2]]:MARKer:PHASe	R/W	2-52
Swap start/stop	[[:SOURce[1|2]]:PHASe:SWAP	W	2-53
Output start/stop	[[:SOURce[1|2]]:PHASe:STATe	W	2-53
Amplitude sweep setting			
Amplitude sweep	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:MODE	R/W	2-53
Start value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STARt	R/W	2-54
Stop value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STOP	R/W	2-54
Center value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:CENTer	R/W	2-55
Span value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SPAN	R/W	2-56
Marker value	[[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate][:AMPLitude]	R/W	2-56
Swap start/stop	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:SWAP	W	2-57
Output start/stop	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]:STATe	W	2-57
DC offset sweep setting			
DC offset sweep	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:MODE	R/W	2-57
Start value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STARt	R/W	2-58
Stop value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STOP	R/W	2-58
Center value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:CENTer	R/W	2-59
Span value	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SPAN	R/W	2-59
Marker value	[[:SOURce[1|2]]:MARKer:VOLTage[:LEVel][:IMMediate]:OFFSet	R/W	2-60
Swap start/stop	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:SWAP	W	2-60
Output start/stop	[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe	W	2-61

Function	Command	R/W	Detail
Duty sweep setting			
Duty sweep	[:SOURce[1|2]][:PULSe]:DCYClE:MODE	R/W	2-61
Start value	[:SOURce[1|2]][:PULSe]:DCYClE:STARt	R/W	2-61
Stop value	[:SOURce[1|2]][:PULSe]:DCYClE:STOP	R/W	2-62
Center value	[:SOURce[1|2]][:PULSe]:DCYClE:CENTer	R/W	2-63
Span value	[:SOURce[1|2]][:PULSe]:DCYClE:SPAN	R/W	2-63
Marker value	[:SOURce[1|2]]:MARKer:PULSe:DCYClE	R/W	2-64
Swap start/stop	[:SOURce[1|2]][:PULSe]:DCYClE:SWAP	W	2-64
Output start/stop	[:SOURce[1|2]][:PULSe]:DCYClE:STATe	W	2-65
Burst oscillation (Common setting)			
Burst oscillation mode	[:SOURce[1|2]]:BURSt:STATe	R/W	2-66
Burst mode	[:SOURce[1|2]]:BURSt:MODE	R/W	2-66
Stop level value	[:SOURce[1|2]]:BURSt:SLEVel	R/W	2-67
Stop level	[:SOURce[1|2]]:BURSt:SLEVel:STATe	R/W	2-67
Synchronization output	:OUTPut[1|2]:SYNC:BURSt:TYPE	R/W	2-68
Auto burst			
Mark wave number	[:SOURce[1|2]]:BURSt:AUTO:NCYCles	R/W	2-68
Space wave number	[:SOURce[1|2]]:BURSt:AUTO:SPACe	R/W	2-69
Trigger burst			
Mark wave number	[:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles	R/W	2-69
Trigger delay time	[:SOURce[1|2]]:BURSt[:TRIGger]:TDELay	R/W	2-70
Gate/triggered gate			
Oscillation stop unit	[:SOURce[1|2]]:BURSt:{GATE|TGATe}:OSTop	R/W	2-70

(2.3.2 Waveform Setting)

Function	Command	R/W	Detail
Waveform (Common setting)			
Waveform	[:SOURce[1|2]]:FUNction[:SHAPe]	R/W	2-71
Waveform polarity	:OUTPut[1|2]:POLarity	R/W	2-72
Amplitude scale range	:OUTPut[1|2]:SCALE	R/W	2-73
Square wave			
Duty range extension	[:SOURce[1|2]]:FUNction:SQUare:EXTend	R/W	2-75
Duty value	[:SOURce[1|2]]:FUNction:SQUare:DCYCLE	R/W	2-75
Pulse wave			
Duty value	[:SOURce[1|2]][:PULSe]:DCYCLE	R/W	2-76
Pulse width	[:SOURce[1|2]][:PULSe]:WIDTh	R/W	2-76
Rising time	[:SOURce[1|2]][:PULSe]:TRANSition[:LEADing]	R/W	2-77
Falling time	[:SOURce[1|2]][:PULSe]:TRANSition:TRAILing	R/W	2-78
Period value	[:SOURce[1|2]][:PULSe]:PERiod	R/W	2-78
Transition wave of pulse rising/falling edge	[:SOURce[1|2]][:PULSe]:TRANSition:FUNction	R/W	2-79
Ramp wave			
Symmetry	[:SOURce[1|2]]:FUNction:RAMP:SYMMetry	R/W	2-81
Noise			
Noise bandwidth	[:SOURce[1|2]]:FUNction:NOISe:BW	R/W	2-82

(2.3.2.6 PWF Waveform)

Function	Command	R/W	Detail
PWF wave (Steady sine wave group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
Unbalanced sine first half amplitude	[[:SOURce[1|2]]][★]:FUNction:USINe:AMPLitude[1]	R/W	2-83
Unbalanced sine latter half amplitude	[[:SOURce[1|2]]][★]:FUNction:USINe:AMPLitude2	R/W	2-84
Clipped sine clip ratio	[[:SOURce[1|2]]][★]:FUNction:CSINe:CLIP	R/W	2-84
CF controlled sine crest factor	[[:SOURce[1|2]]][★]:FUNction:CFCSine:CFACtor	R/W	2-85
Angle controlled sine conduction angle	[[:SOURce[1|2]]][★]:FUNction:ACSine:ANGLE	R/W	2-85
Staircase sine number of Y-steps	[[:SOURce[1|2]]][★]:FUNction:SSINe:STEPs	R/W	2-86
Staircase sine number of X-steps	[[:SOURce[1|2]]][★]:FUNction:SSINe:TSTEPs	R/W	2-86
Multi-cycle sine number of cycle	[[:SOURce[1|2]]][★]:FUNction:MCSine:CYCLes	R/W	2-87
Multi-cycle sine start phase	[[:SOURce[1|2]]][★]:FUNction:MCSine:PHASe	R/W	2-87
PWF wave (Transient sine wave group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
On-phase controlled sine on-phase	[[:SOURce[1|2]]][★]:FUNction:ONPSine:ONPHase	R/W	2-88
On-phase controlled sine on-slope time	[[:SOURce[1|2]]][★]:FUNction:ONPSine:STIME	R/W	2-88
Off-phase controlled sine off-phase	[[:SOURce[1|2]]][★]:FUNction:OFPSine:OFPHase	R/W	2-89
Off-phase controlled sine off-slope time	[[:SOURce[1|2]]][★]:FUNction:OFPSine:STIME	R/W	2-89
Chattering-on sine on-phase	[[:SOURce[1|2]]][★]:FUNction:CONSine:ONPHase	R/W	2-90
Chattering-on sine number of chattering	[[:SOURce[1|2]]][★]:FUNction:CONSine:NCHattering	R/W	2-90
Chattering-on sine on time	[[:SOURce[1|2]]][★]:FUNction:CONSine:TON	R/W	2-91
Chattering-on sine off time	[[:SOURce[1|2]]][★]:FUNction:CONSine:TOFF	R/W	2-91
Chattering-off sine off-phase	[[:SOURce[1|2]]][★]:FUNction:COFSine:OFPHase	R/W	2-92
Chattering-off sine number of chattering	[[:SOURce[1|2]]][★]:FUNction:COFSine:NCHattering	R/W	2-92
Chattering-off sine on time	[[:SOURce[1|2]]][★]:FUNction:COFSine:TON	R/W	2-93
Chattering-off sine off time	[[:SOURce[1|2]]][★]:FUNction:COFSine:TOFF	R/W	2-93
PWF wave (Pulse wave group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
Gaussian pulse standard deviation	[[:SOURce[1|2]]][★]:FUNction:GAUSsian:SIGMa	R/W	2-94
Lorentz pulse half value of width	[[:SOURce[1|2]]][★]:FUNction:LOREntz:HWIDth	R/W	2-94
Haversine width	[[:SOURce[1|2]]][★]:FUNction:HAVersine:WIDTh	R/W	2-95
Half-sine pulse width	[[:SOURce[1|2]]][★]:FUNction:HSPulse:WIDTh	R/W	2-95
Trapezoid pulse slope width	[[:SOURce[1|2]]][★]:FUNction:TPULse:RFALl	R/W	2-96
Trapezoid pulse upper base width	[[:SOURce[1|2]]][★]:FUNction:TPULse:UBASe	R/W	2-96
Sin(x)/x number of zero crossings	[[:SOURce[1|2]]][★]:FUNction:SINC:ZCRossing	R/W	2-97

Function	Command	R/W	Detail
PWF wave (Transient response waveform group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
Exponential rise time constant	[:SOURce[1|2]][★]:FUNction:ERISe:TCONstant	R/W	2-97
Exponential fall time constant	[:SOURce[1|2]][★]:FUNction:EFALl:TCONstant	R/W	2-98
2nd-order LPF step response natural frequency	[:SOURce[1|2]][★]:FUNction:SOLStep:NFRequency	R/W	2-98
2nd-order LPF step response Q-value	[:SOURce[1|2]][★]:FUNction:SOLStep:Q	R/W	2-99
Damped oscillation oscillation frequency	[:SOURce[1|2]][★]:FUNction:DOSCillation:OFRequency	R/W	2-99
Damped oscillation damped oscillation time constant	[:SOURce[1|2]][★]:FUNction:DOSCillation:DTConstant	R/W	2-100
PWF wave (Surge waveform group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
Oscillation surge oscillation frequency	[:SOURce[1|2]][★]:FUNction:OSURge:OFRequency	R/W	2-100
Oscillation surge damped oscillation time constant	[:SOURce[1|2]][★]:FUNction:OSURge:DTConstant	R/W	2-101
Oscillation surge trailing time constant	[:SOURce[1|2]][★]:FUNction:OSURge:TTCOnstant	R/W	2-101
Pulse surge rising time	[:SOURce[1|2]][★]:FUNction:PSURge:TR	R/W	2-102
Pulse surge duration time	[:SOURce[1|2]][★]:FUNction:PSURge:TD	R/W	2-102
PWF wave (Other waveform group) * For keywords in the [★] part, see “2.3.2.6 PWF Waveform”.			
Trapezoid wave with offset leading delay	[:SOURce[1|2]][★]:FUNction:TOFFset:DELay	R/W	2-103
Trapezoid wave with offset rising-slope width	[:SOURce[1|2]][★]:FUNction:TOFFset:RISe	R/W	2-103
Trapezoid wave with offset upper base width	[:SOURce[1|2]][★]:FUNction:TOFFset:UBASe	R/W	2-104
Trapezoid wave with offset falling-slope width	[:SOURce[1|2]][★]:FUNction:TOFFset:FALL	R/W	2-104
Trapezoid wave with offset offset	[:SOURce[1|2]][★]:FUNction:TOFFset:OFFSet	R/W	2-105
Half-sine edge pulse leading edge time	[:SOURce[1|2]][★]:FUNction:HSEPulse:LE	R/W	2-105
Half-sine edge pulse trailing edge time	[:SOURce[1|2]][★]:FUNction:HSEPulse:TE	R/W	2-106
Half-sine edge pulse duty	[:SOURce[1|2]][★]:FUNction:HSEPulse:DCYCLe	R/W	2-106
Double pulse upper base width1	[:SOURce[1|2]][★]:FUNction:DPULse:UBT1	R/W	2-107
Double pulse upper base width2	[:SOURce[1|2]][★]:FUNction:DPULse:UBT2	R/W	2-107
Double pulse lower base width1	[:SOURce[1|2]][★]:FUNction:DPULse:LBT1	R/W	2-108
Double pulse lower base width2	[:SOURce[1|2]][★]:FUNction:DPULse:LBT2	R/W	2-108
Double pulse leading time	[:SOURce[1|2]][★]:FUNction:DPULse:LE	R/W	2-109
Double pulse trailing time	[:SOURce[1|2]][★]:FUNction:DPULse:TE	R/W	2-109
Bottom-referenced ramp symmetry	[:SOURce[1|2]][★]:FUNction:BRRamp:SYMMetry	R/W	2-110
PWF waveform (Polarity/scale) * For keywords in the [●] part, see “2.3.2.6.7 PWF Waveform Polarity/Scale”.			
Polarity	:OUTPut[1|2][●]:POLarity	R/W	2-110
Scale range	:OUTPut[1|2][●]:SCALE	R/W	2-112

(2.3.2.7 Arbitrary Waveform)

Function	Command	R/W	Detail
Select arbitrary waveform	[[:SOURce[1|2]]]:FUNctIon:USER	R/W	2-114
Arbitrary waveform data	{:TRACe[:DATA]}[:DATA]	R/W	2-114
Store	{:TRACe[:DATA]}:STORe	W	2-116
Recall	{:TRACe[:DATA]}:RECall	W	2-116
Copy	{:TRACe[:DATA]}:COpy	W	2-117
Delete	{:TRACe[:DATA]}:DELeTe	W	2-118
Information acquisition	{:TRACe[:DATA]}:INFormaTion?	R	2-118
Setting arbitrary waveform memory name	:MEMory{:TRACe[:DATA]}:DEFine	R/W	2-119

(2.3.3 Output Signal Parameter Setting)

Function	Command	R/W	Detail
Frequency			
Frequency	[[:SOURce[1|2]]]:FREQuency[:CW]:FIXed]	R/W	2-120
External synchronization source (Synchlator)	[[:SOURce[1|2]]]:FREQuency:SYNC	R/W	2-121
Signal polarity of external synchronization source	[[:SOURce[1|2]]]:FREQuency:SYNC:SLOPe	R/W	2-121
Frequency ratio at external synchronization mode	[[:SOURce[1|2]]]:FREQuency:SYNC:HARMOnic	R/W	2-122
Phase			
Phase	[[:SOURce[1|2]]]:PHASe[:ADJust]	R/W	2-123
Amplitude			
Amplitude	[[:SOURce[1|2]]]:VOLTagE[:LEVel][:IMMediate][:AMPLitude]	R/W	2-124
DC offset			
DC offset	[[:SOURce[1|2]]]:VOLTagE[:LEVel][:IMMediate]:OFFSet	R/W	2-125
High level/Low level			
High level	[[:SOURce[1|2]]]:VOLTagE[:LEVel][:IMMediate]:HIGH	R/W	2-126
Low level	[[:SOURce[1|2]]]:VOLTagE[:LEVel][:IMMediate]:LOW	R/W	2-126
Subchannel operation			
Waveform	[[:SOURce[1|2]]]:SCHannel:FUNctIon[:SHAPE]	R/W	2-128
Amplitude	[[:SOURce[1|2]]]:SCHannel:VOLTagE[:LEVel][:IMMediate][:AMPLitude]	R/W	2-129
DC offset	[[:SOURce[1|2]]]:SCHannel:VOLTagE[:LEVel][:IMMediate]:OFFSet	R/W	2-130
Frequency	[[:SOURce[1|2]]]:SCHannel:FREQuency	R/W	2-130
Phase	[[:SOURce[1|2]]]:SCHannel:PHASe[:ADJust]	R/W	2-131
Select arbitrary waveform	[[:SOURce[1|2]]]:SCHannel:FUNctIon:USER	R/W	2-131
Noise bandwidth	[[:SOURce[1|2]]]:SCHannel:FUNctIon:NOISe:BW	R/W	2-132

(2.3.4 Signal Output Operation)

Function	Command	R/W	Detail
Output on/off	:OUTPut[1|2]::STATe	R/W	2-133
Output on at power-on	:OUTPut[1|2]:PON	R/W	2-133
Output auto-range	[:SOURce[1|2]]:VOLTage:RANGe:AUTO	R/W	2-134
Query setting range	[:SOURce[1|2]]:VOLTage:RANGe?	R	2-134
ϕ Sync	[:SOURce[1|2]]:PHASe:INITiate	W	2-135
External addition input	[:SOURce[1|2]]:COMBine:FEED	R/W	2-135
Load impedance	:OUTPut[1|2]:LOAD	R/W	2-136

(2.3.5 Trigger Operation)

Function	Command	R/W	Detail
Trigger source	:TRIGger[1|2]:{SWEep|BURSt}:SOURce	R/W	2-137
Internal trigger period	:TRIGger[1|2]:{SWEep|BURSt}:TIMer	R/W	2-138
External trigger signal polarity	:TRIGger[1|2]:{SWEep|BURSt}:SLOPe	R/W	2-139
Manual trigger (TRIG Key operation)	*TRG	W	2-139
Manual trigger	:TRIGger[1|2]::SEQuence[:IMMediate]	W	2-139
Modulation/Sweep/Sequence	:TRIGger[1|2]:SELEcted:EXECute	W	2-140
External trigger threshold level	:TRIGger[1|2]:{SWEep|BURSt|FSKey|PSKey|SYNC}:LEVel	W	2-141

(2.3.6 Setting Memory Operation)

Function	Command	R/W	Detail
Clear	:MEMory:STATe:DELeTe	W	2-142
Setting memory name	:MEMory:STATe:DEFine	R/W	2-142
Store	*SAV	W	2-142
Recall	*RCL	W	2-142

(2.3.7 USB Storage Operation)

Function	Command	R/W	Detail
Information acquisition	:MMEMory:CATalog[:ALL]?	R	2-143
File delete	:MMEMory:DELeTe	W	2-143
Recall setting	:MMEMory:STATe:RECall	W	2-144
Store current setting	:MMEMory:STATe:STORe	W	2-144
Import arbitrary waveform	:MMEMory:{TRACe|DATA}:IMPorT	W	2-144
Export arbitrary waveform	:MMEMory:{TRACe|DATA}:EXPorT	W	2-145
Import sequence data	:MMEMory:{TRACe|DATA}:SEQuence:RECall	W	2-145
Export sequence data	:MMEMory:{TRACe|DATA}:SEQuence:STORe	W	2-145

(2.3.8 Status Operation)

Function	Command	R/W	Detail
Status operations (Common command)			
Status register and error queue clear	*CLS	W	2-146
Register preset	:STATus:PRESet	W	2-146
Power on status clear flag	*PSC	R/W	2-147
Status byte register	*STB?	R	2-148
Service request enable register	*SRE	R/W	2-148
Standard event status register	*ESR?	R	2-148
Standard event status enable register	*ESE	R/W	2-149
Operation status register group			
Condition register	:STATus:OPERation[:CH1]:CH2]:CONDition?	R	2-150
Transition filter register (Negative)	:STATus:OPERation[:CH1]:CH2]:NTRansition	R/W	2-150
Transition filter register (Positive)	:STATus:OPERation[:CH1]:CH2]:PTRansition	R/W	2-151
Event register	:STATus:OPERation[:CH1]:CH2]:[EVENT]?	R	2-151
Event enable register	:STATus:OPERation[:CH1]:CH2]:ENABle	R/W	2-151
Questionable data status register group			
Condition register	:STATus:QUEStionable[:CH1]:CH2]:CONDition?	R	2-152
Transition filter register (Negative)	:STATus:QUEStionable[:CH1]:CH2]:NTRansition	R/W	2-152
Transition filter register (Positive)	:STATus:QUEStionable[:CH1]:CH2]:PTRansition	R/W	2-153
Event register	:STATus:QUEStionable[:CH1]:CH2]:[EVENT]?	R	2-153
Event enable register	:STATus:QUEStionable[:CH1]:CH2]:ENABle	R/W	2-153
Warning event register group			
Event register	:STATus:WARning[:CH1]:CH2]:[EVENT]?	R	2-154
Event enable register	:STATus:WARning[:CH1]:CH2]:ENABle	R/W	2-154

(2.3.9 Channel Operation, Channel-Link)

Function	Command	R/W	Detail
Channel mode	:CHANnel:MODE	R/W	2-155
Constant frequency difference frequency difference	:CHANnel:DELTA	R/W	2-155
Constant frequency ratio frequency ratio	:CHANnel:RATio	R/W	2-156
Channel-link	:INSTrument:COUPlE	R/W	2-157

(2.3.10 Sequence Mode)

Function	Command	R/W	Detail
Sequence mode	[:SOURce[1|2]]:SEQuence:STATe	R/W	2-158
Sequence data	{:TRACe|:DATA}:SEQuence	R/W	2-159
Compile sequence data	:TRIGger[1|2]:COMPIle[:IMMEdiate]	W	2-159
Acquisition of current step	[:SOURce[1|2]]:SEQuence:CSTeP?	R	2-160
Initialization of sequence data	{:TRACe|:DATA}:SEQuence:CLear	W	2-160
Store sequence data	{:TRACe|:DATA}:SEQuence:STORe	W	2-160
Recall sequence data	{:TRACe|:DATA}:SEQuence:RECall	W	2-161
Setting sequence memory name	:MEMory{:TRACe|:DATA}:STATe:SEQuence:DEFine	R/W	2-161
Sequence auto run at power-on	[:SOURce[1|2]]:SEQuence:PON	R/W	2-162

(2.3.11 Setting Range Limit Operation)

Function	Command	R/W	Detail
Frequency setting range limit	[:SOURce[1|2]]:FREQuency:LIMit: {HIGH|LOW}	R/W	2-163
Voltage setting range limit	[:SOURce[1|2]]:VOLTage:LIMit: {HIGH|LOW}	R/W	2-164
Phase setting range limit	[:SOURce[1|2]]:PHASe:LIMit: {HIGH|LOW}	R/W	2-165
Duty setting range limit	[:SOURce[1|2]][:PULSe]:DCYCLe:LIMit: {HIGH|LOW}	R/W	2-166

(2.3.12 Other Operations)

Function	Command	R/W	Detail
Equipment-specific information	*IDN?	R	2-167
Error message	:SYSTem:ERRor?	R	2-167
Initialization of setting	*RST	W	2-168
Set *OPC on operation completes	*OPC	W	2-168
Query current operation completed	*OPC?	R	2-168
Wait for command processing	*WAI	W	2-169
External reference frequency input	[:SOURce[1|2]]:ROSCillator:SOURce	R/W	2-169
External reference frequency output	[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]	R/W	2-169
Query input state of multi i/o connector	:SYSTem:AUXiliary:INPut?	R	2-170
Set output state of multi i/o connector	:SYSTem:AUXiliary:OUTPut	R/W	2-170
Enable of multi i/o connector	:SYSTem:AUXiliary:OUTPut:ENABle	R/W	2-171
User-defined unit	[:SOURce[1|2]]: {DCYCLe|PERiod|FREQuency|PHASe|VOLTage[:OFFSet]}:USER	R/W	2-172
Theme Color of Display	:DISPlay:THEMe	R/W	2-173
Theme Color of Graph	:DISPlay:THEMe:GRAPh	R/W	2-173
Read Display Capture Data	:HCOPy:DATA?	R	2-173
Save Display Capture Data File to USB Storage	:HCOPy:FILE	W	2-174
Availability of Product Options	:SYSTem:LICense?	R	2-174

2.3 Command Reference

This section describes each command for the instrument.

2.3.1 Oscillation Mode

2.3.1.1 Continuous Oscillation Mode

2.3.1.1.1 Continuous Oscillation Mode (W) [:SOURce[1|2]]:CONTInuous[:IMMEDIATE]

■[:SOURce[1|2]]:CONTInuous[:IMMEDIATE]

Description

Sets the oscillation mode to the continuous oscillation.

Setting parameter

None

Example

:SOURce1:CONTInuous:IMMEDIATE

Sets the oscillation mode of CH1 to the continuous oscillation.

2.3.1.1.2 Continuous Oscillation Mode (R) [:SOURce[1|2]]:CONTInuous:STATe?

□[:SOURce[1|2]]:CONTInuous:STATe?

Description

Query whether the oscillation mode is continuous oscillation or not.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Not the continuous oscillation mode.

1 : 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 (W/R) :OUTPut[1|2]:SYNC:TYPE

■:OUTPut[1|2]:SYNC:TYPE

□:OUTPut[1|2]:SYNC:TYPE?

Description

Set/query of the synchronization output in the continuous oscillation mode.

Setting parameter

SYNC|SBSYnc|SFCTn|OFF

SYNC → Waveform synchronization signal

SBSYnc → Subchannel synchronization signal

SFCTn → Subchannel signal

OFF → Output off

Query parameter

None

Response format

[SYNC|SBSY|SFCT|OFF]

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:SYNC:TYPE SYNC

Set the synchronization output of CH1 in the continuous oscillation mode to the waveform synchronization.

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 you switch to only “modulation mode”, not “burst oscillation with modulation” or “sweep oscillation with modulation”, it is necessary to set “continuous oscillation mode” in advance.

2.3.1.2.1 Common Setting of Modulation

Start or stop of modulation can be setting by “2.3.5.6 Execution Control of Modulation/Sweep/Sequence”.

2.3.1.2.1.1 Phase of Internal Modulation (W/R)

[[: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

Set/query the phase of internal modulation source.
Whichever modulation type is specified, the result is 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 → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

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

Remarks

Phase of the subchannel setting in the continuous oscillation mode is internally common..

2.3.1.2.1.2 Frequency of Internal Modulation (W/R)

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

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

Description

Set/query the internal modulation frequency.
Whichever modulation type is selected, the result is same

Setting parameter

<frequency>|MINimum|MAXimum
<frequency> ::= <REAL>[<eunits>][<units>]
<REAL> → frequency : 0 Hz to 5 MHz,
Resolution : 11 digits or 100 μHz

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

MINimum → 0 Hz

MAXimum → 5 MHz

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FM:INTernal:FREQuency 1KHZ

Sets the internal modulation frequency of CH1 to 1kHz

2.3.1.2.1.3 Synchronization Signal Output (W/R)
:OUTPut[1|2]:SYNC :{FSKey|PSKey|FM|PM|AM|AMSC|OFSM|PWM}:TYPE

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

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

Description

Set/query the synchronization output at the modulation oscillation mode.

Whichever modulation type is selected, the result is same.

Setting parameter

SYNC|MSYnc|SBSYnc|MFCTn|SFCTn|OFF

SYNC → Waveform synchronization (Sync)

MSYnc → Internal modulation synchronization (ModSync)

SBSYnc → Sub output synchronization (SubSync)

MFCTn → Internal modulation waveform (ModFctn)

SFCTn → Sub waveform (SubFctn)

OFF → Output Off (OFF)

Query parameter

None

Response format

[SYNC|MSYN|SBSY|MFCT|SFCT|OFF]

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:SYNC:FSKey:TYPE SYNC

Sets the synchronization output of CH1 to Sync.

Remarks

When the burst modulation, “:OUTPut[1|2]:SYNC:BURSt:TYPE” is used.

When the sweep modulation, “:OUTPut[1|2]:SYNC:SWEep:TYPE” is used.

2.3.1.2.2 Common Setting of FSK/PSK

2.3.1.2.2.1 Modulation Source (W/R) [:SOURce[1|2]]:{FSKey|PSKey}:SOURce

■[:SOURce[1|2]]:{FSKey|PSKey}:SOURce

□[:SOURce[1|2]]:{FSKey|PSKey}:SOURce?

Description

Set/query the modulation source of FSK/PSK.

Setting parameter

INTernal|EXTernal[1]|EXTernal2

INTernal → Internal

EXTernal[1] → TRIG IN 1 input connector

EXTernal2 → TRIG IN 2 input connector

(Only WF1982/WF1984 can be selected)

Query parameter

None

Response format

INT|EXT1|EXT2

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:FSKey:SOURce INTernal

Sets the modulation source of FSK of CH1 to the internal.

2.3.1.2.2.2 Polarity of External Modulation (W/R) [:SOURce[1|2]]:{FSKey|PSKey}:SLOPe

■[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe

□[:SOURce[1|2]]:{FSKey|PSKey}:SLOPe?

Description

Set/query the polarity of the external modulation source, when FSK/PSK is selected.

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.

Example

:SOURce1:FSKey:SLOPe NEGative

Set the polarity of the FSK/PSK external modulation source of the TRIG IN 1 terminal to negative polarity.

Remarks

“[1|2]” of this command is to specify trigger channel.

2.3.1.2.3 Common Setting Except for FSK/PSK

2.3.1.2.3.1 Modulation Source (W/R) [: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

Set/query the modulation source.
Whichever modulation type is specified, the result is same.

Setting parameter

INTernal|EXTernal[1]|EXTernal2
INTernal → Internal
EXTernal[1] → MOD/ADD IN CH1 input connector
EXTernal2 → MOD/ADD IN CH2 input connector
(Only CH2 of WF1982/WF1984 can be selected)

Query parameter

None

Response format

INT|EXT1|EXT2
* For the meaning of each response data, see the setting parameter.

Example

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

2.3.1.2.3.2 Internal Modulation Waveform (W/R) [: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

Set/query the internal modulation waveform.
Whichever modulation type is specified, the result is same.

Setting parameter

SINusoid|SQUare|TRIangle|PRAMp|NRAMp|NOISe
|USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSSian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFAL|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|DPULse|BRRamp
|USER
SINusoid → Sine wave
SQUare → Square wave
TRIangle → Triangle wave
PRAMp → Rising ramp wave
NRAMp → Falling 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
DPULse	→ Double pulse
BRRamp	→ Bottom-referenced ramp wave
USER	→ Arbitrary waveform

Query parameter

None

Response format

SIN|SQU|TRI|PRAM|NRAM|NOIS
 |USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
 |ONPSine|OFPSine|CONSine|COFSine
 |GAUSSian|LOrentz|HAVersine|HSPulse|TPULse|SINC
 |ERISe|EFALl|SOLStep|DOSCillation
 |OSURge|PSURge
 |TOFFset|HSEPulse|DPULse|BRRamp
 |USER

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:FM:INTernal:FUNCTion:SHAPe SINusoid
 Set the internal modulation waveform of CH1 to sine wave.

Remarks

The subchannel waveform setting in the continuous oscillation mode is internally common.

2.3.1.2.3.3 Arbitrary Waveform for Internal Modulation (W/R)

[[: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

Set/query the arbitrary waveform of the internal modulation waveform.
 Whichever modulation type is selected, the result is same.

Setting parameter

<memory> ::= <INT>
 <INT> → Memory number : 0 to 4096

Query parameter

None

Response format

<NR1>

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 waveform setting in the continuous oscillation mode is internally common.

2.3.1.2.3.4 Noise Bandwidth for Internal Modulation (W/R)**[[: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**

Set/query the bandwidth of noise.

Whichever modulation type is selected, the result is same.

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number : 1 to 6

1 → 100kHz

2 → 300kHz

3 → 1MHz

4 → 3MHz

5 → 10MHz

6 → Full * WF1983/WF1984 only

MINimum → 1 (Narrowband 100kHz)

MAXimum → 5 (Wideband 10MHz) * WF1981/WF1982

6 (Wideband Full) * WF1983/WF1984

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:FM:INTernal:FUNCTion:NOISe:BW 1

Sets the noise bandwidth of the modulation source of CH1 to 100kHz.

Remarks

The subchannel waveform setting in the continuous oscillation mode is internally common.

2.3.1.2.4 FSK (Frequency Shift Keying)

2.3.1.2.4.1 Set FSK (W/R) [:SOURce[1|2]]:FSKey:STATe

■[:SOURce[1|2]]:FSKey:STATe

□[:SOURce[1|2]]:FSKey:STATe?

Description

Set the modulation type to FSK (frequency shift keying).
Query whether the modulation type is FSK or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : FSK off when the modulation type is FSK.
1/ON : Set the modulation type to FSK.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not FSK.
1 : Modulation type is FSK.

Example

:SOURce1:FSKey:STATe ON
Set the modulation type of CH1 to FSK.

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.4.2 Hop Frequency (W/R) [:SOURce[1|2]]:FSKey[:FREQuency]

■[:SOURce[1|2]]:FSKey[:FREQuency]

□[:SOURce[1|2]]:FSKey[:FREQuency]?

Description

Set/query 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

* When the unit is frequency, M is used to mean "10⁶".

<units> ::= HZ

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FSKey:FREQuency 1KHZ
 Set the hop frequency of FSK of CH1 to 1kHz.

2.3.1.2.5 PSK (Phase Shift Keying)**2.3.1.2.5.1 Set PSK (W/R)**
[[:SOURce[1|2]]:PSKey:STATe

■[:SOURce[1|2]]:PSKey:STATe

□[:SOURce[1|2]]:PSKey:STATe?

Description

Set the modulation type to PSK (phase shift keying).
 Query whether the modulation type is PSK or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : FSK off when the modulation type is PSK.
 1/ON : Set the modulation type to PSK.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not PSK.
 1 : Modulation type is PSK.

Example

:SOURce1:PSKey:STATe ON
 Switches the modulation type of CH1 to PSK.

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.5.2 Deviation (W/R)
[[:SOURce[1|2]]:PSKey[:DEViation]

■[:SOURce[1|2]]:PSKey[:DEViation]

□[:SOURce[1|2]]:PSKey[:DEViation]?

Description

Set/query the deviation of PSK.

Setting parameter

<deviation>|MINimum|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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

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

Remarks

The setting range may be narrower depending on the current settings.

2.3.1.2.6 FM (Frequency Modulation)**2.3.1.2.6.1 Set FM (W/R)
[:SOURce[1|2]]:FM:STATe**

■[:SOURce[1|2]]:FM:STATe

□[:SOURce[1|2]]:FM:STATe?

Description

Set the modulation type to FM (frequency modulation).
 Query whether the modulation type is FM or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : FM off when the modulation type is FM.
 1/ON : Set the modulation type to FM.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not FM.
 1 : Modulation type is FM.

Example

:SOURce1:FM:STATe ON
 Set the modulation type of CH1 to FM.

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

**2.3.1.2.6.2 Set Peak Deviation (W/R)
[:SOURce[1|2]]:FM[:DEVIation]**

■[:SOURce[1|2]]:FM[:DEVIation]

□[:SOURce[1|2]]:FM[:DEVIation]?

Description

Set/query the peak deviation of FM.

Setting parameter

<deviation>|MINimum|MAXimum

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

<REAL> → Peak deviation

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

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

* When the unit is frequency, M is used to mean "10⁶".

<units> ::= HZ

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FM:DEVIation 1KHZ

Set the peak deviation of FM of CH1 to 1kHz.

2.3.1.2.7 PM (Phase Modulation)**2.3.1.2.7.1 Set PM (W/R)**
[[:SOURce[1|2]]:PM:STATe]

■[:SOURce[1|2]]:PM:STATe

□[:SOURce[1|2]]:PM:STATe?

Description

Set the modulation type to PM (phase modulation).

Query whether the modulation type is PM or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : PM off when the modulation type is PM.

1/ON : Set the modulation type to PM.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not PM.

1 : Modulation type is PM.

Example

:SOURce1:PM:STATe ON

Set the modulation type of CH1 to PM.

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.7.2 Peak Deviation (W/R)
[[:SOURce[1|2]]:PM[:DEVIation]]

■[:SOURce[1|2]]:PM[:DEVIation]

□[:SOURce[1|2]]:PM[:DEVIation]?

Description

Set/query the peak deviation of PM

Setting parameter

<deviation>|MINimum|MAXimum

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

<REAL> → Deviation : 0.000° to 180.000°

Resolution : 0.001°

<units> ::= DEG

MINimum → 0.000°

MAXimum → 180.000°

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PM:DEVIation 30DEG

Sets the peak deviation of PM of CH1 to 30°

Remarks

The setting range may be narrower depending on the current settings.

2.3.1.2.8 AM (amplitude modulation)**2.3.1.2.8.1 Set AM (W/R)
[:SOURce[1|2]]:AM:STATe**

■[:SOURce[1|2]]:AM:STATe

□[:SOURce[1|2]]:AM:STATe?

Description

Set the modulation type to AM (amplitude modulation).

Query whether the modulation type is AM or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : AM off when the modulation type is AM.

1/ON : Set the modulation type to AM.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not AM.

1 : Modulation type is AM.

Example

:SOURce1:AM:STATe ON

Set the modulation type of CH1 to AM

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

**2.3.1.2.8.2 Modulation Depth (W/R)
[:SOURce[1|2]]:AM[:DEPTh]**

■[:SOURce[1|2]]:AM[:DEPTh]

□[:SOURce[1|2]]:AM[:DEPTh]?

Description

Set/query the modulation depth of AM

Setting parameter

<depth>|MINimum|MAXimum

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

<REAL> → Depth : 0.0 % to 100.0 %

Resolution : 0.1 %

<units> ::= PCT

MINimum → Set the minimum value
MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:AM:DEPTh 30PCT

Set the modulation depth of AM of CH1 to 30%

2.3.1.2.9 AM (DSB-SC)

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

■[:SOURce[1|2]]:AMSC:STATe

□[:SOURce[1|2]]:AMSC:STATe?

Description

Set the modulation type to AMSC(carrier suppression amplitude modulation).
Query whether the modulation type is AMSC or not

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : AMSC off when the modulation type is AMSC.
1/ON : Set the modulation type to AMSC.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not AMSC.
1 : Modulation type is AMSC.

Example

:SOURce1:AMSC:STATe ON

Set the modulation type of CH1 to AMSC

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.9.2 Modulation Depth (W/R) [:SOURce[1|2]]:AMSC[:DEPTh]

■[:SOURce[1|2]]:AMSC[:DEPTh]

□[:SOURce[1|2]]:AMSC[:DEPTh]?

Description

Set/query the modulation depth of AMSC.

Setting parameter

<depth>|MINimum|MAXimum

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

<REAL> → Depth : 0.0 % to 100.0 %
Resolution : 0.1 %

<units> ::= PCT

MINimum → Set the minimum value
MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:AMSC:DEPTh 30PCT
Set the modulation depth of AMSC of CH1 to 30%

2.3.1.2.10 DC Offset Modulation

2.3.1.2.10.1 Set DC Offset Modulation (W/R) [:SOURce[1|2]]:OFSM:STATe

■[:SOURce[1|2]]:OFSM:STATe

□[:SOURce[1|2]]:OFSM:STATe?

Description

Set the modulation type to DC offset modulation.
Query whether the modulation type is DC offset modulation or not.

Setting parameter

<state> ::= <BOL>
<BOL> → 0/OFF : Modulation off when the modulation type is DC offset.
1/ON : Set the modulation type to DC offset.

Query parameter

None

Response format

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

Example

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

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.10.2 Peak Deviation (W/R) [:SOURce[1|2]]:OFSM[:DEViation]

■[:SOURce[1|2]]:OFSM[:DEViation]

□[:SOURce[1|2]]:OFSM[:DEViation]?

Description

Set/query the peak deviation of DC offset modulation.

Setting parameter

<deviation>|MINimum|MAXimum
<deviation> ::= <REAL>[<eunits>][<units>]
<REAL> → Deviation : 0 V to 10.5 V
Resolution : 0.1 mV (3V below), 1 mV (3V or more)
<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:OFSM:DEViation 3V

Set 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 (W/R) [:SOURce[1|2]]:PWM:STATe

■[:SOURce[1|2]]:PWM:STATe

□[:SOURce[1|2]]:PWM:STATe?

Description

Set the modulation type to PWM (pulse width modulation).

Query whether the modulation type is PWM or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : PWM off when the modulation type is PWM.

1/ON : Set the modulation type to PWM.

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Modulation type is not PWM.

1 : Modulation type is PWM.

Example

:SOURce1:PWM:STATe ON

Set the modulation type of CH1 to PWM.

Remarks

Setting may not be possible depending on the combination of the current channel mode, oscillation mode, and waveform.

2.3.1.2.11.2 Peak Deviation (W/R) [:SOURce[1|2]]:PWM[:DEVIation]:DCYClE

■[:SOURce[1|2]]:PWM[:DEVIation]:DCYClE

□[:SOURce[1|2]]:PWM[:DEVIation]:DCYClE?

Description

Set/query the peak deviation of PWM.

Setting parameter

<deviation>|MINimum|MAXimum

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

<REAL> → Deviation : 0.0000 % to 49.9999 %

(Square wave/normal duty range)

: 0.0000 % to 50.0000 %

(Square wave/extended duty range)

: 0.0000 % to 49.9999 %

(pulse wave)

Resolution : 0.0001 %

<units> ::= PCT

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query format

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PWM:DEVIation:DCYClE 30PCT

Set the peak deviation of PWM of CH1 to 30%

Remarks

The upper limit of peak deviation setting may vary depending on the duty value of the carrier frequency or duty setting.

2.3.1.3 Sweep Oscillation Mode

2.3.1.3.1 Common Setting of Sweep

Start/stop/hold/resume of sweep can be setting by “2.3.5.6 Execution Control of Modulation/Sweep/Sequence (W)
:TRIGger[1|2]:SElected:EXECute”.

2.3.1.3.1.1 Set Sweep Mode (W/R) [:SOURce[1|2]]:SWEep:MODE

■[:SOURce[1|2]]:SWEep:MODE

□[:SOURce[1|2]]:SWEep:MODE?

Description

Set/query 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.

Example

:SOURce1:SWEep:MODE SINGle

Set the sweep mode of CH1 to the single.

Remarks

Setting may not be possible depending on the current channel mode.

2.3.1.3.1.2 Sweep Slope (W/R) [:SOURce[1|2]]:SWEep:SPACing

■[:SOURce[1|2]]:SWEep:SPACing

□[:SOURce[1|2]]:SWEep:SPACing??

Description

Set/query 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.

Example

:SOURce1:SWEep:SPACing LINear

Set the sweep slope of CH1 to linear.

2.3.1.3.1.3 Sweep Direction (W/R) [:SOURce[1|2]]:SWEep:INTernal:FUNCTion

■[:SOURce[1|2]]:SWEep:INTernal:FUNCTion

□[:SOURce[1|2]]:SWEep:INTernal:FUNCTion?

Description

Set/query 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.

Example

:SOURce1:SWEep:INTernal:FUNCTion RAMP

Set the sweep direction of CH1 to one-way.

2.3.1.3.1.4 Sweep Time (W/R) [:SOURce[1|2]]:SWEep:TIME

■[:SOURce[1|2]]:SWEep:TIME

□[:SOURce[1|2]]:SWEep:TIME?

Description

Set/query the sweep time.

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Sweep time : 0.1 ms to 10 ks

Resolution : 5 digits or 10 μs

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

<units> ::= S

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:SWEep:TIME 1MS

Sets the sweep time of CH1 to 1ms.

2.3.1.3.1.5 Stop Level Value (W/R) [:SOURce[1|2]]:SWEep:SLEVel

■[:SOURce[1|2]]:SWEep:SLEVel

□[:SOURce[1|2]]:SWEep:SLEVel?

Description

Set/query 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 → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:SWEep:SLEVel 20PCT

Set the stop level value to 20% when gated single-shot sweep of CH1 is stopped.

2.3.1.3.1.6 Set Stop level (W/R) [:SOURce[1|2]]:SWEep:SLEVel:STATe

■[:SOURce[1|2]]:SWEep:SLEVel:STATe

□[:SOURce[1|2]]:SWEep:SLEVel:STATe?

Description

Set/query the stop level ON/OFF 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>

Example

:SOURce1:SWEep:SLEVel:STATe ON

Enable the stop level 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 (W/R) [:SOURce[1|2]]:SWEep:OSTop

■[:SOURce[1|2]]:SWEep:OSTop

□[:SOURce[1|2]]:SWEep:OSTop?

Description

Set/query the oscillation stop unit at the time of sweep oscillation.

Setting parameter

HALF|CYCLe

HALF → 0.5 cycle

CYCLe → 1 cycle

Query parameter

None

Response format

HALF|CYCL

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:SWEep:OSTop HALF

Set the oscillation stop unit of CH1 at the time of sweep oscillation to 0.5 cycle.

2.3.1.3.1.8 Multi-Connector Control On/Off (W/R) [:SOURce[1|2]]:SWEep:MCONnector:STATe

■[:SOURce[1|2]]:SWEep:MCONnector:STATe

□[:SOURce[1|2]]:SWEep:MCONnector:STATe?

Description

Set/query of enable/disable of the multi-connector control in sweep oscillation mode.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Disabled

1/ON : Enabled

Query parameter

None

Response format

<NBOL>

Example

:SOURce1:SWEep:MCONnector:STATe ON

Enables the multi-connector control of CH1 at the time of sweep oscillation.

2.3.1.3.1.9 Synchronization Output (W/R) :OUTPut[1|2]:SYNC:SWEep:TYPE

■:OUTPut[1|2]:SYNC:SWEep:TYPE

□:OUTPut[1|2]:SYNC:SWEep:TYPE?

Description

Set/query the synchronization output at the sweep oscillation mode.

Setting parameter

SYNC|SSYNc|MARKer|MSYNc|SBSYNc|MFCTn|SFCTn|OFF

SYNC → Reference phase synchronization

SSYNc → Sweep synchronization

MARKer → Marker

MSYNc → Internal modulation synchronization

SBSYNc → Subchannel synchronization
 MFCTc → Internal modulation function
 SFCTc → Sub function
 OFF → Output stop

Query parameter

None

Response format

SYNC|SSYN|MARK|MSYN|SBSY|MFCT|SFCT|OFF

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:SYNC:SWEep:TYPE SYNC

Set 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 (W/R) [:SOURce[1|2]]:FREQuency:MODE

■[:SOURce[1|2]]:FREQuency:MODE

□[:SOURce[1|2]]:FREQuency:MODE?

Description

Set the oscillation mode to the sweep oscillation of frequency.

Query whether the oscillation mode is the sweep oscillation of frequency or not.

Setting parameter

CW|FIXed|SWEep

CW|FIXed → Set to the continuous oscillation when the oscillation mode is the sweep oscillation of frequency.

SWEep → Set to the oscillation mode to the sweep oscillation of frequency.

Query parameter

None

Response format

CW|SWE

CW : The oscillation mode is not the sweep oscillation of frequency.

SWE : The oscillation mode is the sweep oscillation of frequency.

Example

:SOURce1:FREQuency:MODE SWEep

Set the oscillation mode of CH1 to the sweep oscillation frequency sweep type.

2.3.1.3.2.2 Start Value (W/R) [:SOURce[1|2]]:FREQuency:START

■[:SOURce[1|2]]:FREQuency:START

□[:SOURce[1|2]]:FREQuency:START?

Description

Set/query the start value of the frequency sweep.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Start value : 0 Hz to 30 MHz * WF1981/WF1982

: 0 Hz to 60 MHz * WF1983/WF1984

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

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FREQuency:STARt 1KHZ

Set the start value of the frequency sweep of CH1 to 1kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

2.3.1.3.2.3 Stop Value (W/R)
[[:SOURce[1|2]]:FREQuency:STOP

■[:SOURce[1|2]]:FREQuency:STOP

□[:SOURce[1|2]]:FREQuency:STOP?

Description

Set/query the stop value of frequency sweep.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Stop value : 0 Hz to 30 MHz * WF1981/WF1982

: 0 Hz to 60 MHz * WF1983/WF1984

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

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FREQuency:STOP 1KHZ

Set the stop value of the frequency sweep of CH1 to 1kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

2.3.1.3.2.4 Center Value (W/R) [:SOURce[1|2]]:FREQuency:CENTer

■[:SOURce[1|2]]:FREQuency:CENTer

□[:SOURce[1|2]]:FREQuency:CENTer?

Description

Set/query the center value of frequency sweep.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Center value : 0.01 μHz to 30 MHz * WF1981/WF1982
: 0.01 μHz to 60 MHz * WF1983/WF1984
Resolution : 0.01 μHz (< 50MHz), 0.1 μHz (≥ 50MHz)

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:FREQuency:CENTer 1KHZ

Set the center value for the frequency sweep of CH1 to 1kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

2.3.1.3.2.5 Span value (W/R) [:SOURce[1|2]]:FREQuency:SPAN

■[:SOURce[1|2]]:FREQuency:SPAN

□[:SOURce[1|2]]:FREQuency:SPAN?

Description

Set/query the span value of frequency sweep

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Span value : 0 Hz to 30 MHz * WF1981/WF1982
: 0 Hz to 60 MHz * WF1983/WF1984
Resolution : 0.01 μHz (<50MHz), 0.1 μHz (≥ 50MHz)

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:FREQuency:SPAN 1KHZ

Set the span value for the frequency sweep of CH1 to 1kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

2.3.1.3.2.6 Marker Value (W/R)
[[:SOURce[1|2]]:MARKer:FREQuency]

■[:SOURce[1|2]]:MARKer:FREQuency

□[:SOURce[1|2]]:MARKer:FREQuency?

Description

Set/query the marker value of frequency sweep..

Setting parameter

<frequency>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value : Start value to stop value

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

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ

CENTer → Center value of frequency sweep

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[CENTer|MINimum|MAXimum]

CENTer → Query the center value of frequency sweep

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:MARKer:FREQuency 1KHZ

Set the marker value of the frequency sweep of CH1 to 1kHz.

Remarks

Setting range varies at the waveform and oscillation mode.

2.3.1.3.2.7 Swap Start/Stop Value (W)
[[:SOURce[1|2]]:FREQuency:SWAP]

■[:SOURce[1|2]]:FREQuency:SWAP

Description

Swap the start value and the stop value of the frequency sweep.

Setting parameter

None

Example

:SOURce1:FREQuency:SWAP

Swap the start value and the stop value of the frequency sweep of CH1.

2.3.1.3.2.8 Output of Start/Stop Value (W) [:SOURce[1|2]]:FREQuency:STATe

■[:SOURce[1|2]]:FREQuency:STATe

Description

Set the state of frequency sweep.

Setting parameter

START|STOP

START → Set the output to the start value

STOP → Set the output to the stop value

Example

:SOURce1:FREQuency:STATe START

Set the state of frequency sweep of CH1 to the start value

2.3.1.3.3 Phase Sweep Setting

2.3.1.3.3.1 Phase Sweep (W/R) [:SOURce[1|2]]:PHASe:MODE

■[:SOURce[1|2]]:PHASe:MODE

□[:SOURce[1|2]]:PHASe:MODE?

Description

Set the oscillation mode to the sweep oscillation of phase.

Query whether the oscillation mode is the sweep oscillation of phase or not.

Setting parameter

FIXed|SWEep

FIXed → Set to the continuous oscillation when the oscillation mode is the sweep oscillation of phase.

SWEep → Set to the oscillation mode to the sweep oscillation of phase.

Query parameter

None

Response format

FIX|SWE

FIX : Oscillation mode is not the sweep oscillation of phase.

SWE : Oscillation mode is the sweep oscillation of phase.

Example

:SOURce1:PHASe:MODE SWEep

Set the oscillation mode of CH1 to the sweep oscillation phase sweep type.

2.3.1.3.3.2 Start Value (W/R) [:SOURce[1|2]]:PHASe:START

■[:SOURce[1|2]]:PHASe:START

□[:SOURce[1|2]]:PHASe:START?

Description

Set/query the start value of the phase sweep.

Setting parameter

<phase>|MINimum|MAXimum

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

<REAL> → Start value : -1800.000° to 1800.000°

Resolution : 0.001°

<units> ::= DEG

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PHASe:STARt 90DEG

Set the start value of the phase sweep of CH1 to 90°.

2.3.1.3.3.3 Stop Value (W/R)
[:SOURce[1|2]]:PHASe:STOP

■[:SOURce[1|2]]:PHASe:STOP

□[:SOURce[1|2]]:PHASe:STOP?

Description

Set/query 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 → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PHASe:STOP 90DEG

Set the stop value of the phase sweep of CH1 to 90°.

2.3.1.3.3.4 Center Value (W/R)
[:SOURce[1|2]]:PHASe:CENTer

■[:SOURce[1|2]]:PHASe:CENTer

□[:SOURce[1|2]]:PHASe:CENTer?

Description

Set/query 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 → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value
 MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PHASe:CENTer 90DEG

Set the center value of the phase sweep of CH1 to 90°.

2.3.1.3.3.5 Span Value (W/R)

[:SOURce[1|2]]:PHASe:SPAN

■[:SOURce[1|2]]:PHASe:SPAN

□[:SOURce[1|2]]:PHASe:SPAN?

Description

Set/query 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 → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PHASe:SPAN 90DEG

Set the span value of the phase sweep of CH1 to 90°.

2.3.1.3.3.6 Marker Value (W/R)

[:SOURce[1|2]]:MARKer:PHASe

■[:SOURce[1|2]]:MARKer:PHASe

□[:SOURce[1|2]]:MARKer:PHASe?

Description

Set/query the marker value of the phase sweep.

Setting parameter

<phase>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value : Start value to stop value
 Resolution : 0.001°

<units> ::= DEG

CENTer → Center value of the phase sweep

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[CNETer|MINimum|MAXimum]

CENTER → Query the center value of the phase sweep
MINimum → Query the minimum value currently available
MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:MARKer:PHASe 90DEG

Set the marker value of the phase sweep of CH1 to 90°.

2.3.1.3.3.7 Swap Start/Stop Value (W) [:SOURce[1|2]]:PHASe:SWAP

■[:SOURce[1|2]]:PHASe:SWAP

Description

Swap the start value and the stop value of the phase sweep.

Setting parameter

None

Example

:SOURce1:PHASe:SWAP

Swap the start value and the stop value of the phase sweep of CH1.

2.3.1.3.3.8 Output of Start/Stop Value (W) [:SOURce[1|2]]:PHASe:STATe

■[:SOURce[1|2]]:PHASe:STATe

Description

Set the state of phase sweep.

Setting parameter

START|STOP

START → Set the output to the start value

STOP → Set the output to the stop value

Example

:SOURce1:PHASe:STATe START

Set the state of phase sweep of CH1 to the start value.

2.3.1.3.4 Amplitude Sweep Setting

2.3.1.3.4.1 Amplitude Sweep (W/R) [: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

Set the oscillation mode to the sweep oscillation of amplitude.

Query whether not the oscillation mode is the sweep oscillation of amplitude or not.

Setting parameter

FIXed|SWEep

FIXed → Set to the continuous oscillation when the oscillation mode is the sweep oscillation of amplitude.

SWEep → Set to the oscillation mode to the sweep oscillation of amplitude.

Query parameter

None

Response format

FIX|SWE

FIX : The oscillation mode is not the sweep oscillation of amplitude.

SWE : The oscillation mode is the sweep oscillation of amplitude.

Example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:MODE SWEep

Set the oscillation mode of CH1 to the sweep oscillation amplitude sweep type.

2.3.1.3.4.2 Start Value (W/R)**[[: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

Set/query the start value of the amplitude sweep

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Start value : 0 Vp-p to 21 Vp-p/open

: 0 Vp-p to 10.5 Vp-p/50Ω

Resolution : 0.1 mVp-p (3Vp-p below),

1 mVp-p (3Vp-p or more)

<eunits> ::= M (milli)

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

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

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

Set the start value of the amplitude sweep of CH1 to 5Vp-p

Remarks

Setting range may not be possible depending on the waveform and the oscillation mode.

2.3.1.3.4.3 Stop Value (W/R)**[[: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

Set/query the stop value of the amplitude sweep.

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Stop value : 0 Vp-p to 21 Vp-p/open

: 0 Vp-p to 10.5 Vp-p/50Ω

Resolution : 0.1 mVp-p (3Vp-p below),
1 mVp-p (3Vp-p or more)

<eunits> ::= M (milli)

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

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

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

Set the stop value of the amplitude sweep of CH1 to 5Vp-p.

Remarks

Setting range may not be possible depending on the waveform and the oscillation mode.

2.3.1.3.4.4 Center Value (W/R) [: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

Set/query the center value of the amplitude sweep.

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Center value : 0 Vp-p to 21 Vp-p/open

: 0 Vp-p to 10.5 Vp-p/50Ω

Resolution : 0.1 mVp-p (3Vp-p below),

1 mVp-p (3Vp-p or more)

<eunits> ::= M (milli)

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

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

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

Set the center value of the amplitude sweep of CH1 to 5Vp-p.

Remarks

Setting range may not be possible depending on the waveform and the oscillation mode.

Query parameter

[CENTer|MINimum|MAXimum]

CENTer → Query the center value of the amplitude sweep
MINimum → Query the minimum value currently available
MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:MARKer:VOLTage:LEVel:IMMediate:AMPLitude 5VPP
Set the marker value of the amplitude sweep of CH1 to 5Vp-p.

2.3.1.3.4.7 Swap Start/Stop Value (W) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:AMPLitude:SWAP

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

Description

Swap the start value and the stop value of the amplitude sweep.

Setting parameter

None

Example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:SWAP
Swap the start value and the stop value of the amplitude sweep of CH1.

2.3.1.3.4.8 Output of Start/Stop Value (W) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:AMPLitude:STATE

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

Description

Set the state of amplitude sweep.

Setting parameter

START|STOP

START → Set the output to the start value
STOP → Set the output to the stop value

Example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude:STATE START
Set the state of amplitude sweep of CH1 to the start value.

2.3.1.3.5 DC Offset Sweep Setting

2.3.1.3.5.1 DC Offset Sweep (W/R) [: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

Set the oscillation mode to the sweep oscillation of DC offset.
Query whether the oscillation mode is the sweep oscillation of DC offset or not.

Setting parameter

FIXed|SWEep

FIXed → Set to the continuous oscillation when the oscillation mode is the sweep oscillation of DC offset.
SWEep → Set to the oscillation mode to the sweep oscillation of DC offset.

Query parameter

None

Response format

FIX|SWE

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

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

Example

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

Set the oscillation mode of CH1 to the sweep oscillation DC offset sweep type.

2.3.1.3.5.2 Start Value (W/R)**[[: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

Set/query the start value of the DC offset sweep.

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : -10.5 V to +10.5 V

Resolution : 0.1 mV (±3V below), 1 mV (±3V or more)

<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

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

Set the start value of the DC offset sweep of CH1 to 2.5V.

2.3.1.3.5.3 Stop Value (W/R)**[[: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

Set/query the stop value of DC offset sweep.

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : -10.5 V to +10.5 V

Resolution : 0.1 mV (±3V below), 1 mV (±3V or more)

<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value
 MAXimum → Query the maximum value

Response format

<NR3>

Example

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

2.3.1.3.5.4 Center Value (W/R)

[[: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

Set/query the center value of DC offset sweep.

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : -10.5 V to +10.5 V

Resolution : 0.1 mV (±3V below), 1 mV (±3V or more)

<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:CENTer 2.5V
 Set the center value of the DC offset sweep of CH1 to 2.5V.

2.3.1.3.5.5 Span Value (W/R)

[[: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

Set/query the span value of the DC offset sweep

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : 0 V to 21 V

Resolution : 0.1 mV (3V below), 1 mV (3V or more)

<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:VOLTage:LEVel:IMMEDIATE:OFFSet:SPAN 2.5V

Set the span value of the DC offset sweep of CH1 to 2.5V.

2.3.1.3.5.6 Marker Value (W/R)

[[: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

Set/query the marker value of the DC offset sweep

Setting parameter

<offset>|CENTer|MINimum|MAXimum

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

<REAL> → DC offset : Start value to stop value

Resolution : 0.1 mV ($\pm 3V$ below), 1 mV ($\pm 3V$ or more)

<eunits> ::= M (milli)

<units> ::= V

CENTer → The center value of DC offset sweep

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[CENTer|MINimum|MAXimum]

CENTer → Queries the center value of DC offset sweep

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:MARKer:VOLTage:LEVel:IMMEDIATE:OFFSet 2.5V

Set the marker value of the DC offset sweep of CH1 to 2.5V.

2.3.1.3.5.7 Swap Start/Stop Value (W)

[[:SOURce[1|2]]:VOLTage[:LEVel][:IMMEDIATE]:OFFSet:SWAP

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

Description

Swap the start value and the stop value of the DC offset sweep.

Setting parameter

None

Example

:SOURce1:VOLTage:LEVel:IMMEDIATE:OFFSet:SWAP

Swap the start value and the stop value of the DC offset sweep of CH1.

2.3.1.3.5.8 Output of Start/Stop Value (W) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet:STATe

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

Description

Set the state of DC offset sweep.

Setting parameter

START|STOP

START → Set the output to the start value

STOP → Set the output to the stop value

Example

:SOURce1:VOLTage:LEVel:IMMediate:OFFSet:STATe START

Set the state of DC offset sweep of CH1 to the start value.

2.3.1.3.6 Duty Sweep Setting

2.3.1.3.6.1 Duty Sweep (W/R) [:SOURce[1|2]]:PULSe:DCYClE:MODE

■[:SOURce[1|2]]:PULSe:DCYClE:MODE

□[:SOURce[1|2]]:PULSe:DCYClE:MODE?

Description

Set the oscillation mode to the sweep oscillation of duty.

Query whether the oscillation mode is the sweep oscillation of duty or not.

Setting parameter

FIXed|SWEep

FIXed → Set to the continuous oscillation when the oscillation mode is the sweep oscillation of duty.

SWEep → Set the oscillation mode to the sweep oscillation of duty.

Query parameter

None

Response format

FIX|SWE

FIX : The oscillation mode is not the sweep oscillation of duty.

SWE : The oscillation mode is the sweep oscillation of duty.

Example

:SOURce1:PULSe:DCYClE:MODE SWEep

Set the oscillation mode of CH1 to the sweep oscillation duty sweep type

2.3.1.3.6.2 Start Value (W/R) [:SOURce[1|2]]:PULSe:DCYClE:STARt

■[:SOURce[1|2]]:PULSe:DCYClE:STARt

□[:SOURce[1|2]]:PULSe:DCYClE:STARt?

Description

Set/query the start value of the duty sweep.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Start value : 0.0001 % to 99.9999 %

(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 → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:DCYClE:STARt 20PCT

Set the start value of the duty sweep of CH1 to 20%.

Remarks

Setting range varies at the waveform and frequency.

2.3.1.3.6.3 Stop Value (W/R) [:SOURce[1|2]]:PULSe:DCYClE:STOP

■[:SOURce[1|2]][:PULSe]:DCYClE:STOP

□[:SOURce[1|2]][:PULSe]:DCYClE:STOP?

Description

Set/query the stop value of duty sweep.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Stop value : 0.0001 % to 99.9999 %

(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 → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:DCYClE:STOP 20PCT

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

Remarks

Setting range varies at the waveform and frequency.

2.3.1.3.6.4 Center Value (W/R) [:SOURce[1|2]]:PULSe:DCYClE:CENTer

■[:SOURce[1|2]]:PULSe:DCYClE:CENTer

□[:SOURce[1|2]]:PULSe:DCYClE:CENTer?

Description

Set/query the center value of duty sweep.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Center value : 0.0001 % to 99.9999 %

(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 → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:DCYClE:CENTer 20PCT

Set the center value of the duty sweep of CH1 to 20%.

Remarks

Setting range varies at the waveform and frequency.

2.3.1.3.6.5 Span Value (W/R) [:SOURce[1|2]]:PULSe:DCYClE:SPAN

■[:SOURce[1|2]]:PULSe:DCYClE:SPAN

□[:SOURce[1|2]]:PULSe:DCYClE:SPAN?

Description

Set/query the span value of duty sweep

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Span value : 0.0000 % to 99.9999 %

(Square wave/normal duty range)

: 0.0000 % to 100.0000 %

(Square wave/extended duty range)

: 0.0000 % to 99.9999 %

(Pulse wave)

Resolution : 0.0000 %

<units> ::= PCT

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available
 MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:DCYClE:SPAN 20PCT
 Set the span value of the duty sweep of CH1 to 20%.

Remarks

Setting range varies at the waveform and frequency.

2.3.1.3.6.6 Marker Value (W/R)

[[:SOURce[1|2]]:MARKer:PULSe:DCYClE

■[:SOURce[1|2]]:MARKer:PULSe:DCYClE

□[:SOURce[1|2]]:MARKer:PULSe:DCYClE?

Description

Set/query the marker value of duty sweep.

Setting parameter

<duty>|CENTer|MINimum|MAXimum

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

<REAL> → Marker value : Start value to stop value
 Resolution : 0.0001 %

<units> ::= PCT

MINimum → Set the minimum value currently available
 MAXimum → Set the maximum value currently available

Query parameter

[CENTer|MINimum|MAXimum]

CENTer → Query the center value of duty sweep
 MINimum → Query the minimum value currently available
 MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:MARKer:PULSe:DCYClE 20PCT
 Set the marker value of the duty sweep of CH1 to 20%.

Remarks

Setting range varies at the waveform and frequency.

2.3.1.3.6.7 Swap Start/Stop Value (W)

[[:SOURce[1|2]]:PULSe:DCYClE:SWAP

■[:SOURce[1|2]][:PULSe]:DCYClE:SWAP

Description

Swap the start value and the stop value of the duty sweep.

Setting parameter

None

Example

:SOURce1:PULSe:DCYClE:SWAP
 Swap the start value and the stop value of the duty sweep of CH1.

2.3.1.3.6.8 Output of Start/Stop Value (W) [:SOURce[1|2]]:PULSe:DCYClE:STATe

■[:SOURce[1|2]]:PULSe:DCYClE:STATe

Description

Set the state of duty sweep.

Setting parameter

STARt|STOP

STARt → Set the output to the start value

STOP → Set the output to the stop value

Example

:SOURce1:PULSe:DCYClE:STATe STARt

Set the state of duty sweep of CH1 to the start 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 “2.3.5 Trigger Operation”.

2.3.1.4.1.1 Set Burst Oscillation Mode (W/R) [:SOURce[1|2]]:BURSt:STATe

■[:SOURce[1|2]]:BURSt:STATe

□[:SOURce[1|2]]:BURSt:STATe?

Description

Set the burst/continuous oscillation mode.

Query whether the oscillation mode is burst or not.

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

Example

:SOURce1:BURSt:STATe ON

Set the oscillation mode of CH1 to burst.

2.3.1.4.1.2 Select Burst Mode (W/R) [:SOURce[1|2]]:BURSt:MODE

■[:SOURce[1|2]]:BURSt:MODE

□[:SOURce[1|2]]:BURSt:MODE?

Description

Set/query the burst mode.

Setting parameter

AUTO|TRIGger|GATE|TGATe

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

Query parameter

None

Response format

AUTO|TRIG|GATE|TGAT

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:BURSt:MODE AUTO

Set the burst mode of CH1 to the auto burst.

2.3.1.4.1.3 Stop Level Value (W/R) [:SOURce[1|2]]:BURSt:SLEVel

■[:SOURce[1|2]]:BURSt:SLEVel

□[:SOURce[1|2]]:BURSt:SLEVel?

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:BURSt:SLEVel 20PCT

Set the stop level value of CH1 at the time of burst to 20%.

2.3.1.4.1.4 Set Stop Level (W/R) [:SOURce[1|2]]:BURSt:SLEVel:STATe

■[:SOURce[1|2]]:BURSt:SLEVel:STATe

□[:SOURce[1|2]]:BURSt:SLEVel:STATe?

Description

Set/query 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>

Example

:SOURce1:BURSt:SLEVel:STATe ON

Enable the stop level of CH1 of the burst oscillation.

2.3.1.4.1.5 Synchronization Output (W/R) :OUTPut[1|2]:SYNC:BURSt:TYPE

■:OUTPut[1|2]:SYNC:BURSt:TYPE

□:OUTPut[1|2]:SYNC:BURSt:TYPE?

Description

Set/query the synchronization output in the burst mode.

Setting parameter

SYNC|BSYNc|MSYNc|SBSYNc|MFCTn|SFCTn|OFF

SYNC → Waveform synchronization

BSYNc → Burst synchronization

MSYNc → Internal modulation synchronization

SBSYNc → Sub waveform synchronization

MFCTn → Modulation function

SFCTn → Sub function

OFF → Output stop

Query parameter

None

Response format

SYNC|BSYN|MSYN|SBSY|MFCT|SFCT|OFF

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:SYNC:BURSt:TYPE SYNC

Set the burst synchronization output of CH1 to the waveform synchronization

2.3.1.4.2 Auto Burst

2.3.1.4.2.1 Mark Wave Number (W/R) [:SOURce[1|2]]:BURSt:AUTO:NCYCles

■[:SOURce[1|2]]:BURSt:AUTO:NCYCles

□[:SOURce[1|2]]:BURSt:AUTO:NCYCles?

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:BURSt:AUTO:NCYCles 10

Set the mark wave number of CH1 at the time of auto burst to 10.

2.3.1.4.2.2 Space Wave Number (W/R) [:SOURce[1|2]]:BURSt:AUTO:SPACe

■[:SOURce[1|2]]:BURSt:AUTO:SPACe

□[:SOURce[1|2]]:BURSt:AUTO:SPACe?

Description

Set/query 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 → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:BURSt:AUTO:SPACe 10

Set 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 (W/R) [:SOURce[1|2]]:BURSt[:TRIGger]:NCYCles

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

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

Description

Set/query 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

INFINITY → Infinity

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:BURSt:TRIGger:NCYCles 10

Set the mark wave number of CH1 at the time of trigger burst to 10.

2.3.1.4.3.2 Trigger Delay Time (W/R) [:SOURce[1|2]]:BURSt[:TRIGger]:TDElay

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

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

Description

Set/query the trigger delay time of trigger burst.

Setting parameter

<delay>|MINimum|MAXimum

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

<REAL> → Trigger delay time : 0 ns to 1 ks,

Resolution : 8 digits or 0.1 ns

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

<units> ::= S

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:BURSt:TRIGger:TDElay 10MS

Set the trigger delay time of CH1 at the time of trigger burst to 10ms.

2.3.1.4.4 Common setting of Gate / Triggered gate

2.3.1.4.4.1 Oscillation stop unit setting/query [:SOURce[1|2]]:BURSt:{GATE|TGATe}:OSTop

■[:SOURce[1|2]]:BURSt:{GATE|TGATe}:OSTop

□[:SOURce[1|2]]:BURSt:{GATE|TGATe}:OSTop?

Description

Set/query the oscillation stop unit at the time of gate/triggered-gate.

Setting keyword

GATE|TGATe

GATE → Gate

TGATe → Triggered gate

Setting parameter

HALF|CYCLe

HALF → 0.5 cycle

CYCLe → 1 cycle

Query parameter

None

Response format

HALF|CYCL

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:BURSt:TGATe:OSTop HALF

Set the oscillation stop unit of CH1 at the time of the triggered gate to 0.5 cycle.

2.3.2 Waveform Setting

2.3.2.1 Common Setting of Waveform

2.3.2.1.1 Select Waveform (W/R)[:SOURce[1|2]]:FUNCTION[:SHAPE]

■[:SOURce[1|2]]:FUNCTION[:SHAPE]

□[:SOURce[1|2]]:FUNCTION[:SHAPE]?

Description

Set/query 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|DPULse|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
DPULse	→	Double 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|DPUL|BRR
 |USER

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:FUNCTION:SHAPE RAMP
 Set the waveform of CH1 to ramp wave.

2.3.2.1.2 Waveform Polarity (W/R)
:OUTPut[1|2]:POLarity

■:OUTPut[1|2]:POLarity

□:OUTPut[1|2]:POLarity?

Description

Set/query 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|EFAL|SOLStep|DOSCillation
 |OSURge|PSURge
 |TOFFset|HSEPulse|DPULse|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
DPULse	→	Double 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|DPULse|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.

Example

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

2.3.2.1.3 Amplitude Scale Range (W/R)
:OUTPut[1|2]:SCALE

■:OUTPut[1|2]:SCALE

□:OUTPut[1|2]:SCALE?

Description

Set/query the amplitude scale 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|DPULse|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
EFALI	→	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
DPULse	→	Double pulse
BRRamp	→	Bottom-referenced ramp wave
USER	→	Arbitrary waveform

<scale> ::= MFS|FS|PFS

MFS	→	From minus-full-scale to 0
FS	→	Full-scale
PFS	→	From 0 to plus-full-scale

Query parameter

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

Example

:OUTPut1:SCALE SINusoid,FS

Set the amplitude scale range of sine wave of CH1 to ±FS.

2.3.2.2 Square Wave

2.3.2.2.1 Duty Range Extension (W/R) [:SOURce[1|2]]:FUNCTION:SQUare:EXTend

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

□[:SOURce[1|2]]:FUNCTION:SQUare:EXTend?

Description

Set/query the square wave of extended duty range.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Normal duty range

1/ON : Extended duty range

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Normal duty range

1 : Extended duty range

Example

:SOURce1:FUNCTION:SQUare:EXTend ON

Set the square wave of CH1 to the extended duty range.

2.3.2.2.2 Duty Value (W/R) [:SOURce[1|2]]:FUNCTION:SQUare:DCYCLE

■[:SOURce[1|2]]:FUNCTION:SQUare:DCYCLE

□[:SOURce[1|2]]:FUNCTION:SQUare:DCYCLE?

Description

Set/query the duty of the square wave.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0.0001 % to 99.9999 % (Normal range)

: 0.0000 % to 100.0000 % (Extended range)

Resolution : 0.0001 %

<units> ::= PCT|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:FUNCTION:SQUare:DCYCLE 20PCT

Set the duty of square wave of CH1 to 20%.

Remarks

The setting range of duty varies depending on the oscillation frequency in case of normal duty range.

2.3.2.3 Pulse Wave

2.3.2.3.1 Duty Value (W/R) [:SOURce[1|2]][:PULSe]:DCYCLe

■[:SOURce[1|2]][:PULSe]:DCYCLe

□[:SOURce[1|2]][:PULSe]:DCYCLe?

Description

Set/query the duty of pulse wave.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0.0001 % to 99.9999 %

Resolution : 0.0001 %

<units> ::= PCT|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= PCT|USER

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* Selected <units> as query parameter, be returned the value in that unit.

Response format

<NR3>

Example

:SOURce1:PULSe:DCYCLe 20PCT

Set the duty of pulse wave of CH1 to 20%.

Remarks

The setting range of duty varies depending on the oscillation frequency.

2.3.2.3.2 Pulse Width (W/R) [:SOURce[1|2]][:PULSe]:WIDTH

■[:SOURce[1|2]][:PULSe]:WIDTH

□[:SOURce[1|2]][:PULSe]:WIDTH?

Description

Set/query the pulse width.

Setting parameter

<width>|MINimum|MAXimum

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

<REAL> → Pulse width : 20 ns to 99.999 9 Ms

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

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

<units> ::= S

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:WIDTh 1MS
Sets the pulse width of CH1 to 1ms.

Remarks

The setting range varies depending on the currently setting.

2.3.2.3.3 Rising Time (W/R)
[[:SOURce[1|2]][:PULSe]:TRANSition[:LEADing]

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

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

Description

Set/query the rising time of pulse wave.

Setting parameter

<seconds>|MINimum|MAXimum

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

<REAL> → Rising time :

7.68 ns to 59.03 Ms (Transition wave cosine)

11.98 ns to 100.0 Ms (Transition wave except cosine)

Resolution : 4 digits or 0.01 ns

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

<units> ::= S

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:TRANSition:LEADing 1ms
Set the rising time of the pulse wave of CH1 to 1ms.

Remarks

The setting range varies depending on the currently setting.

2.3.2.3.4 Falling Time (W/R)

[[:SOURce[1|2]][:PULSe]:TRANSition:TRAILing

■[:SOURce[1|2]][:PULSe]:TRANSition:TRAILing

□[:SOURce[1|2]][:PULSe]:TRANSition:TRAILing?

Description

Set/query the falling time of pulse wave.

Setting parameter

<seconds>|MINimum|MAXimum

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

<REAL> → Falling time :

7.68 ns to 59.03 Ms (Transition wave cosine)

11.98 ns to 100.0 Ms (Transition wave except cosine)

Resolution : 4 digits or 0.01 ns

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

<units> ::= S

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:TRANSition:TRAILing 1ms

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

Remarks

The setting range varies depending on the currently setting.

2.3.2.3.5 Period Value (W/R)

[[:SOURce[1|2]][:PULSe]:PERiod

■[:SOURce[1|2]][:PULSe]:PERiod

□[:SOURce[1|2]][:PULSe]:PERiod?

Description

Set/query the period value.

Setting parameter

<period>|MINimum|MAXimum

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

<REAL> → Cycle : 33.34 ns to 100 Ms * WF1981/WF1982

: 16.67 ns to 100 Ms * WF1983/WF1984

Resolution : 0.01 ns or 16 digits

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

<units> ::= S|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:PULSe:PERiod 1US
 Set the period of CH1 to 1μs.

Remarks

The setting range varies depending on the currently setting.

2.3.2.3.6 Transition Wave of Pulse Rising/Falling Edge (W/R) [:SOURce[1|2]][:PULSe]:TRANSition:FUNCtion

■[:SOURce[1|2]][:PULSe]:TRANSition:FUNCtion

□[:SOURce[1|2]][:PULSe]:TRANSition:FUNCtion?

Description

Set/query the transition wave of pulse rising/falling edge.

Setting parameter

COSine|LINear
 |USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
 |ONPSine|OFPSine|CONSine|COFSine
 |GAUSSian|LORentz|HAVersine|HSPulse|TPULse|SINC
 |ERISe|EFALI|SOLStep|DOSCillation
 |OSURge|PSURge
 |TOFFset|HSEPulse|DPULse|BRRamp
 |USER

COSine	→	Cosine wave
LINear	→	Linear wave
USINe	→	Unbalanced sine wave
CSINe	→	Clipped sine wave
CFCSine	→	CF controlled sine wave
ACSine	→	Conduction angle controlled sine wave
SSINe	→	Staircase sine wave
MCSine	→	Multi-cycle sine wave
ONPSine	→	On-phase controlled sine wave
OFPSine	→	Off-phase controlled sine wave
CONSine	→	Chattering-on sine wave
COFSine	→	Chattering-off sine wave
GAUSSian	→	Gaussian pulse
LORentz	→	Lorentz pulse
HAVersine	→	Haversine
HSPulse	→	Half-sine pulse
TPULse	→	Trapezoid pulse
SINC	→	Sin(x)/x
ERISe	→	Exponential rise
EFALI	→	Exponential fall
SOLStep	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation
OSURge	→	Oscillation surge
PSURge	→	Pulse surge
TOFFset	→	Trapezoid wave with offset
HSEPulse	→	Half-sine edge pulse
DPULse	→	Double pulse
BRRamp	→	Bottom-referenced ramp wave
USER	→	Arbitrary waveform

Query parameter

None

Response format

COS|LIN
|USIN|CSIN|CFCS|ACS|SSIN|MCS
|ONPS|OFPS|CONS|COFS
|GAUS|LOR|HAV|HSP|TPUL|SINC
|ERIS|EFAL|SOLS|DOSC
|OSUR|PSUR
|TOFF|HSEP|DPUL|BRR
|USER

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:PULSe:TRANSition:FUNCtion LINear

Set the transition wave of CH1 to linear wave.

2.3.2.4 Ramp Wave

2.3.2.4.1 Symmetry (W/R) [:SOURce[1|2]]:FUNCtion:RAMP:SYMMetry

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

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

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCtion:RAMP:SYMMetry 20PCT

Set the symmetry of the ramp wave of CH1 to 20%.

2.3.2.5 Noise

2.3.2.5.1 Noise Bandwidth (W/R) [:SOURce[1|2]]:FUNCTION:NOISe:BW

■[:SOURce[1|2]]:FUNCTION:NOISe:BW

□[:SOURce[1|2]]:FUNCTION:NOISe:BW?

Description

Set/query the bandwidth of noise.

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number: 1 to 7

1 → 100kHz

2 → 300kHz

3 → 1MHz

4 → 3MHz

5 → 10MHz

6 → 30MHz

7 → Full * WF1983/WF1984 only

MINimum → 1 (Narrowband 100kHz)

MAXimum → 6 (Wideband 30MHz) * WF1981/WF1982

7 (Wideband Full) * WF1983/WF1984

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:NOISe:BW 1

Set the noise bandwidth of CH1 to 100kHz.

2.3.2.6 PWF Waveform

PWF waveform can set the main channel, sub channel, internal modulated waveform and transition wave of pulse.

In this section, for the convenience of command explanation, the keyword part that selects the setting target is written as [★].

[★] includes one of the following keyword part that correspond to the setting target below.

Setting target	Keyword part
Main channel	None
Sub channel	:SCHannel
Internal modulated waveform	:{FM|PM|AM|AMSC|OFSM|PWM}::INTernal
Transition wave of pulse wave	[:PULSe]:TRANsition

2.3.2.6.1 Steady Sine Wave Group

2.3.2.6.1.1 Unbalanced Sine First Half Amplitude (W/R) [:SOURce[1|2]][★]:FUNctIon:USINe:AMPLitude[1]

■[:SOURce[1|2]][★]:FUNctIon:USINe:AMPLitude[1]

□[:SOURce[1|2]][★]:FUNctIon:USINe:AMPLitude[1]?

Description

Set/query the first half amplitude of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNctIon:USINe:AMPLitude1 20PCT

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

2.3.2.6.1.2 Unbalanced Sine Latter Half Amplitude (W/R) [:SOURce[1|2]][★]:FUNcTion:USINe:AMPLitude2

■[:SOURce[1|2]][★]:FUNcTion:USINe:AMPLitude2

□[:SOURce[1|2]][★]:FUNcTion:USINe:AMPLitude2?

Description

Set/query the latter half amplitude of the unbalanced sine wave.

Setting parameter

<amplitude>|MINimum|MAXimum
<amplitude> ::= <REAL>[<units>]
<REAL> → Latter half amplitude : -100.00 % to 100.00 %
Resolution : 0.01 %
<units> ::= PCT
MINimum → -100.00 %
MAXimum → 100.00 %

Query parameter

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

Response format

<NR3>

Example

:SOURce1:SCHannel:FUNcTion:USINe:AMPLitude2 20PCT
Set the latter half amplitude of the unbalanced sine wave of CH1 subchannel to 20%.

2.3.2.6.1.3 Clipped Sine Clip Ratio (W/R) [:SOURce[1|2]][★]:FUNcTion:CSINe:CLIP

■[:SOURce[1|2]][★]:FUNcTion:CSINe:CLIP

□[:SOURce[1|2]][★]:FUNcTion:CSINe:CLIP?

Description

Set/query the clip ratio of the clipped sine wave.

Setting parameter

<clip>|MINimum|MAXimum
<clip> ::= <REAL>[<units>]
<REAL> → Clip ratio : 0.00 % to 99.99 %
Resolution : 0.01 %
<units> ::= PCT
MINimum → 0.00 %
MAXimum → 99.99 %

Query parameter

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

Response format

<NR3>

Example

:SOURce1:FM:INTernal:FUNcTion:CSINe:CLIP 20PCT
Set the clip ratio of the clipped sine wave set to internal modulated wave of CH1 to 20%.

2.3.2.6.1.4 CF Controlled Sine Crest Factor (W/R)

[[:SOURce[1|2]][*]:FUNction:CFCSine:CFACTOR

■[:SOURce[1|2]][*]:FUNction:CFCSine:CFACTOR

□[:SOURce[1|2]][*]:FUNction:CFCSine:CFACTOR?

Description

Set/query the crest factor of the CF controlled sine wave.

Setting parameter

<cf>|MINimum|MAXimum

<cf> ::= <REAL>

<REAL> → Crest factor : 1.41 to 10.00

Resolution : 0.01

MINimum → 1.41

MAXimum → 10.00

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:PULSe:TRANSition:FUNction:CFCSine:CFACTOR 5

Set the crest factor of the CF controlled sine wave set to the transition wave of pulse of CH1 to 5.

2.3.2.6.1.5 Angle Controlled Sine Conduction Angle (W/R)

[[:SOURce[1|2]][*]:FUNction:ACSine:ANGLE

■[:SOURce[1|2]][*]:FUNction:ACSine:ANGLE

□[:SOURce[1|2]][*]:FUNction:ACSine:ANGLE?

Description

Set/query the conduction angle of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:ACSine:ANGLE 30DEG

Set the conduction angle of the angle controlled sine wave of CH1 to 30°.

2.3.2.6.1.6 Staircase Sine Number of Y-steps (W/R) [:SOURce[1|2]][★]:FUNctIon:SSINe:STEPs

■[:SOURce[1|2]][★]:FUNctIon:SSINe:STEPs

□[:SOURce[1|2]][★]:FUNctIon:SSINe:STEPs?

Description

Set/query the number of Y-steps(amplitude axis) of the staircase sine wave.

Setting parameter

<steps>|MINimum|MAXimum|INFinity

<steps> ::= <INT>

<INT> → Number of steps : 2 to 256

MINimum → 2

MAXimum → Infinity

INFinity → Infinity

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:FUNctIon:SSINe:STEPs 10

Set the number of Y-steps of the staircase sine wave of CH1 to 10.

2.3.2.6.1.7 Staircase Sine Number of X-steps (W/R) [:SOURce[1|2]][★]:FUNctIon:SSINe:TSTEPs

■[:SOURce[1|2]][★]:FUNctIon:SSINe:TSTEPs

□[:SOURce[1|2]][★]:FUNctIon:SSINe:TSTEPs?

Description

Set/query the number of X-steps(time axis) of the staircase sine wave.

Setting parameter

<steps>|MINimum|MAXimum|INFinity

<steps> ::= <INT>

<INT> → Number of steps : 2 to 1024

MINimum → 2

MAXimum → Infinity

INFinity → Infinity

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:FUNctIon:SSINe:TSTEPs 10

Sets the number of X-steps of the staircase sine wave of CH1 to 10.

2.3.2.6.1.8 Multi-Cycle Sine Number of Cycle (W/R) [:SOURce[1|2]][★]:FUNction:MCsine:CYCLes

■[:SOURce[1|2]][★]:FUNction:MCsine:CYCLes

□[:SOURce[1|2]][★]:FUNction:MCsine:CYCLes?

Description

Set/query the number of cycles of the multi-cycle sine wave.

Setting parameter

<cycles>|MINimum|MAXimum
<cycles> ::= <REAL>
<REAL> → Number of cycles : 0.01 to 50.00
Resolution : 0.01
MINimum → 0.01
MAXimum → 50.00

Query parameter

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

Response format

<NR3>

Example

:SOURce1:FUNction:MCsine:CYCLes 0.2

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

2.3.2.6.1.9 Multi-Cycle Sine Start Phase (W/R) [:SOURce[1|2]][★]:FUNction:MCsine:PHASe

■[:SOURce[1|2]][★]:FUNction:MCsine:PHASe

□[:SOURce[1|2]][★]:FUNction:MCsine:PHASe?

Description

Set/query the start phase of the multi-cycle sine wave.

Setting parameter

<phase>|MINimum|MAXimum
<phase> ::= <REAL>[<units>]
<REAL> → Start phase : -360.00° to 360.00°
Resolution : 0.01°
<units> ::= DEG
MINimum → -360.00°
MAXimum → 360.00°

Query parameter

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

Response format

<NR3>

Example

:SOURce1:FUNction:MCsine:PHASe 30DEG

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

2.3.2.6.2 Transient Sine Wave Group

2.3.2.6.2.1 On-Phase Controlled Sine On-Phase (W/R) [:SOURce[1|2]][★]:FUNction:ONPSine:ONPHase

■[:SOURce[1|2]][★]:FUNction:ONPSine:ONPHase

□[:SOURce[1|2]][★]:FUNction:ONPSine:ONPHase?

Description

Set/query the on phase of on-phase controlled 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:ONPSine:ONPHase 30DEG

Set the on-phase of the on-phase controlled sine wave of CH1 to 30°.

2.3.2.6.2.2 On-Phase Controlled Sine On-Slope Time (W/R) [:SOURce[1|2]][★]:FUNction:ONPSine:STIME

■[:SOURce[1|2]][★]:FUNction:ONPSine:STIME

□[:SOURce[1|2]][★]:FUNction:ONPSine:STIME?

Description

Set/query the on-slope time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:ONPSine:STIME 20PCT

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

2.3.2.6.2.3 Off-Phase Controlled Sine Off-Phase (W/R) [:SOURce[1|2]][★]:FUNction:OFPSine:OFPHase

■[:SOURce[1|2]][★]:FUNction:OFPSine:OFPHase

□[:SOURce[1|2]][★]:FUNction:OFPSine:OFPHase?

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:OFPSine:OFPHase 30DEG

Set the off-phase of the off-phase controlled sine wave of CH1 to 30°.

2.3.2.6.2.4 Off-Phase Controlled Sine Off-Slope Time (W/R) [:SOURce[1|2]][★]:FUNction:OFPSine:STIME

■[:SOURce[1|2]][★]:FUNction:OFPSine:STIME

□[:SOURce[1|2]][★]:FUNction:OFPSine:STIME?

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:OFPSine:STIME 20PCT

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

2.3.2.6.2.5 Chattering-On Sine On-Phase (W/R)

[[:SOURce[1|2]][*]:FUNCTION:CONSine:ONPHase

■[:SOURce[1|2]][*]:FUNCTION:CONSine:ONPHase

□[:SOURce[1|2]][*]:FUNCTION:CONSine:ONPHase?

Description

Set/query the on-phase of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:CONSine:ONPHase 30DEG

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

2.3.2.6.2.6 Chattering-On Sine Number of Chattering (W/R)

[[:SOURce[1|2]][*]:FUNCTION:CONSine:NCHattering

■[:SOURce[1|2]][*]:FUNCTION:CONSine:NCHattering

□[:SOURce[1|2]][*]:FUNCTION:CONSine:NCHattering?

Description

Set/query the number of chattering of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:FUNCTION:CONSine:NCHattering 2

Set the number of chattering of the chattering-on sine wave of CH1 to 2.

2.3.2.6.2.7 Chattering-On Sine On Time (W/R) [:SOURce[1|2]][★]:FUNctIon:CONsine:TON

■[:SOURce[1|2]][★]:FUNctIon:CONsine:TON

□[:SOURce[1|2]][★]:FUNctIon:CONsine:TON?

Description

Set/query the on time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNctIon:CONsine:TON 20PCT

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

2.3.2.6.2.8 Chattering-On Sine Off Time (W/R) [:SOURce[1|2]][★]:FUNctIon:CONsine:TOFF

■[:SOURce[1|2]][★]:FUNctIon:CONsine:TOFF

□[:SOURce[1|2]][★]:FUNctIon:CONsine:TOFF?

Description

Set/query the off time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNctIon:CSINE:CLIP 20PCT

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

2.3.2.6.2.9 Chattering-Off Sine Off-Phase (W/R) [:SOURce[1|2]][★]:FUNction:COFSine:OFPHase

■[:SOURce[1|2]][★]:FUNction:COFSine:OFPHase

□[:SOURce[1|2]][★]:FUNction:COFSine:OFPHase?

Description

Set/query the off-phase of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:COFSine:OFPHase 30DEG

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

2.3.2.6.2.10 Chattering-Off Sine Number of Chattering (W/R) [:SOURce[1|2]]:FUNction:COFSine:NCHattering

■[:SOURce[1|2]][★]:FUNction:COFSine:NCHattering

□[:SOURce[1|2]][★]:FUNction:COFSine:NCHattering?

Description

Set/query the number of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:FUNction:COFSine:NCHattering 2

Set the number of chattering of the chattering-off sine wave of CH1 to 2.

2.3.2.6.2.11 Chattering-Off Sine On Time (W/R) [:SOURce[1|2]][★]:FUNCTION:COFSine:TON

■[:SOURce[1|2]][★]:FUNCTION:COFSine:TON

□[:SOURce[1|2]][★]:FUNCTION:COFSine:TON?

Description

Set/query the on time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:COFSine:TON 20PCT

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

2.3.2.6.2.12 Chattering-Off Sine Off Time (W/R) [:SOURce[1|2]][★]:FUNCTION:COFSine:TOFF

■[:SOURce[1|2]][★]:FUNCTION:COFSine:TOFF

□[:SOURce[1|2]][★]:FUNCTION:COFSine:TOFF?

Description

Set/query the off time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:COFSine:TOFF 20PCT

Set the off time of the chattering-off sine wave of CH1 to 20%.

2.3.2.6.3 Pulse Waveform Group

2.3.2.6.3.1 Gaussian Pulse Standard Deviation (W/R) [:SOURce[1|2]][★]:FUNcTion:GAUSSian:SIGMa

■[:SOURce[1|2]][★]:FUNcTion:GAUSSian:SIGMa

□[:SOURce[1|2]][★]:FUNcTion:GAUSSian:SIGMa?

Description

Set/query the standard deviation of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:GAUSSian:SIGMa 20PCT

Set the standard deviation of the gaussian pulse of CH1 to 20%.

2.3.2.6.3.2 Lorentz Pulse Half Value of Width (W/R) [:SOURce[1|2]][★]:FUNcTion:LOREntz:HWIDth

■[:SOURce[1|2]][★]:FUNcTion:LOREntz:HWIDth

□[:SOURce[1|2]][★]:FUNcTion:LOREntz:HWIDth?

Description

Set/query the half value of width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:LOREntz:HWIDth 20PCT

Set the half value of width of the lorentz pulse of CH1 to 20%.

2.3.2.6.3.3 Haversine Width (W/R)

[[:SOURce[1|2]][★]:FUNcTion:HAVersine:WIDTh

■[:SOURce[1|2]][★]:FUNcTion:HAVersine:WIDTh

□[:SOURce[1|2]][★]:FUNcTion:HAVersine:WIDTh?

Description

Set/query the width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:HAVersine:WIDTh 20PCT

Set the width of the haversine of CH1 to 20%.

2.3.2.6.3.4 Half-Sine Pulse Width (W/R)

[[:SOURce[1|2]][★]:FUNcTion:HSPulse:WIDTh

■[:SOURce[1|2]][★]:FUNcTion:HSPulse:WIDTh

□[:SOURce[1|2]][★]:FUNcTion:HSPulse:WIDTh?

Description

Set/query the width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:HSPulse:WIDTh 20PCT

Set the width of the half-sine pulse of CH1 to 20%.

2.3.2.6.3.5 Trapezoid Pulse Slope Width (W/R) [:SOURce[1|2]][★]:FUNcTion:TPULse:RFALI

■[:SOURce[1|2]][★]:FUNcTion:TPULse:RFALI

□[:SOURce[1|2]][★]:FUNcTion:TPULse:RFALI?

Description

Set/query the slope width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:TPULse:RFALI 20PCT

Set the slope width of the trapezoid pulse of CH1 to 20%.

2.3.2.6.3.6 Trapezoid Pulse Upper Base Width (W/R) [:SOURce[1|2]][★]:FUNcTion:TPULse:UBASe

■[:SOURce[1|2]][★]:FUNcTion:TPULse:UBASe

□[:SOURce[1|2]][★]:FUNcTion:TPULse:UBASe?

Description

Set/query the upper base width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:TPULse:UBASe 20PCT

Set the upper base width of the trapezoid pulse of CH1 to 20%.

2.3.2.6.3.7 Sin(x)/x Number of Zero Crossings (W/R) [:SOURCE[1|2]][★]:FUNCTION:SINC:ZCRossing

■[:SOURCE[1|2]][★]:FUNCTION:SINC:ZCRossing

□[:SOURCE[1|2]][★]:FUNCTION:SINC:ZCRossing?

Description

Set/query the number of zero crossings of the $\sin(x)/x$

Setting parameter

<number>|MINimum|MAXimum

<number> ::= <INT>

<INT> → Number of zero crossings : 1 to 50

MINimum → 1

MAXimum → 50

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURCE1:FUNCTION:SINC:ZCRossing 10

Set the number of zero crossings of the $\sin(x)/x$ of CH1 to 10.

2.3.2.6.4 Transient Response Waveform Group

2.3.2.6.4.1 Exponential Rise Time Constant (W/R) [:SOURCE[1|2]][★]:FUNCTION:ERISe:TCONstant

■[:SOURCE[1|2]][★]:FUNCTION:ERISe:TCONstant

□[:SOURCE[1|2]][★]:FUNCTION:ERISe:TCONstant?

Description

Set/query the time constant of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURCE1:FUNCTION:ERISe:TCONstant 20PCT

Set the time constant of the exponential rise of CH1 to 20%.

2.3.2.6.4.2 Exponential Fall Time Constant (W/R) [:SOURce[1|2]][★]:FUNction:EFAL:TCONstant

■[:SOURce[1|2]][★]:FUNction:EFAL:TCONstant

□[:SOURce[1|2]][★]:FUNction:EFAL:TCONstant?

Description

Set/query the time constant of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:EFAL:TCONstant 20PCT

Set the time constant of the exponential fall of CH1 to 20%.

2.3.2.6.4.3 2nd-Order LPF Step Response Natural frequency (W/R) [:SOURce[1|2]][★]:FUNction:SOLStep:NFRrequency

■[:SOURce[1|2]][★]:FUNction:SOLStep:NFRrequency

□[:SOURce[1|2]][★]:FUNction:SOLStep:NFRrequency?

Description

Set/query the natural frequency of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:SOLStep:NFRrequency 10

Sets the natural frequency of the 2nd-order LPF step response of CH1 to 10

2.3.2.6.4.4 2nd-Order LPF Step Response Q-value (W/R) [:SOURce[1|2]][★]:FUNction:SOLStep:Q

■[:SOURce[1|2]][★]:FUNction:SOLStep:Q

□[:SOURce[1|2]][★]:FUNction:SOLStep:Q?

Description

Set/query the Q of the 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 → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:SOLStep:Q 10
Set the Q-value of the 2nd-order LPF step response of CH1 to 10.

2.3.2.6.4.5 Damped Oscillation Oscillation Frequency (W/R) [:SOURce[1|2]][★]:FUNction:DOSCillation:OFRequency

■[:SOURce[1|2]][★]:FUNction:DOSCillation:OFRequency

□[:SOURce[1|2]][★]:FUNction:DOSCillation:OFRequency?

Description

Set/query the oscillation frequency of the damped oscillation.

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 → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:DOSCillation:OFRequency 10
Set the oscillation frequency of the damped oscillation of CH1 to 10.

2.3.2.6.4.6 Damped Oscillation Damped Oscillation Time Constant (W/R) [:SOURce[1|2]][★]:FUNction:DOSCillation:DTConstant

■[:SOURce[1|2]][★]:FUNction:DOSCillation:DTConstant

□[:SOURce[1|2]][★]:FUNction:DOSCillation:DTConstant?

Description

Set/query the damped oscillation time constant of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction: DOSCillation:DTConstant 20PCT

Set the damping time constant of the damped oscillation of CH1 to 20%.

2.3.2.6.5 Surge Waveform Group

2.3.2.6.5.1 Oscillation Surge Oscillation Frequency (W/R) [:SOURce[1|2]][★]:FUNction:OSURge:OFrequency

■[:SOURce[1|2]][★]:FUNction:OSURge:OFrequency

□[:SOURce[1|2]][★]:FUNction:OSURge:OFrequency?

Description

Set/query the oscillation frequency of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:OSURge:OFrequency 10

Set the oscillation frequency of the oscillation surge of CH1 to 10.

2.3.2.6.5.2 Oscillation Surge Damping Time Constant (W/R) [:SOURce[1|2]][★]:FUNcTion:OSURge:DTConstant

■[:SOURce[1|2]][★]:FUNcTion:OSURge:DTConstant

□[:SOURce[1|2]][★]:FUNcTion:OSURge:DTConstant?

Description

Set/query the damping time constant of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:OSURge:DTConstant 20PCT

Set the damping time constant of the oscillation surge of CH1 to 20%.

2.3.2.6.5.3 Oscillation Surge Trailing Time Constant (W/R) [:SOURce[1|2]][★]:FUNcTion:OSURge:TTConstant

■[:SOURce[1|2]][★]:FUNcTion:OSURge:TTConstant

□[:SOURce[1|2]][★]:FUNcTion:OSURge:TTConstant?

Description

Set/query the trailing time constant of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:OSURge:TTConstant 20PCT

Set the trailing time constant of the oscillation surge of CH1 to 20%.

2.3.2.6.5.4 Pulse Surge Rising Time (W/R) [:SOURce[1|2]][★]:FUNcTion:PSURge:TR

■[:SOURce[1|2]][★]:FUNcTion:PSURge:TR

□[:SOURce[1|2]][★]:FUNcTion:PSURge:TR?

Description

Set/query the rising time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:PSURge:TR 20PCT

Set the rising time of the pulse surge of CH1 to 20%.

2.3.2.6.5.5 Pulse Surge Duration Time (W/R) [:SOURce[1|2]][★]:FUNcTion:PSURge:TD

■[:SOURce[1|2]][★]:FUNcTion:PSURge:TD

□[:SOURce[1|2]][★]:FUNcTion:PSURge:TD?

Description

Set/query the duration time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:PSURge:TD 20PCT

Set the duration time of the pulse surge of CH1 to 20%.

2.3.2.6.6 Other Waveform Group

2.3.2.6.6.1 Trapezoid Wave with Offset Leading Delay (W/R) [:SOURce[1|2]][★]:FUNction:TOFFset:DELay

■[:SOURce[1|2]][★]:FUNction:TOFFset:DELay

□[:SOURce[1|2]][★]:FUNction:TOFFset:DELay?

Description

Set/query the leading delay of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:TOFFset:DELay 20PCT

Set the leading delay of the trapezoid wave with offset of CH1 to 20%.

2.3.2.6.6.2 Trapezoid Wave with Offset Rising-Slope Width (W/R) [:SOURce[1|2]][★]:FUNction:TOFFset:RISe

■[:SOURce[1|2]][★]:FUNction:TOFFset:RISe

□[:SOURce[1|2]][★]:FUNction:TOFFset:RISe?

Description

Set/query the rising-slope width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:TOFFset:RISe 20PCT

Set the rising-slope width of the trapezoid wave with offset of CH1 to 20%.

2.3.2.6.6.3 Trapezoid Wave with Offset Upper Base Width (W/R) [:SOURce[1|2]][★]:FUNCTION:TOFFset:UBASe

■[:SOURce[1|2]][★]:FUNCTION:TOFFset:UBASe

□[:SOURce[1|2]][★]:FUNCTION:TOFFset:UBASe?

Description

Set/query the upper base width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:TOFFset:UBASe 20PCT

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

2.3.2.6.6.4 Trapezoid Wave with Offset Falling-Slope Width (W/R) [:SOURce[1|2]][★]:FUNCTION:TOFFset:FALL

■[:SOURce[1|2]][★]:FUNCTION:TOFFset:FALL

□[:SOURce[1|2]][★]:FUNCTION:TOFFset:FALL?

Description

Set/query the falling-slope width of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:TOFFset:FALL 20PCT

Set the falling-slope width of the trapezoid wave with offset of CH1 to 20%.

2.3.2.6.6.5 Trapezoid Wave with Offset Offset (W/R) [:SOURce[1|2]][:FUNCTION:TOFFset:OFFSet]

■[:SOURce[1|2]][★]:FUNCTION:TOFFset:OFFSet

□[:SOURce[1|2]][★]:FUNCTION:TOFFset:OFFSet?

Description

Set/query the offset of the 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 → Query the minimum value
MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNCTION:TOFFset:OFFSet 20PCT
Set the offset of the trapezoid wave with offset of CH1 to 20%.

2.3.2.6.6.6 Half-Sine Edge Pulse Leading Edge Time (W/R) [:SOURce[1|2]][★]:FUNCTION:HSEPulse:LE

■[:SOURce[1|2]][★]:FUNCTION:HSEPulse:LE

□[:SOURce[1|2]][★]:FUNCTION:HSEPulse:LE?

Description

Set/query the leading edge time of the half-sine edge pulse.

Setting parameter

<time>|MINimum|MAXimum
<time> ::= <REAL>[<units>]
<REAL> → Rising edge time : 0.00 % to 100.00 %
Resolution : 0.01 %
<units> ::= PCT
MINimum → 0.00 %
MAXimum → 100.00 %

Query parameter

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

Response format

<NR3>

Example

:SOURce1:FUNCTION:HSEPulse:LE 20PCT
Set the leading edge time of the half-sine edge pulse of CH1 to 20%.

2.3.2.6.6.7 Half-Sine Edge Pulse Trailing Edge Time (W/R) [:SOURce[1|2]][★]:FUNction:HSEPulse:TE

■[:SOURce[1|2]][★]:FUNction:HSEPulse:TE

□[:SOURce[1|2]][★]:FUNction:HSEPulse:TE?

Description

Set/query the trailing edge time of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:HSEPulse:TE 20PCT

Set the trailing edge time of the half-sine edge pulse of CH1 to 20%.

2.3.2.6.6.8 Half-Sine Edge Pulse Duty (W/R) [:SOURce[1|2]][★]:FUNction:HSEPulse:DCYClE

■[:SOURce[1|2]][★]:FUNction:HSEPulse:DCYClE

□[:SOURce[1|2]][★]:FUNction:HSEPulse:DCYClE?

Description

Set/query the duty of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:HSEPulse:DCYClE 20PCT

Set the duty of the half-sine edge pulse of CH1 to 20%.

2.3.2.6.6.9 Double Pulse Upper Base Width1 (W/R) [:SOURce[1|2]][★]:FUNcTion:DPULse:UBT1

■[:SOURce[1|2]][★]:FUNcTion:DPULse:UBT1

□[:SOURce[1|2]][★]:FUNcTion:DPULse:UBT1?

Description

Set/query the upper base width1 of the double pulse.

Setting parameter

<width>|MINimum|MAXimum

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

<REAL> → Upper base width1 : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:DPULse:UBT1 20PCT

Set the upper base width1 of the double pulse of CH1 to 20%.

2.3.2.6.6.10 Double Pulse Upper Base Width2 (W/R) [:SOURce[1|2]][★]:FUNcTion:DPULse:UBT2

■[:SOURce[1|2]][★]:FUNcTion:DPULse:UBT2

□[:SOURce[1|2]][★]:FUNcTion:DPULse:UBT2?

Description

Set/query the upper base width2 of the double pulse.

Setting parameter

<width>|MINimum|MAXimum

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

<REAL> → Upper base width2 : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:DPULse:UBT2 20PCT

Set the upper base width2 of the double pulse of CH1 to 20%.

2.3.2.6.6.11 Double Pulse Lower Base Width1 (W/R) [:SOURce[1|2]][★]:FUNction:DPULse:LBT1

■[:SOURce[1|2]][★]:FUNction:DPULse:LBT1

□[:SOURce[1|2]][★]:FUNction:DPULse:LBT1?

Description

Set/query the lower base width1 of the double pulse.

Setting parameter

<width>|MINimum|MAXimum

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

<REAL> → Lower base width1 : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:DPULse:LBT1 20PCT

Set the lower base width1 of the double pulse of CH1 to 20%.

2.3.2.6.6.12 Double Pulse Lower Base Width2 (W/R) [:SOURce[1|2]][★]:FUNction:DPULse:LBT2

■[:SOURce[1|2]][★]:FUNction:DPULse:LBT2

□[:SOURce[1|2]][★]:FUNction:DPULse:LBT2?

Description

Set/query the lower base width2 of the double pulse.

Setting parameter

<width>|MINimum|MAXimum

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

<REAL> → Lower base width2 : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNction:DPULse:LBT2 20PCT

Set the lower base width2 of the double pulse of CH1 to 20%.

2.3.2.6.6.13 Double Pulse Leading Time (W/R) [:SOURce[1|2]][★]:FUNcTion:DPULse:LE

■[:SOURce[1|2]][★]:FUNcTion:DPULse:LE

□[:SOURce[1|2]][★]:FUNcTion:DPULse:LE?

Description

Set/query the leading time of the double pulse.

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Rising time : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:DPULse:LE 20PCT

Set the leading time of the double pulse of CH1 to 20%.

2.3.2.6.6.14 Double Pulse Trailing Time (W/R) [:SOURce[1|2]][★]:FUNcTion:DPULse:TE

■[:SOURce[1|2]][★]:FUNcTion:DPULse:TE

□[:SOURce[1|2]][★]:FUNcTion:DPULse:TE?

Description

Set/query the trailing time of the double pulse.

Setting parameter

<time>|MINimum|MAXimum

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

<REAL> → Falling time : 0.00 % to 100.00 %

Resolution : 0.01 %

<units> ::= PCT

MINimum → 0.00 %

MAXimum → 100.00 %

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:DPULse:TE 20PCT

Set the trailing time of the double pulse of CH1 to 20%.

2.3.2.6.6.15 Bottom-Referenced Ramp Symmetry (W/R) [:SOURce[1|2]][★]:FUNcTion:BRRamp:SYMMetry

■[:SOURce[1|2]][★]:FUNcTion:BRRamp:SYMMetry

□[:SOURce[1|2]][★]:FUNcTion: BRRamp:SYMMetry?

Description

Set/query the symmetry of the 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:FUNcTion:BRRamp:SYMMetry 20PCT

Set the symmetry of the bottom-referenced ramp wave of CH1 to 20%.

2.3.2.6.7 PWF Waveform Polarity/Scale

2.3.2.6.7.1 Polarity (W/R) :OUTPut[1|2][●]:POLarity

■:OUTPut[1|2][●]:POLarity

□:OUTPut[1|2][●]:POLarity?

Description

Set/query the polarity of PWF waveform.

Setting target is the subchannel or internal modulated waveform.

Setting keyword

[●] includes one of the following keyword part that correspond to the setting target below.

Setting target	Keyword part
Sub channel	:SCHannel
Internal modulated waveform	:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal

Setting parameter

<shape>,<polarity>

<shape> ::= USINe|CSINe|CFCSine|ACSine|SSINe|MCSine

|ONPSine|OFPSine|CONSine|COFSine

|GAUSSian|LORentz|HAVersine|HSPulse|TPULse|SINC

|ERISe|EFALI|SOLStep|DOSCillation

|OSURge|PSURge

|TOFFset|HSEPulse|DPULse|BRRamp

USINe	→	Unbalanced sine wave
CSINe	→	Clipped sine wave
CFCSine	→	CF controlled sine wave
ACSine	→	Conduction angle controlled sine wave
SSINe	→	Staircase sine wave
MCSine	→	Multi-cycle sine wave
ONPSine	→	On-phase controlled sine wave
OFPSine	→	Off-phase controlled sine wave
CONSine	→	Chattering-on sine wave
COFSine	→	Chattering-off sine wave
GAUSSian	→	Gaussian pulse
LOREntz	→	Lorentz pulse
HAVersine	→	Haversine
HSPulse	→	Half-sine pulse
TPULse	→	Trapezoid pulse
SINC	→	Sin(x)/x
ERISe	→	Exponential rise
EFALI	→	Exponential fall
SOLStep	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation
OSURge	→	Oscillation surge
PSURge	→	Pulse surge
TOFFset	→	Trapezoid wave with offset
HSEPulse	→	Half-sine edge pulse
DPULse	→	Double pulse
BRRamp	→	Bottom-referenced ramp wave

<polarity> ::= NORMAl|INVerted

NORMAl	→	Normal
INVerted	→	Inverted

Query parameter

<shape> ::= USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSSian|LOREntz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFALI|SOLStep|DOSCillation
|OSURge|PSURge
|TOFFset|HSEPulse|DPULse|BRRamp

* For the meaning of each query parameter, see the setting parameter.

Response format

NORM|INV

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:FM:INTernal:POLarity USINe,NORMAl

Set the polarity of internal modulated waveform(unbalanced sine wave) of CH1 to normal.

2.3.2.6.7.2 Scale Range (W/R) :OUTPut[1|2][●]:SCALe

■:OUTPut[1|2][●]:SCALe

□:OUTPut[1|2][●]:SCALe?

Description

Set/query the scale range of PWF waveform.

Setting target is the subchannel or internal modulated waveform.

Setting keyword

[●] includes one of the following keyword part that correspond to the setting target below.

Setting target	Keyword part
Sub channel	:SCHannel
Internal modulated waveform	:{FM|PM|AM|AMSC|OFSM|PWM}:INTernal

Setting parameter

<shape>,<scale>

<shape> ::= USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
 |ONPSine|OFPSine|CONSine|COFSine
 |GAUSSian|LORentz|HAVersine|HSPulse|TPULse|SINC
 |ERISe|EFALI|SOLStep|DOSCillation
 |OSURge|PSURge
 |TOFFset|HSEPulse|DPULse|BRRamp

USINe	→	Unbalanced sine wave
CSINe	→	Clipped sine wave
CFCSine	→	CF controlled sine wave
ACSine	→	Conduction angle controlled sine wave
SSINe	→	Staircase sine wave
MCSine	→	Multi-cycle sine wave
ONPSine	→	On-phase controlled sine wave
OFPSine	→	Off-phase controlled sine wave
CONSine	→	Chattering-on sine wave
COFSine	→	Chattering-off sine wave
GAUSSian	→	Gaussian pulse
LORentz	→	Lorentz pulse
HAVersine	→	Haversine
HSPulse	→	Half-sine pulse
TPULse	→	Trapezoid pulse
SINC	→	Sin(x)/x
ERISe	→	Exponential rise
EFALI	→	Exponential fall
SOLStep	→	2nd-order LPF step response
DOSCillation	→	Damped oscillation
OSURge	→	Oscillation surge
PSURge	→	Pulse surge
TOFFset	→	Trapezoid wave with offset
HSEPulse	→	Half-sine edge pulse
DPULse	→	Double pulse
BRRamp	→	Bottom-referenced ramp wave

<scale> ::= MFS|FS|PFS
MFS → From minus-full-scale to 0
FS → Full-scale
PFS → From 0 to plus-full-scale

Query parameter

<shape> ::= USINe|CSINe|CFCSine|ACSine|SSINe|MCSine
|ONPSine|OFPSine|CONSine|COFSine
|GAUSSian|LORentz|HAVersine|HSPulse|TPULse|SINC
|ERISe|EFALl|SOLStep|DOScillation
|OSURge|PSURge
|TOFFset|HSEPulse|DPULse|BRRamp

* For the meaning of each query parameter, see the setting parameter.

Response format

MFS|FS|PFS

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:FM:INTernal:SCALe USINe,FS

Set the scale range of internal modulated waveform(unbalanced sine wave) of CH1 to full-scale.

2.3.2.7 Arbitrary Waveform

2.3.2.7.1 Set Arbitrary Waveform (W/R) [:SOURce[1|2]]:FUNction:USER

■[:SOURce[1|2]]:FUNction:USER

□[:SOURce[1|2]]:FUNction:USER?

Description

Set/query arbitrary waveform.

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

Query parameter

None

Response format

<NR1>

Example

:SOURce1:FUNction:USER 3

Set the data of memory number 3 to the arbitrary waveform of CH1.

Remarks

Memory number 0 is the edit memory.

2.3.2.7.2 Arbitrary Waveform Data (W/R) {:TRACe|:DATA}:DATA

■{:TRACe|:DATA}:DATA

□{:TRACe|:DATA}:DATA?

Description

Read/write the arbitrary waveform data.

* When writing the data, write the arbitrary waveform 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 waveform stored in the memory number <memory> as described below.

Setting parameter

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

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

<name> ::= <STR>

<STR> → Arbitrary waveform name (20 characters below)

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

<data> ::= <BLK>

<BLK> → See the "Data format of arbitrary waveform"

Data format of arbitrary waveform

Data format of arbitrary waveform is used the array format or control point format, as below.

○Array format

#<digit><bytes><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 <bytes>
- <bytes> → Numeric string which indicates the number of bytes of the subsequent data
- <format> → The data format (4 bytes)
When the array, specified "0"
- <number> → The number of data (4 byte) 16 to 33554432 is specified
* WF1981/WF1982
16 to 67108864 is specified
* WF1983/WF1984
- <data[i]> → The i-th data (2 byte)

○Control point format

#<digit><bytes><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 <bytes>
- <bytes> → Numeric string which indicates the number of bytes of the subsequent data
- <format> → The data format (4 byte)
When the control point, specified "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 4096

Response format

"<name>",<data>

- <name> ::= <STR>
- <STR> → Arbitrary waveform name (20 characters)
- <data> ::= <BLK>
- * For <BLK>, see the "Data format of arbitrary waveform".

Remarks

- (1) <format>, <number>, <data[i]>, <x[i]>, and <y[i]> are binary data (big endian).
- (2) <data[i]> is the complement form of 2 and from -32767 (H'8001) to 32767 (H'7FFF).
* -32768 (H'8000) should not be specified.
- (3) The control point <x[i]> is treated as a numeric value of X axis from 0 up to 31th power of 2. The numeric range is expressed as a range from H'00000000 to H'7FFFFFFF in hexadecimal.
If data exceeding the setting range included, be 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) should not be specified.

If the amplitude width of actual signal output is $\pm 1.0V_{p-p}$, 1 LSB of 16bit ADC is equivalent to $1/32767 V$.

- (6) Arbitrary waveform memory number 0 is the edit memory.
(7) The arbitrary waveform name of memory number 0 is "<Edit Memory>" (20 characters).
(8) Array format data cannot be set to the arbitrary waveform memory number 0.
(9) Arbitrary waveform name cannot be set for the arbitrary waveform memory number 0.
If specified, it is ignored.

2.3.2.7.3 Store (W) {:TRACe|:DATA}:STORe

■{:TRACe|:DATA}:STORe

Description

Save arbitrary waveform data in edit memory (memory number 0) to specified memory number.

Setting parameter

```
<memory>,"<name>"
    <memory> ::= <INT>
                <INT> → Memory number of location to save: 1 to 4096
    <name> ::= <STR>
                <STR> → Arbitrary waveform name (20 characters as less)
                * Optional (If omitted, the setting is not changed)
```

Example

```
:TRACe:STORe 2,"name"
```

Save arbitrary waveform data in edit memory as the arbitrary waveform name "name" to the memory number 2.

2.3.2.7.4 Recall (W) {:TRACe|:DATA}:RECall

■{:TRACe|:DATA}:RECall

Description

Read the arbitrary waveform data of the specified memory number into the edit memory (memory number 0).

Setting parameter

```
<memory>
    <memory> ::= <INT>
                <INT> → Memory number : 1 to 4096
```

Example

```
:TRACe:RECall 2
```

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

2.3.2.7.5 Copy (W) {:TRACe|:DATA}:COPY

■{:TRACe|:DATA}:COPY

Description

Copy the specified arbitrary waveform data to specified number of memory.

* If waveform parameter is required, referenced the parameter of specified channel.

Setting parameter

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

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

<name> ::= <STR>

<STR> → Arbitrary waveform name (20 characters)

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

<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|EFAL|SOLStep|DOSCillation

|OSURge|PSURge

|TOFFset|HSEPulse|DPULse|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

DPULse → Double pulse

BRRamp → Bottom-referenced ramp wave

USER → Arbitrary waveform

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

Example

:TRACe:COpy 5,"name",1,BRRamp

Copy the bottom-referenced ramp wave of CH1 as the arbitrary waveform name "name" to the arbitrary waveform memory 5.

Remarks

- (1) Memory number 0 is the edit memory.
- (2) The arbitrary waveform name of memory number 0 is "<Edit Memory>" (20 characters).
- (3) When copying the arbitrary waveform from specified memory number, see "2.3.2.7.1 Set Arbitrary Waveform".

2.3.2.7.6 Delete (W) {:TRACe|:DATA}:DELeTe

■{:TRACe|:DATA}:DELeTe

Description

Delete the arbitrary waveform data in specified memory number.

Setting parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

Example

:TRACe:DELeTe 1

Delete the data in memory number 1.

Remarks

- (1) Memory number 0 is the edit memory.
- (2) When specified the memory number 0 gives same effect as the case of operating the [New] soft-key in the ARB Edit screen.

2.3.2.7.7 Information Acquisition (R) {:TRACe|:DATA}:INFormAtion?

□{:TRACe|:DATA}:INFormAtion?

Description

Acquire the information in the specified memory.

Query parameter

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

Response format

"<name>",<format>,<number>

<name> ::= <STR>

<STR> → Arbitrary waveform name (20 characters)

<format> ::= <INT>

<INT> → Data format

0 → Array format

1 → Control point format

<number> ::= <INT>

<INT> → The number of data points

Remarks

If queried empty memory, returned
 "<Empty> ",0,0

2.3.2.7.8 **Setting Arbitrary waveform Memory Name (W/R)** **:MEMory{:TRACe|:DATA}:DEFine**

■:MEMory{:TRACe|:DATA}:DEFine

□:MEMory{:TRACe|:DATA}:DEFine?

Description

Set/query the specified arbitrary waveform memory name.

Setting parameter

"<name>",<memory>
 <name> ::= <STR>
 <STR> → Setting memory name (20 characters or less)
 <memory> ::= <INT>
 <INT> → Memory number : 1 to 4096

Query parameter

<memory> ::= <INT>
 <INT> → Memory number : 0 to 4096

Response format

"<name>"

Remarks

If queried empty memory, returned
 "<Empty> "
 If queried empty memory number = 0, returned
 "<Edit Memory> "

2.3.3 Output Signal Parameter Setting

2.3.3.1 Frequency

2.3.3.1.1 Set Frequency (W/R) [:SOURce[1|2]]:FREQUency[:CW]:FIXed]

■[:SOURce[1|2]]:FREQUency[:CW]:FIXed]

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

Description

Set/query the frequency of the main oscillator.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Frequency : 0 Hz to 30 MHz * WF1981/WF1982
: 0 Hz to 60 MHz * WF1983/WF1984

Resolution : 0.01 μ Hz (< 50MHz), 0.1 μ Hz (\geq 50MHz)

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

* Note that when the unit is frequency, M is used to mean "10⁶".

<units> ::= HZ|USER

MINimum → Set the maximum value

MAXimum → Set the minimum value

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= HZ|USER

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:FREQUency:CW 1MHZ

Set the frequency of CH1 to 1MHz.

Remarks

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

2.3.3.1.2 External Synchronization Mode (W/R) [:SOURce[1|2]]:FREQuency:SYNC

■[:SOURce[1|2]]:FREQuency:SYNC

□[:SOURce[1|2]]:FREQuency:SYNC?

Description

Set/query the external synchronization mode(Synchlator function).

Setting parameter

0|OFF|1|EXTErnal[1]|2|EXTErnal2

- 0|OFF → External synchronization mode off
- 1|EXTErnal[1] → External synchronization mode on
(Synchronization source is TRIG IN1 connector)
- 2|EXTErnal2 → External synchronization mode on
(Synchronization source is TRIG IN2 connector)

Query parameter

None

Response format

<sync_mode>,<reserved>

<sync_mode> ::= <INT>

- <INT> → 0 : External synchronization mode off
- 1 : External synchronization mode on
(Synchronization source is TRIG IN1 connector)
- 2 : External synchronization mode on
(Synchronization source is TRIG IN2 connector)

<reserved> ::= <INT>

- <INT> → 0 : (reserved)
- 1 : (reserved)

Example

:SOURce1:FREQuency:SYNC OFF

Cancel the external synchronization oscillation mode of CH1.

2.3.3.1.3 Signal Polarity of External Synchronization (W/R) [:SOURce[1|2]]:FREQuency:SYNC:SLOPe

■[:SOURce[1|2]]:FREQuency:SYNC:SLOPe

□[:SOURce[1|2]]:FREQuency:SYNC:SLOPe?

Description

Set/query the signal polarity of external synchronization source(Synchlator 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.

Example

:SOURce1:FREQuency:SYNC:SLOPe NEGative

Set the polarity of synchronization source(Synchlator function) of CH1 to negative polarity.

2.3.3.1.4 Frequency Ratio at External Synchronization Mode (W/R) [:SOURce[1|2]]:FREQuency:SYNC:HARMonic

■[:SOURce[1|2]]:FREQuency:SYNC:HARMonic

□[:SOURce[1|2]]:FREQuency:SYNC:HARMonic?

Description

Set/query the frequency ratio when in external synchronization mode(Synchlator function).

Setting parameter

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

<value1> ::= <INT>

<INT> → Multiplication number m : 1 to 64

<value2> ::= <INT>

<INT> → Devision number n : 1 to 64

MINimum → 1

MAXimum → 64

Query parameter

None

Response format

<NR1>,<NR1>

Example

:SOURce1:FREQuency:SYNC:HARMonic 2,3

Set the multiplication number m to 2 and division number n to 3 of CH1 in external synchronization mode(Synchlator function).

2.3.3.2 Phase

2.3.3.2.1 Set Phase (W/R) [:SOURce[1|2]]:PHASe[:ADJust]

■[:SOURce[1|2]]:PHASe[:ADJust]

□[:SOURce[1|2]]:PHASe[:ADJust]?

Description

Set/query 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

[<units>|MINimum|MAXimum]

<units> ::= DEG|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:PHASe:ADJust 90DEG

Set the phase of CH1 to 90°.

2.3.3.3 Amplitude

2.3.3.3.1 Set Amplitude (W/R) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate][:AMPLitude]

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

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

Description

Set/query the amplitude of oscillator.

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Amplitude : 0 Vp-p to 21 Vp-p/open

: 0 Vp-p to 10.5 Vp-p/50Ω

Resolution : 0.1 mVp-p (3Vp-p below),

1 mVp-p (3Vp-p or more)

* 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 → Set the maximum value currently available

Query parameter

[<units>|MINimum|MAXimum]

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

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:VOLTage:LEVel:IMMediate:AMPLitude 10VPP

Set the amplitude of CH1 to 10Vp-p.

2.3.3.4 DC Offset

2.3.3.4.1 Set DC Offset (W/R) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:OFFSet

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

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

Description

Set/query the DC offset of oscillator.

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±10.5 V/open, ±5.25 V/50Ω

Resolution : 0.1 mVp-p (±3V below),

1 mVp-p (±3V or more)

* The setting range varies depending on the amplitude setting.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= V|USER

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

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

Set the DC offset of CH1 to 2.5V.

2.3.3.5 High Level/Low Level Voltage

2.3.3.5.1 High level (W/R) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:HIGH

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

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

Description

Set/query the high level voltage.

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 → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= V|USER

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

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

Set the high level of CH1 to 5V

2.3.3.5.2 Low Level (W/R) [:SOURce[1|2]]:VOLTage[:LEVel][:IMMediate]:LOW

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

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

Description

Set/query the low level voltage.

Setting parameter

<low>|MINimum|MAXimum

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

<REAL> → Low level

* The setting range varies depending on the state.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= V|USER

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

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

Set the low level of CH1 to 0V.

2.3.3.6 Subchannel operation

2.3.3.6.1 Waveform (W/R) [:SOURce[1|2]]:SCHannel:FUNcTion[:SHApe]

■[:SOURce[1|2]]:SCHannel:FUNcTion[:SHApe]

□[:SOURce[1|2]]:SCHannel:FUNcTion[:SHApe]?

Description

Set/query the subchannel waveform.

Setting parameter

SINusoid|SQUare|TRIangle|PRAMp|NRAMp|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|DPULse|BRRamp
|USER

SINusoid	→	Sine wave
SQUare	→	Square wave
TRIangle	→	Triangle wave
PRAMp	→	Positive ramp wave
NRAMp	→	Negative 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
DPULse	→	Double pulse
BRRamp	→	Bottom-referenced ramp wave
USER	→	Arbitrary waveform

Query parameter

None

Response format

SIN|SQU|TRI|PRAM|NRAM|NOIS
 |USIN|CSIN|CFCS|ACS|SSIN|MCS
 |ONPS|OFPS|CONS|COFS
 |GAUS|LOR|HAV|HSP|TPUL|SINC
 |ERIS|EFAL|SOLS|DOSC
 |OSUR|PSUR
 |TOFF|HSEP|DPUL|BRR
 |USER

* For the meaning of each response data, see the setting parameter.

Example

:SOURce1:SCHannel:FUNction:SHApe SINusoid
 Set the subchannel waveform of CH1 to sine wave.

Remarks

The setting of each PWF wave parameter, see the “2.3.2.6 PWF waveform”.

2.3.3.6.2**Amplitude (W/R)**

[[: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

Set/query the amplitude of subchannel output.

Setting parameter

<amplitude>|MINimum|MAXimum

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

<REAL> → Amplitude : 0 Vp-p to 6.6 Vp-p/open
 Resolution : 1 mVp-p

<eunits> ::= M (milli)

<units> ::= VPP

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:SCHannel:VOLTage:LEVel:IMMediate:AMPLitude 3VPP
 Set the amplitude of the subchannel output of CH1 to 3Vp-p.

2.3.3.6.3 Offset (W/R)

[[: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

Set/query the DC offset of subchannel output.

Setting parameter

<offset>|MINimum|MAXimum

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

<REAL> → DC offset : ±3.3 V

Resolution : 1 mV

<eunits> ::= M (milli)

<units> ::= V

MINimum → Set the minimum value currently available

MAXimum → Set the maximum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:SCHannel:VOLTage:LEVel:IMMEDIATE:OFFSet 2.5V

Set the DC offset of the subchannel output of CH1 to 2.5V.

2.3.3.6.4 Frequency (W/R)

[[:SOURce[1|2]]:SCHannel:FREQuency

■[:SOURce[1|2]]:SCHannel:FREQuency

□[:SOURce[1|2]]:SCHannel:FREQuency?

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Frequency : 0 Hz to 5 MHz

Resolution : 15 digits or 10 nHz

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

* Note that when the unit is frequency, M is used to mean "10⁶".

<units> ::= HZ

MINimum → Set the maximum value currently available

MAXimum → Set the minimum value currently available

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value currently available

MAXimum → Query the maximum value currently available

Response format

<NR3>

Example

:SOURce1:SCHannel:FREQuency 1KHZ

Set the frequency of subchannel of CH1 to 1kHz.

Remarks

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

2.3.3.6.5 Phase (W/R) [:SOURce[1|2]]:SCHannel:PHASe[:ADJust]

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

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

Description

Set/query 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 → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:SOURce1:SCHannel:PHASe:ADJust 90DEG

Set the subchannel phase of CH1 to 90°.

2.3.3.6.6 Set Arbitrary Waveform (W/R) [:SOURce[1|2]]:SCHannel:FUNcTion:USER

■[:SOURce[1|2]]:SCHannel:FUNcTion:USER

□[:SOURce[1|2]]:SCHannel:FUNcTion:USER?

Description

Set/query the arbitrary waveform of subchannel.

Setting parameter

<memory> ::= <INT>

<INT> → Memory number : 0 to 4096

Query parameter

None

Response format

<NR1>

Example

:SOURce1:SCHannel:FUNcTion:USER 3

Set the data of memory number 3 to the arbitrary waveform of the subchannel of CH1

Remarks

Memory number 0 is the edit memory.

2.3.3.6.7 Noise Bandwidth (W/R) [:SOURce[1|2]]:SCHannel:FUNcTion:NOISe:BW

■[:SOURce[1|2]]:SCHannel:FUNcTion:NOISe:BW

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

Description

Set/query the bandwidth of noise of subchannel.

Setting parameter

<bw>|MINimum|MAXimum

<bw> ::= <INT>

<INT> → Bandwidth number: 1 to 6

1 → 100kHz

2 → 300kHz

3 → 1MHz

4 → 3MHz

5 → 10MHz

6 → Full * WF1983/WF1984 only

MINimum → 1 (Narrowband 100kHz)

MAXimum → 5 (Wideband 10MHz) * WF1981/WF1982

6 (Wideband Full) * WF1983/WF1984

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>

Example

:SOURce1:SCHannel:FUNcTion:NOISe:BW 1

Set the noise bandwidth of subchannel of CH1 to 100kHz.

2.3.4 Signal Output Operation

2.3.4.1 Set Output (W/R) :OUTPut[1|2][:STATe]

■:OUTPut[1|2][:STATe]

□:OUTPut[1|2][:STATe]?

Description

Set/query 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

Example

:OUTPut1:STATe ON

Set the output of CH1 to On.

2.3.4.2 Output On at Power-On setting/query :OUTPut[1|2]:PON

■:OUTPut[1|2]:PON

□:OUTPut[1|2]:PON?

Description

Set/query the output on at Power-on operation.

Setting parameter

ON|OFF|LAST

ON → Output On

OFF → Output Off

LAST → Set from the state when last turned off

* When the power is turned on without using the power switch, the output is set off regardless of this setting.

Query parameter

None

Response format

ON|OFF|LAST

* For the meaning of each response data, see the setting parameter.

Example

:OUTPut1:PON ON

Set the output on of CH1 at power-on.

2.3.4.3 Output Auto-Range (W/R) [:SOURce[1|2]]:VOLTage:RANGe:AUTO

■[:SOURce[1|2]]:VOLTage:RANGe:AUTO

□[:SOURce[1|2]]:VOLTage:RANGe:AUTO?

Description

Set/query the auto range on/off.

If the auto range is set, the signal range is auto switched depending on the output voltage setting.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Auto range off (fixed to current range)
1/ON : Auto range on

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Auto range off(range fix)
1 : Auto range on

Example

:SOURce1:VOLTage:RANGe:AUTO ON

Set the auto range of CH1 to On.

2.3.4.4 Query Signal Range (R) [:SOURce[1|2]]:VOLTage:RANGe?

□[:SOURce[1|2]]:VOLTage:RANGe?

Description

Query the current signal range, including output range, AC range and DC range.

Query parameter

None

Response format

<output_range>,<ac_range>,<dc_range>

<output_range> ::= <INT>

1 → 0.8V range
2 → 4V range
3 → 20V range

<ac_range> ::= <INT>

1 → -30dB
2 → -20dB
3 → -10dB
4 → 0dB

<dc_range> ::= <INT>

1 → -14dB
2 → 0dB

2.3.4.5 Execution of ϕ Sync (W) [:SOURce[1|2]]:PHASe:INITiate

■[:SOURce[1|2]]:PHASe:INITiate

Description

Execution of ϕ Sync.

* In this command, “[1|2]” does not affect operation.

Setting parameter

None

Example

:SOURce1:PHASe:INITiate

Execution of ϕ Sync.

2.3.4.6 Set External Addition Input (W/R) [:SOURce[1|2]]:COMBine:FEED

■[:SOURce[1|2]]:COMBine:FEED

□[:SOURce[1|2]]:COMBine:FEED?

Description

Set/query the external addition input setting.

* The external addition range that can be set depends on the current signal range.

Setting parameter

OFF|X0.4|X2|X10

OFF → Disable the external addition input.

X0.4 → Add 0.4 times of the external addition input.

X2 → Add 2 times of the external addition input.

X10 → Add 10 times of the external addition input.

Query parameter

None

Response format

OFF|X0.4|X2|X10

Example

:SOURce1:COMBine:FEED X2

Add 2 times of the external addition input to the output of CH1.

2.3.4.7 Load Impedance (W/R) :OUTPut[1|2]:LOAD

■:OUTPut[1|2]:LOAD

□:OUTPut[1|2]:LOAD?

Description

Set/query the load impedance.

Setting parameter

<load>|MINimum|MAXimum|INFinity

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

<INT> → Load impedance : 1 Ω to 10 kΩ

Resolution : 1 Ω

<eunits> ::= K

<units> ::= OHM

MINimum → 1 Ω

MAXimum → 10 kΩ

INFinity → High-Z

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR1>|INF

Example

:OUTPut1:LOAD 50OHM

Set the load impedance of CH1 to 50Ω.

2.3.5 Trigger Operation

Commands of the trigger operation varies depend on the oscillation mode.

Details described in “2.5 Commands Available for Trigger/Oscillation State Control”.

2.3.5.1 Trigger Source (W/R) :TRIGger[1|2]:{SWEep|BURSt}:SOURce

■:TRIGger[1|2]:{SWEep|BURSt}:SOURce

□:TRIGger[1|2]:{SWEep|BURSt}:SOURce?

Description

Set/query the trigger source at the time of sweep

Setting keyword

SWEep|BURSt

SWEep → Sweep

BURSt → Burst

Setting parameter

TIMer[1]|TIMer2|EXTernal[1]|EXTernal2

TIMer[1] → Internal trigger source1

TIMer2 → Internal trigger source2

EXTernal[1] → External trigger source1 (External trigger input connector 1)

EXTernal2 → External trigger source2 (External trigger input connector 2)

Query parameter

None

Response format

TIM1|TIM2|EXT1|EXT2

* For the meaning of each response data, see the setting parameter.

Example

:TRIGger2:SWEep:SOURce EXT

Set the trigger source of CH2 sweep to external trigger source 1.

2.3.5.2 Internal Trigger Period (W/R) :TRIGger[1|2]:{SWEep|BURSt}:TImeR

■:TRIGger[1|2]:{SWEep|BURSt}:TImeR

□:TRIGger[1|2]:{SWEep|BURSt}:TImeR?

Description

Set/query the internal trigger period at the sweep or burst oscillation.

Setting keyword

SWEep|BURSt

SWEep → Sweep

BURSt → Burst

Setting parameter

<period>|MINimum|MAXimum

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

<REAL> → Period : 100 ns to 10 ks

Resolution : 7 digits or 2.5 μs

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

<units> ::= S

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>

Example

:TRIGger1:SWEep:TImeR 1MS

Set the internal trigger period to 1ms during CH1 sweep.

2.3.5.3 External Trigger Signal Polarity (W/R) :TRIGger[1|2]:{SWEep|BURSt}:SLOPe

■:TRIGger[1|2]:{SWEep|BURSt}:SLOPe

□:TRIGger[1|2]:{SWEep|BURSt}:SLOPe?

Description

Set/query the external trigger polarity at the sweep or burst oscillation.

Setting keyword

SWEep|BURSt

SWEep → Sweep

BURSt → Burst

Setting parameter

POSitive|NEGative|OFF

POSitive → Rising edge (except the gate burst)

Positive polarity (on the gate burst)

NEGative → Falling edge (except the gate burst)

Negative polarity (on the gate burst)

OFF → Disabled

Query parameter

None

Response format

POS|NEG|OFF

* For the meaning of each response data, see the setting parameter.

Example

:TRIGger:SWEep:SLOPe NEGative

Set the external trigger polarity during sweep to falling edge.

Remarks

In this command, the external trigger source is specified as “[1|2]”.

2.3.5.4 Execution of Manual Trigger (TRIG key operation) *TRG

■*TRG

Description

Execution of the manual trigger.

Effect the same as Group Execution Trigger command (<GET>).

Setting parameter

None

Remarks

“*TRG” command is executed to CH1 only.

To execute a manual trigger to the CH2 side, use the “2.3.5.5 :TRIGger[1|2]” command.

2.3.5.5 Execution of Manual Trigger (W) :TRIGger[1|2]:[SEQuence]:[IMMediate]

■:TRIGger[1|2]:[SEQuence]:[IMMediate]

Description

Execution of the manual trigger to the specified channel.

Setting parameter

None

■:TRIGger[1|2]:SElected:EXECute
Description

Execution control of each oscillation mode.

The handling of setting parameters differs depending on the current oscillation mode.

Setting parameter

<value1>,[<value2>]

* <value2> is valid only in sweep and modulated oscillation mode.

○Modulated oscillation mode

<value1> ::= START|STOP

START → Modulation start

STOP → Modulation stop

○Sweep oscillation mode

<value1> ::= START|STOP|HOLD|RESume

START → Sweep start

STOP → Sweep stop

HOLD → Hold

RESume → Resume

○Sweep and modulated oscillation mode

<value1> ::= START|STOP|HOLD|RESume

START → Sweep start

STOP → Sweep stop

HOLD → Hold

RESume → Resume

<value2> ::= START|STOP

START → Modulation start

STOP → Modulation stop

○Sequence

<value1> ::= START|STOP|ISTop|HOLD|RESume|EBRanch

START → Sequence start

STOP → Sequence stop

ISTop → Forced termination

HOLD → Hold

RESume → Resume

EBRanch → Event branch

Remarks

In sequence mode, “[1|2]” does not affect operation.

This command cannot be used in the burst oscillation mode.

2.3.5.7

External Trigger Threshold Level (W/R)

:TRIGger[1|2]:{SWEep|BURSt|FSKey|PSKey|SYNC}:LEVel

■:TRIGger[1|2]:{SWEep|BURSt|FSKey|PSKey|SYNC}:LEVel

□:TRIGger[1|2]:{SWEep|BURSt|FSKey|PSKey|SYNC}:LEVel?

Description

Set/query the external trigger input threshold voltage for each oscillation mode.

Setting parameter

<threshold>[TTL|MINimum|MAXimum]

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

<REAL> → DC offset : -5 V to 5 V

Resolution : 0.1 V

<eunits> ::= M (milli)

<units> ::= V

TTL → Support TTL level input

MINimum → -5 V

MAXimum → 5 V

Query parameter

[MINimum|MAXimum]

MINimum → Query the minimum value

MAXimum → Query the maximum value

Response format

<NR3>[TTL]

Example

:SOURce1:SWEep:LEVel 2V

Set the external trigger input of CH1 for the sweep oscillation to 2V.

Remarks

“[1|2]” of this command is to specify trigger channel.

2.3.6 Setting Memory Operation

2.3.6.1 Clear (W) :MEMory:STATe:DELeTe

■:MEMory:STATe:DELeTe

Description

Clear the specified setting memory.

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

2.3.6.2 Setting Memory Name (W/R) :MEMory:STATe:DEFine

■:MEMory:STATe:DEFine

□:MEMory:STATe:DEFine?

Description

Set/query the specified setting memory name.

Setting parameter

"<name>",<memory>
<name> ::= <STR>
<STR> → Setting memory name (20 characters or less)
<memory> ::= <INT>
<INT> → Memory number : 1 to 10

Query parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

Response format

"<name>"

2.3.6.3 Store *SAV

■*SAV

Description

Store the current setting to the specified memory number.

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

2.3.6.4 Recall *RCL

■*RCL

Description

Recall the setting from the specified memory number.

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

2.3.7 USB Storage Operation

2.3.7.1 Acquire USB Storage Information (R) :MMEMory:CATalog[:ALL]?

□:MMEMory:CATalog[:ALL]?

Description

Acquire the USB storage information and file list in specified path folder.

Query parameter

"<path>"

<path> ::= <INT>

<INT> → Full path of USB storage

Response format

<mem_used>,<mem_free>[,<file_listing>"]

<mem_used> ::= <NR1>

<NR1> → Used bytes

<mem_free> ::= <NR1>

<NR1> → Available bytes

<file_listing> ::= <name>,<type>,<size>

<name> ::= <STR>

<STR> → file name or folder name

<type > ::= <STR>

<STR> → When folder : " FOLD"

When file : Large characters of extension

* Omit if not applicable.

<size> ::= <STR>

<STR> → File's bytes

Remarks

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

When omitted <path>, got only USB storage information.

If you specify <path> that does not exist, the processing will be the same as when <path> is omitted.

2.3.7.2 Delete File or Folder (W) :MMEMory:DELEte

■:MMEMory:DELEte

Description

Delete file or folder in the USB storage.

Setting parameter

"<path>"

<path> ::= <STR>

<STR> → Full path of USB storage

Remarks

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.3 Recall Setting (W) :MMEMory:STATe:RECall

■:MMEMory:STATe:RECall

Description

Recall the setting data from the USB storage.

Setting parameter

"<path>"

<path> ::= <STR>

<STR> → Full path of USB storage

Remarks

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.4 Store Current Setting (W) :MMEMory:STATe:STORe

■:MMEMory:STATe:STORe

Description

Store the current setting for the USB storage.

Setting parameter

"<path>"

<path> ::= <STR>

<STR> → Full path of USB storage

Remarks

Full path include file name.

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.5 Import Arbitrary Waveform (W) :MMEMory:{TRACe|DATA}:IMPorT

■:MMEMory:{TRACe|DATA}:IMPorT

Description

Import the arbitrary waveform from the USB storage to the arbitrary waveform memory on the unit.

Setting parameter

"<path>",<memory>

<path> ::= <STR>

<STR> → Full path of USB storage

<memory> ::= <INT>

<INT> → Memory number : 1 to 4096

Remarks

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.6 Export Arbitrary Waveform (W) :MMEMory:{TRACe|DATA}:EXPort

■:MMEMory:{TRACe|DATA}:EXPort

Description

Export the arbitrary waveform to the USB storage from the arbitrary waveform memory on the unit.

Setting parameter

<memory>,"<path>"
 <memory> ::= <INT>
 <INT> → Memory number : 1 to 4096
 <path> ::= <STR>
 <STR> → Full path of USB storage

Remarks

Full path include file name.
Root path of the USB storage is "\\".
When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.7 Import Sequence Data (W) :MMEMory:{TRACe|DATA}:SEquence:RECall

■:MMEMory:{TRACe|DATA}:SEquence:RECall

Description

Import the sequence setting data from the USB storage to the unit.

Setting parameter

"<path>"
 <path> ::= <STR>
 <STR> → Full path of USB storage

Remarks

Root path of the USB storage is "\\".
When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.7.8 Export Sequence Data (W) :MMEMory:{TRACe|DATA}:SEquence:STORE

■:MMEMory:{TRACe|DATA}:SEquence:STORE

Description

Export the sequence setting data to the USB storage from the unit.

Setting parameter

"<path>"
 <path> ::= <STR>
 <STR> → Full path of USB storage

Remarks

Full path include file name.
Root path of the USB storage is "\\".
When specifying the AAA folder in the USB storage, write "\\AAA\".

2.3.8 Status Operation

This section describes detail of each command.

See “3 Status System” for the explanation of the status system.

2.3.8.1 Common Command of Status Operation

2.3.8.1.1 Status Register and Error Queue Clear (W) *CLS

■*CLS

Description

Clears the status 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.

2.3.8.1.2 Status reporting related preset setting (W) :STATus:PRESet

■:STATus:PRESet

Description

Preset the registers.

Setting parameter

None

Remarks

- * The following registers are preset 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

2.3.8.1.3 Power On Status Clear Flag (W/R) *PSC

■*PSC

□*PSC?

Description

Set/query the power-on status clear flag.

Setting parameter

<state> ::= <INT>
 <INT> → 0 : OFF
 1 : ON

Query parameter

None

Response format

<NR1>

Example

*PSC 1

Set the the power-on status clear flag.

Remarks

* The following registers are preset 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

2.3.8.1.4 Status Byte Register (R) *STB?

□*STB?

Description

Query the status byte register.

Query parameter

None

Response format

<NR1>

2.3.8.1.5 Service Request Enable Register (W/R) *SRE

■*SRE

□*SRE?

Description

Set/query the service request enable register.

Setting parameter

<value> ::= <INT>

<INT> → 0 to 255

Query parameter

None

Response format

<NR1>

Example

*SRE 8

Set 8 to the service request enable register.

2.3.8.1.6 Standard Event Status Register (R) *ESR?

□*ESR?

Description

Query the standard event status register.

Query parameter

None

Response format

<NR1>

2.3.8.1.7 Standard Event Status Enable Register (W/R) *ESE

■*ESE

□*ESE?

Description

Set/query the standard event status enable register.

Setting parameter

<value> ::= <INT>
<INT> → 0 to 8

Query parameter

None

Response format

<NR1>

Example

*ESE 8

Set 8 to the standard event status enable register.

2.3.8.2 Operation Status Register Group

The operation status register group on this unit includes three registers set (common/CH1/CH2).
The register set can be selected from the [:CH1|:CH2] keyword.
* CH2 register set exists only 2ch model.

Setting target	Keyword part
Common register set	None
CH1 register set	:CH1
CH2 register set	:CH2

2.3.8.2.1 Condition Register (R) :STATus:OPERation[:CH1|:CH2]:CONDition?

□:STATus:OPERation[:CH1|:CH2]:CONDition?

Description

Query the operation status condition register .

Query parameter

None

Response format

<NR1>

2.3.8.2.2 Transition Filter Register (Negative) (W/R) :STATus:OPERation[:CH1|:CH2]:NTRansition

■:STATus:OPERation[:CH1|:CH2]:NTRansition

□:STATus:OPERation[:CH1|:CH2]:NTRansition?

Description

Set/query the operation status transition filter (negative).

Setting parameter

<value> ::= <INT>
<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:OPERation:NTRansition 512

Set 1 in the bit 9 of the common operation status transition filter (negative).

2.3.8.2.3 Transition Filter Register (Positive) (W/R) :STATus:OPERation[:CH1]:CH2]:PTRansition

■:STATus:OPERation[:CH1]:CH2]:PTRansition

□:STATus:OPERation[:CH1]:CH2]:PTRansition?

Description

Set/query the operation status transition filter (positive).

Setting parameter

<value> ::= <INT>
<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:OPERation:CH1:PTRansition 512

Set 1 in the bit 9 of the CH1 operation status transition filter (positive).

2.3.8.2.4 Event Register (R) :STATus:OPERation[:CH1]:CH2]:EVENTt]?

□:STATus:OPERation[:CH1]:CH2]:EVENTt]?

Description

Query the operation status event register.

Query parameter

None

Response format

<NR1>

2.3.8.2.5 Event Enable Register (W/R) :STATus:OPERation[:CH1]:CH2]:ENABLE

■:STATus:OPERation[:CH1]:CH2]:ENABLE

□:STATus:OPERation[:CH1]:CH2]:ENABLE?

Description

Set/query the operation status event enable register.

Setting parameter

<value> ::= <INT>
<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:OPERation:CH1:ENABLE 512

Set 1 in the bit 9 of the CH1 operation status event enable register.

2.3.8.3 Questionable Data Status Register Group

The questionable status register group on this unit includes three registers set(common/CH1/CH2).
The register set can be selected from the [:CH1|:CH2] keyword.
* CH2 register set exists only 2ch model.

Setting target	Keyword part
Common register set	None
CH1 register set	:CH1
CH2 register set	:CH2

2.3.8.3.1 Condition Register (R) :STATus:QUESTionable[:CH1|:CH2]:CONDition?

□:STATus:QUESTionable[:CH1|:CH2]:CONDition?

Description

Query the questionable data status condition register.

Query parameter

None

Response format

<NR1>

2.3.8.3.2 Transition Filter Register (Negative) (W/R) :STATus:QUESTionable[:CH1|:CH2]:NTRansition

■:STATus:QUESTionable[:CH1|:CH2]:NTRansition

□:STATus:QUESTionable[:CH1|:CH2]:NTRansition?

Description

Set/query the questionable data status transition filter (negative).

Setting parameter

<value> ::= <INT>
<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:QUESTionable:NTRansition 16

Set 1 in the bit 4 of the common questionable data status transition filter(negative).

2.3.8.3.3 Transition Filter Register (Positive) (W/R) :STATus:QUESTionable[:CH1]:CH2]:PTRansition

■:STATus:QUESTionable[:CH1]:CH2]:PTRansition

□:STATus:QUESTionable[:CH1]:CH2]:PTRansition?

Description

Set/query the questionable data status transition filter (positive).

Setting parameter

<value> ::= <INT>

<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:QUESTionable:CH1:PTRansition 16

Set 1 in the bit 4 of the CH1 questionable data status transition filter(positive).

2.3.8.3.4 Event Register (R) :STATus:QUESTionable[:CH1]:CH2][:EVENT]?

□:STATus:QUESTionable[:CH1]:CH2][:EVENT]?

Description

Query the questionable data status event register.

Query parameter

None

Response format

<NR1>

2.3.8.3.5 Event Enable Register (W/R) :STATus:QUESTionable[:CH1]:CH2]:ENABLE

■:STATus:QUESTionable[:CH1]:CH2]:ENABLE

□:STATus:QUESTionable[:CH1]:CH2]:ENABLE?

Description

Set/query the questionable data status event enable register.

Setting parameter

<value> ::= <INT>

<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:QUESTionable:ENABLE 16

Set 1 in the bit 4 of the common questionable data status event enable register.

2.3.8.4 Warning event register group

The warning event register group on this unit includes three registers set(common/CH1/CH2).
The register set can be selected from the [:CH1|:CH2] keyword.
* CH2 register set exists only 2ch model.

Setting target	Keyword part
Common register set	None
CH1 register set	:CH1
CH2 register set	:CH2

2.3.8.4.1 Event Register (R) :STATus:WARNing[:CH1|:CH2][:EVENT]?

□:STATus:WARNing[:CH1|:CH2][:EVENT]?

Description

Query the warning event register.

Query parameter

None

Response format

<NR1>

2.3.8.4.2 Event Enable Register (W/R) :STATus:WARNing[:CH1|:CH2]:ENABLE

■:STATus:WARNing[:CH1|:CH2]:ENABLE

□:STATus:WARNing[:CH1|:CH2]:ENABLE?

Description

Set/query the warning event enable register.

Setting parameter

<value> ::= <INT>
<INT> → 0 to 65535

Query parameter

None

Response format

<NR1>

Example

:STATus:WARNing:CH1:ENABLE 16
Set 1 in the bit 4 of the CH1 warning event enable register.

2.3.9 Channel Operation, Channel-Link

These commands are only enabled for the 2-channel model (WF1982/WF1984).

2.3.9.1 Set Channel Mode (W/R) :CHANnel:MODE

■:CHANnel:MODE

□:CHANnel:MODE?

Description

Set/query the channel mode.

Setting parameter

INDEpendent|PHASe|TONE|RATio|DIFFerential|DIFF2

INDEpendent → Independent

PHASe → 2 phase

TONE → Constant frequency difference

RATio → Constant frequency ratio

DIFFerential → Differential output 1

DIFF2 → Differential output 2

Query parameter

None

Response format

IND|PHAS|TONE|RAT|DIFF|DIFF2

* For the meaning of each response data, see the setting parameter.

Example

:CHANnel:MODE INDEpendent

Set the channel mode to independent

2.3.9.2 Constant Frequency Difference Mode Frequency Difference (W/R) :CHANnel:DELTA

■:CHANnel:DELTA

□:CHANnel:DELTA?

Description

Set/query the frequency difference in the constant frequency difference mode.

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Frequency : (CH2 frequency – CH1 frequency)

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

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

* When the unit is frequency, M is used to mean “10⁶”.

<units> ::= HZ|USER

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= HZ|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:CHANnel:DELTA 1KHZ

Set the frequency difference to 1kHz.

Remarks

The setting range may be narrower depending on the current settings.

If the current frequency is out of the setting range as a result of setting the frequency difference, the CH1 frequency is adjusted.

2.3.9.3 Constant Frequency Ratio Mode Frequency Ratio (W/R) :CHANnel:RATio

■:CHANnel:RATio**□:CHANnel:RATio?****Description**

Set/query 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>

Example

:CHANnel:RATio 2,3

Set the frequency ratio to 2:3 for CH1:CH2.

Remarks

The setting range may be narrower depending on the current settings.

If the current frequency is out of the setting range as a result of setting the frequency difference, the CH1 frequency is adjusted.

**Channel-Link (W/R)
:INSTrument:COUPle**

■:INSTrument:COUPle**□:INSTrument:COUPle?****Description**

Set/query the channel-link state.

When channel-link is enabled, operations are always executed on CH1 and CH2.

Setting parameter

ALL|NONE

ALL → CH-Link On

NONE → CH-Link Off

Query parameter

None

Response format

ALL|NONE

* For the meaning of each response data, see the setting parameter.

Example

:INSTrument:COUPle ALL

Set the channel-link function on.

2.3.10 Sequence Mode

See “2.3.5.6 Execution Control of Modulation/Sweep/Sequence” for the sequence execution control.

2.3.10.1 Set Sequence Mode (W) [:SOURce[1|2]]:SEQuence:STATe

■[:SOURce[1|2]]:SEQuence:STATe

□[:SOURce[1|2]]:SEQuence:STATe?

Description

Set the sequence mode or oscillation mode.

Query whether sequence mode is on or not.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Oscillator mode

1/ON : Sequence mode

Query parameter

None

Response format

<NBOL>

<NBOL> → 0 : Not sequence mode

1 : Sequence mode

Example

:SOURce1:SEQuence:STATe ON

Set the oscillation mode to sequence.

Remarks

Whether or not “[1|2]” is specified does not affect the operation.

An error will occur if used during sequence execution.

2.3.10.2 Sequence Data I/O (W/R) {:TRACe|:DATA}:SEQuence

■{:TRACe|:DATA}:SEQuence

□{:TRACe|:DATA}:SEQuence?

Description

Set/query the input and output of the sequence data.

Setting parameter

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

<memory> ::= <INT>

<INT> → Memory number : 0 to 99

<name> ::= <STR>

<STR> → Sequence name (20 characters or less)

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

<data> ::= <BLK>

<BLK> → #<digit><byte><data>

→ Start of binary data

<digit> → Indicates the number of digits in <byte> and is a non-zero number.

<byte> → Indicates the number of bytes in <byte>

<data> → Sequence data

(See "2.4 Specification of Sequence I/O Data")

Query parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number : 0 to 99

Response format

"<name>",<data>

(See "2.4 Specification of Sequence I/O Data")

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 (WF1981/WF1983) can import the sequence data obtained by the 2 channel equipment (WF1982/WF1984). In this case, however, the data of CH2 is ignored.

* 2-channel equipment (WF1982/WF1984) can import the sequence data obtained by the 1 channel equipment (WF1981/WF1983). In this case, however, the sequence of CH2 is considered as the initial data.

2.3.10.3 Compile Sequence Data (W) :TRIGger[1|2]:COMPile[:IMMediate]

■:TRIGger[1|2]:COMPile[:IMMediate]

Description

Compile the sequence data.

Setting parameter

None

Remarks

Whether or not "[1|2]" is specified does not affect the operation.

2.3.10.4 Acquisition of Current Step Number (R) [:SOURce[1|2]]:SEQuence:CSTep?

□[:SOURce[1|2]]:SEQuence:CSTep?

Description

Query 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.

2.3.10.5 Initialization of Sequence Data (W) {:TRACe|:DATA}:SEQuence:CLEAr

■{:TRACe|:DATA}:SEQuence:CLEAr

Description

Initialize the sequence data in specified memory.

Setting parameter

<memory>

<memory> ::= <INT>

<INT> → Memory number : 0 to 99

Remarks

Memory number 0 is the current memory.

If executed while the sequence is in RUN or HOLD status, an error will occur.

If executed when the sequence is in the READY state, the EDIT state will be entered and the contents of the command will be executed.

2.3.10.6 Store of Sequence Data (W) {:TRACe|:DATA}:SEQuence:STORe

■{:TRACe|:DATA}:SEQuence:STORe

Description

Store the sequence data.

Setting parameter

<memory>,["<name>"]

<memory> ::= <INT>

<INT> → Memory number : 1 to 99

<name> ::= <STR>

<STR> → Sequence name (20 characters or less)

* <name> is Optional (If omitted, the setting is not changed)

Example

:TRACe:SEQuence:STORe 2,"name"

Save the sequence data with the sequence name "name" in the memory number 2.

2.3.10.7 Recall of Sequence Data (W) {:TRACe|:DATA}:SEQuence:RECall

■{:TRACe|:DATA}:SEQuence:RECall

Description

Recall the sequence data.

Setting parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 99

Example

:TRACe:SEQuence:RECall 2
Recall the sequence data of memory number 2.

2.3.10.8 Setting Sequence Memory Name (W/R) :MEMOrY{:TRACe|:DATA}:SEQuence:STATe:DEFine

■:MEMOrY{:TRACe|:DATA}:SEQuence:STATe:DEFine

□:MEMOrY{:TRACe|:DATA}:SEQuence:STATe:DEFine?

Description

Set/query the specified sequence memory name.

Setting parameter

"<name>",<memory>
<name> ::= <STR>
<STR> → Setting memory name (20 characters or less)
<memory> ::= <INT>
<INT> → Memory number : 1 to 10

Query parameter

<memory> ::= <INT>
<INT> → Memory number : 1 to 10

Response format

"<name>"

2.3.10.9 Sequence Auto Run at Power-On (W/R) [:SOURce[1|2]]:SEQuence:PON

■[:SOURce[1|2]]:SEQuence:PON

□[:SOURce[1|2]]:SEQuence:PON?

Description

Set/query the sequence automatic run on/off at power-on operation.

Setting parameter

ON|OFF|LAST

ON → Sequence automatic execution On

OFF → Sequence automatic execution Off

LAST → Setting from the previous power-off operation

* When the power is turned on without using the power switch, the sequence auto run is set off regardless of this setting.

Query parameter

None

Response format

ON|OFF|LAST

* For the meaning of each response data, see the setting parameter.

Example

:SEQuence:PON ON

Set the sequence auto run execution at power-on operation to On.

Remarks

Whether or not “[1|2]” is specified does not affect the operation.

2.3.11 Setting Range Limit Operation

2.3.11.1 Frequency Setting Range Limit (W/R) [:SOURce[1|2]]:FREQuency:LIMit:{HIGH|LOW}

■[:SOURce[1|2]]:FREQuency:LIMit:{HIGH|LOW}
□[:SOURce[1|2]]:FREQuency:LIMit:{HIGH|LOW}?

Description

Set/query the frequency setting range limit of oscillator.

Setting keyword

HIGH|LOW

HIGH → High limit

LOW → Low limit

Setting parameter

<frequency>|MINimum|MAXimum

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

<REAL> → Range : 0 Hz to 30 MHz * WF1981/WF1982

: 0 Hz to 60 MHz * WF1983/WF1984

Resolution : 0.01 μ Hz (< 50MHz), 0.1 μ Hz (\geq 50MHz)

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

* Note that when the unit is frequency, M is used to mean "10⁶".

<units> ::= HZ|USER

MINimum → Set the maximum value

MAXimum → Set the minimum value

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= HZ|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:FREQuency:LIMit:HIGH 30MHZ

Set the frequency setting range limit of oscillator of CH1 to 30MHz.

2.3.11.2 Voltage Setting Range Limit (W/R) [:SOURce[1|2]]:VOLTage:LIMit:{HIGH|LOW}

■[:SOURce[1|2]]:VOLTage:LIMit:{HIGH|LOW}

□[:SOURce[1|2]]:VOLTage:LIMit:{HIGH|LOW}?

Description

Set/query the voltage setting range limit of oscillator.

Setting keyword

HIGH|LOW

HIGH → High limit

LOW → Low limit

Setting parameter

<range>|MINimum|MAXimum

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

<REAL> → Range : -10.5 V to 10.5 V

Resolution : 0.1 mV ($\pm 3V$ below), 1 mV ($\pm 3V$ or more)

* The setting range varies depending on the amplitude setting.

<eunits> ::= M (milli)

<units> ::= V|USER

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= V|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:VOLTage:LEVel:LIMit:HIGH 7V

Set the voltage setting range limit of oscillator of CH1 to 7V.

2.3.11.3 Phase Setting Range Limit (W/R) [:SOURce[1|2]]:PHASe:LIMit:{HIGH|LOW}

■[:SOURce[1|2]]:PHASe:LIMit:{HIGH|LOW}

□[:SOURce[1|2]]:PHASe:LIMit:{HIGH|LOW}?

Description

Set/query the phase setting range limit of oscillator.

Setting keyword

HIGH|LOW

HIGH → High limit

LOW → Low limit

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

[<units>|MINimum|MAXimum]

<units> ::= DEG|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:PHASe:LIMit:HIGH 360DEG

Set the phase setting range limit of oscillator of CH1 to 360°.

2.3.11.4 Duty Setting Range Limit (W/R)

[[:SOURce[1|2]][:PULSe]:DCYClE:LIMit:{HIGH|LOW}]

■[:SOURce[1|2]][:PULSe]:DCYClE:LIMit:{HIGH|LOW}

□[:SOURce[1|2]][:PULSe]:DCYClE:LIMit:{HIGH|LOW}?

Description

Set/query the duty setting range limit of oscillator.

Setting parameter

<duty>|MINimum|MAXimum

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

<REAL> → Duty : 0 % to 100 %

Resolution : 0.0001 %

<units> ::= PCT|USER

MINimum → Set the minimum value

MAXimum → Set the maximum value

Query parameter

[<units>|MINimum|MAXimum]

<units> ::= PCT|USER

MINimum → Query the minimum value

MAXimum → Query the maximum value

* When <units> is input, returned the value with unit.

Response format

<NR3>

Example

:SOURce1:PULSe:DCYClE:LIMit:HIGH 60PCT

Set the duty setting range limit of oscillator of CH1 to 60%.

2.3.12 Other Operations

2.3.12.1 Equipment-Specific Information (R) *IDN?

□*IDN?

Description

Query the device ID.

Query parameter

None

Response format

<corporation>,<model>,<serial>,<firmware>

<corporation>	→	Manufacturer	:NF Corporation
<model>	→	Model	: (e.g.) WF1983
<serial>	→	Serial number	: (e.g.) 1234567
<firmware>	→	Firmware version	: (e.g.) Ver1.00

2.3.12.2 Error Message (R) :SYSTem:ERRor?

□:SYSTem:ERRor?

Description

Query the error from error queue.

Query parameter

None

Response format

<code>,"<message>"

<code> ::= <INT>

<INT> → Error code

<message> ::= <STR>

<STR> → Error message

Remarks

The error queue can store 16 error messages, which can be read out one by one, starting with the oldest.

If the number of errors exceeds 16, the last error stored in the error queue will be replaced with "Queue overflow" and no new errors will be added until there is space in the error queue.

The error queue is cleared when the *CLS command is received.

2.3.12.3 Initialization of Setting (W) *RST

■*RST

Description

Initialize oscillator-related settings.

Setting parameter

None

Remarks

The parameters to be initialized by the *RST command are the same as the OSC RESET operation.

In sequence mode, transition to oscillator mode.

For initialization of sequence parameters, see “2.3.10.5 Initialization of Sequence Data”.

2.3.12.4 Set *OPC on Operation Completes (W) *OPC

■*OPC

Description

Set 1 to the OPC bit at the completion of the current operation.

Setting parameter

None

2.3.12.5 Query Current Operation Completed (R) *OPC?

□*OPC?

Description

Return 1 to the output buffer at the current operation completed.

Query parameter

None

Response format

<INT>

0 → Current operation not completes

1 → Current operation completed

Remarks

The “OPC” and “*OPC?” command are generally used to check whether the measurement process has completed.

In the case of this unit, it is assumed that it will be used to check whether commands with slow processing, such as operating arbitrary waveform data or sequence data have completed.

2.3.12.6 Wait for Command Processing (W) *WAI

■*WAI

Description

Wait subsequent commands executed until all waiting commands have been processed.

Setting parameter

None

2.3.12.7 External Reference Frequency Input (W/R) [:SOURce[1|2]]:ROSCillator:SOURce

■[:SOURce[1|2]]:ROSCillator:SOURce

□[:SOURce[1|2]]:ROSCillator:SOURce?

Description

Set/query the external reference frequency input state.

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Disable the external reference frequency input
1/ON : Enable the external reference frequency input

Query parameter

None

Response format

<NBOL>

Example

:SOURce:ROSCillator:SOURce OFF

Set the external reference frequency input to disable.

Remarks

Whether or not “[1|2]” is specified does not affect the operation.

2.3.12.8 External Reference Frequency Output (W/R) [:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]

■[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]

□[:SOURce[1|2]]:ROSCillator:OUTPut[:STATe]?

Description

Set/query the external reference frequency output state

Setting parameter

<state> ::= <BOL>

<BOL> → 0/OFF : Disable the external reference frequency output
1/ON : Enable the external reference frequency output

Query parameter

None

Response format

<NBOL>

Example

:SOURce:ROSCillator:OUTPut ON

Set the external reference frequency output to enable.

Remarks

* Whether or not “[1|2]” is specified does not affect the operation.

2.3.12.9 Query Input State of Multi I/O Connector (R) :SYSTem:AUXiliary:INPut?

□:SYSTem:AUXiliary:INPut?

Description

Return the input state of pin11 to pin14 of the multi I/O connector by 4bits.

Query parameter

None

Response format

<NR1> → 0 to 15

Remarks

When pin11 to pin14 are all high, the value is 15.

The pin numbers and corresponding value are as follows.

1 → pin 11
2 → pin 12
4 → pin 13
8 → pin 14

2.3.12.10 Set Output State of Multi I/O Connector (W/R) :SYSTem:AUXiliary:OUTPut

■:SYSTem:AUXiliary:OUTPut

□:SYSTem:AUXiliary:OUTPut?

Description

Set/query the output state of pin1 to pin4 of the multi I/O connector.

Setting parameter

<value>

<value> ::= <INT>

<INT> → 0 to 15

Response format

<NR1>

Remarks

When pin1 to pin4 are all high, the value is 15.

The pin numbers and corresponding value are as follows.

1 → pin 1
2 → pin 2
4 → pin 3
8 → pin 4

2.3.12.11 Enable of Multi I/O Connector (W/R) :SYSTem:AUXiliary:OUTPut:ENABle

■:SYSTem:AUXiliary:OUTPut:ENABle

□:SYSTem:AUXiliary:OUTPut:ENABle?

Description

Set/query the output enable/disable of pin1 to pin4 of the multi I/O connector.

Setting parameter

<value>

<value> ::= <INT>

<INT> → 0 to 15

Query parameter

None

Response format

<NR1>

Remarks

When disabled, the output pin cannot remote control.

When pin1 to pin4 are all enable, the value is 15.

The pin numbers and corresponding value are as follows.

1 → pin 1

2 → pin 2

4 → pin 3

8 → pin 4

■[:SOURce[1|2]]:{DCYClE|PERiod|FREQuency|PHASe|VOLTage[:OFFSet]}:USER

□[:SOURce[1|2]]:{DCYClE|PERiod|FREQuency|PHASe|VOLTage[:OFFSet]}:USER?

Description

Set/query the user-defined each parameter unit.

Setting keyword

DCYClE|PERiod|FREQuency|PHASe|VOLTage|VOLTage:OFFSet

DCYClE → Duty cycle

PERiod → Period

FREQuency → Frequency

PHASe → Phase

VOLTage → Voltage

VOLTage:OFFSet → Offset

Setting parameter

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

(Unit name)

<name> ::= <STR>

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

(Conversion format)

<form> ::= LINear|LOGarithmic

LINear → Linear

LOGarithmic → Log

(m-value (scale))

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

<REAL> → Range : $\pm 9.999\ 999\ 999\ 999\ 99\ e^{\pm 9}$

Resolution : 15 digits

(n-value (offset))

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

<REAL> → Range : $\pm 9.999\ 999\ 999\ 999\ 99\ e^{\pm 9}$

Resolution : 15 digits

MINimum → Set the minimum value

MAXimum → Set the maximum value

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.

Example

:SOURce1:PULSe:DCYClE:USER "INTN",LINear,100,0

Set the user-defined unit of the duty of CH1 to

“unit name:INTN, conversion format:linear, m-value:100, n-value:0”.

Remarks

Each setting parameter is optional.

If omitted, the setting will not be changed.

2.3.12.13 Theme Color of Display (W/R) :DISPlay:THEMe

■:DISPlay:THEMe

□:DISPlay:THEMe?

Description

Set/query the display theme color.

Setting parameter

DARK|LIGHt|GRAY

DARK → Dark color theme

LIGHt → Light color theme

GRAY → Gray color theme

Query parameter

None

Response format

DARK|LIGHt|GRAY

* For the meaning of each response data, see the setting parameter.

2.3.12.14 Theme Color of Graph (W/R) :DISPlay:THEMe:GRAPh

■:DISPlay:THEMe:GRAPh

□:DISPlay:THEMe:GRAPh?

Description

Set/query the graph theme color.

Setting parameter

DARK|LIGHt|GRAY

DARK → Dark color theme

LIGHt → Light color theme

GRAY → Gray color theme

Query parameter

None

Response format

DARK|LIGHt|GRAY

* For the meaning of each response data, see the setting parameter.

2.3.12.15 Read Display Capture Data (R) :HCOPy:DATA?

□:HCOPy:DATA?

Description

Query the display capture data.

Query parameter

None

Response format

<BLK>

* <BLK> is the binary data of bitmap file format.

2.3.12.16 Save Display Capture Data File to USB Storage (W) :HCOPY:FILE

■:HCOPY:FILE

Description

Save the screen capture file to USB storage.

Setting parameter

"<path>"

<path> ::= <STR>

<STR> → Full path of USB storage.

Remarks

Root path of the USB storage is "\".

When specifying the AAA folder in the USB storage, write "\\AAA\".

The extension (.bmp) is required.

2.3.12.17 Availability of Product Options (R) :SYSTEM:LICense?

□:SYSTEM:LICense?

Description

Query the availability of the product options.

Query parameter

None

Response format

Option is none, "" is returned.

2.4 Specification of Sequence I/O Data

This section describes the specification of sequence data from “2.3.10.2 Sequence Data I/O (W/R) {:TRACe|:DATA}:SEQUence” command.

2.4.1 Overview of Setting Parameters

The setting parameters corresponding to the "2.3.10.2 Sequence Data I/O (W/R) {:TRACe|:DATA}:SEQUence" command are as follows.

```
<memory>,[ "<name>" ],<data>
  <memory> ::= <INT>
              <INT> → Memory number : 0 to 99
  <name> ::= <STR>
              <STR> → Sequence name (20 characters or less)
  * Optional (If omitted, the setting is not changed)
  <data> → #<digit><byte><data>
              # → Start of binary data
              <digit> → Indicates the number of digits in <byte> and is a non-zero number.
              <byte> → Indicates the number of bytes in <byte>
              <data> → Sequence data
                      (See “2.4.2 Description of <data> part”)
```

2.4.2 Description of <data> part

It is described using a group name called section and a key-value pair, and has the same format as a windows configuration file (*.ini).

INI file sections and keys are described in the following sections.

2.4.2.1 Section: [FILE]

This sets the parameter related to the file format. This section cannot be omitted.

2.4.2.1.1 Key: VERSION

Description

File version.

Key

VERSION.

Value

“1.00”

* Specify “1.00” as the version.

2.4.2.2 Section: [SYSTEM]

This sets the system information of the unit. This section cannot be omitted.

2.4.2.2.1 Key: MODEL

Description

Model name.

Key

MODEL

Value

“WF1981”, “WF1982”, “WF1983” or “WF1984”.

2.4.2.2.2 Key: NCHAN

Description

Channel numbers.

Key

NCHAN

Value

<INT> → 1 to 2

2.4.2.2.3 Key: VERSION

Description

Firmware version.

Key

VERSION

Value

"1.00"

* Specify "1.00" as the version.

2.4.2.3 Section: [DATA]

This section sets the sequence data.

All keys in this section can be omitted if they do not need to be set.

2.4.2.3.1 Key: SEQ

Description

Common setting of the sequence.

Key

SEQ

Value

<stsstp>, <syncout>, <dctrl>, <dctrl_mode>, <trgslp>

(Start step)

<stsstp> ::= <INT>

<INT> → 1 ~ 1023

(Synchronization output)

<syncout> ::= <DISC>

<DISC> → SYNC:Waveform sync, SSYN:Sequence sync

(Digital control input)

<dctrl> ::= <BOL>

<BOL> → 0:OFF, 1:ON

(pin14 assign of the multi i/o connector)

<dctrl_mode> ::= <DISC>

<DISC> → STAR:Start, SBR:State branch

(Trigger slope)

<trgslp> ::= <DISC>

<DISC> → POS:Positive, NEG:Negative, OFF:Disable

2.4.2.3.2 Key: TRGTH

Description

Trigger threshold setting.

Key

TRGTH

Value

<threshold>|TTL

<threshold> ::= <REAL>

<REAL> → Range : -5 V to 5 V

Resolution : 0.1 V

TTL → Correspond to the TTL input.

2.4.2.3.3 Key: NOISEBW

Description

Noise bandwidth.

Key

NOISEBW#<chan>

(Setting channel)

<chan> ::= <INT>

<INT> → Range : 1 to 2

Value

<INT> → Range : 1 to 6 * WF1981/WF1982

: 1 to 7 * WF1983/WF1984

(1:100kHz, 2:300kHz, 3:1MHz, 4:3MHz, 5:10MHz, 6:30MHz, 7:Full)

2.4.2.3.4 Key: EXTADD

Description

External addition input.

Key

EXTADD#<chan>

(Setting channel)

<chan> ::= <INT>

<INT> → Range : 1 to 2

Value

OFF|X0.4|X2|X10

OFF → Disable the external addition input.

X0.4 → Add 0.4 times of the external addition input.

X2 → Add 2 times of the external addition input.

X10 → Add 10 times of the external addition input.

2.4.2.3.5 Key: OUTPUT

Description

Sequence automatic control setting.

Key

OUTPUT#<chan>
(Setting channel)
<chan> ::= <INT>
<INT> → Range : 1 to 2

Value

OFF|ON
OFF → Disable automatic output control.
ON → Output turns off when the compile done.
Output turns on when the sequence start.
Output turns off when the sequence stop.

2.4.2.3.6 Key: LOAD

Description

Load impedance setting.

Key

LOAD#<chan>
(Setting channel)
<chan> ::= <INT>
<INT> → Range : 1 to 2

Value

<load>|INFINITY
<load> ::= <REAL>
<REAL> → Range : 1 Ω to 10 kΩ
Resolution : 1 Ω
INFINITY → High-Z Setting

2.4.2.3.7 Key: TRACE

Description

Sequence graph display settings.

Key

TRACE#<trc>
(Graph trace channel)
<chan> ::= <INT>
<INT> → Range : 1 to 4

Value

<chan>,<type>,[<scale>],[<offset>]
(Channel assigned to the target trace)
<chan> ::= <INT>
<INT> → 1 to 2
(Parameter type assigned to the target trace)
<type> ::= <DISC>
<type> ::= FCTN|FREQ|AMPT|OFFS|PHAS|DUTY|SYMM
(Graph display scale for Y-axis)
<scale> ::= <REAL>
(Graph display offset for Y-axis)
<offset> ::= <REAL>

2.4.2.3.8 Key: STEP

Description

Sequence step control settings.

Key

STEP#<step>

(Setting step)

<step> ::= <INT>

<INT> → Range : 0 to 1023

Value

<time>, <stern>, <auto_hold>, <scode>, <stbra_sw>, [<stbra>], <evbra_sw>,
[<evbra>], <jpstp_sw>,[<jpstp>], [<jpcnt_sw>], [<jpcnt>], <sphase_sw>, [<sphase>]

(Step time)

<time> ::= <REAL>

<REAL> → 0.1 ms to 1 ks

(Step termination)

<stern> ::= <DISC>

<DISC> → CONT : Continuous, STOP : End

(Auto hold)

<auto_hold> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(Step sync code)

<scode> ::= <INT>

<INT> → Range : 0 to 15

(State branch enable/disable)

<stbra_sw> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(State branch destination)

<stbra> ::= <INT>

<INT> → Range : 1 to 1023

(Event branch enable/disable)

<evbra_sw> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(Event branch destination)

<evbra> ::= <INT>

<INT> → Range : 1 to 1023

(Jump enable/disable)

<jpstp_sw> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(Jump destination)

<jpstp> ::= <INT>

<INT> → Range : 1 to 1023

(Jump count specified)

<jpcnt_sw> ::= <DISC>

<DISC> → INF : Infinity, ON : Specified counts

(Jump count)

<jpcnt> ::= <INT>

<INT> → Range : 1 to 9999

(Stop phase enable/disable)

<sphase_sw> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(stop phase)

<sphase> ::= <REAL>

<REAL> → Range : 0 to 360 deg

2.4.2.3.9 Key: CHAN

Description

Channel parameter settings.

Key

CHAN#<step>#<chan>

(Setting step)

<step> ::= <INT>

<INT> → Range : 0 to 1023

(Setting channel)

<chan> ::= <INT>

<INT> → Range : 1 to 2

Value

<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>, <symm_val>

(Waveform)

<wf_type> ::= SIN|SQU|RAMP|NOIS|DC|USER

(ARB wave memory number)

<wf_arb_no> ::= <INT>

<INT> → Range : 1 to 4096

(Waveform polarity)

<wf_polarity> ::= NORM|INV

(Square wave duty range extention)

<wf_squex> ::= <BOL>

<BOL> → 0/OFF, 1/ON

(Frequency)

<freq_val> ::= <REAL>

(Frequency action setting)

<freq_actn> ::= CONS|KEEP|SWE

(Amplitude)

<amptd_val> ::= <REAL>

(Amplitude action setting)

<amptd_actn> ::= CONS|KEEP|SWE

(DC offset)

<ofs_val> ::= <REAL>

(DC offset action setting)

<ofs_actn> ::= CONS|KEEP|SWE

(Phase)

<ph_val> ::= <REAL>

(Phase action setting)

<ph_actn> ::= CONS|KEEP|SWE

(Duty)

<dy_val> ::= <REAL>

(Duty action setting)

<dy_actn> ::= CONS|KEEP|SWE

(Symmetry)

<sym_val> ::= <REAL>

2.5 Commands Available for Trigger/Oscillation State Control

WF198x series provide the commands to trigger and the command to control the oscillation state.

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 Commands available for trigger/oscillation state control for each oscillation mode

Oscillation Mode	Commands for trigger	Command to control the oscillation state
	*TRG :TRIGger[1|2][:SEQuence][:IMMediate] GET(Group Execute Trigger)	:TRIGger[1|2]:SElected:EXEcute
Continuous	-	-
Modulation	-	○
Sweep (continuous)	-	○
Sweep (single)	○	○
Sweep (gated single)	○	○
Burst (auto)	-	-
Burst (trigger)	○	-
Burst (gate)	-	-
Burst (triggered gate)	○	-
Sequence	-	○

In the above command, GET and *TRG specify only CH1, so channel specification is not possible. However, if 2-channel link is on, you can specify CH1 and CH2 (WF1982/WF1984 only).

3. Status System

3.1	Status Byte Register and..... Service Request Enable Register	
	3-2	
3.2	Standard Event Status Register Group.....	3-4
3.3	Operation status register group /	
	Questionable data status register group.....	3-5
3.4	Warning Event Register Group	3-14
3.5	Others	3-16

WF198x series 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.

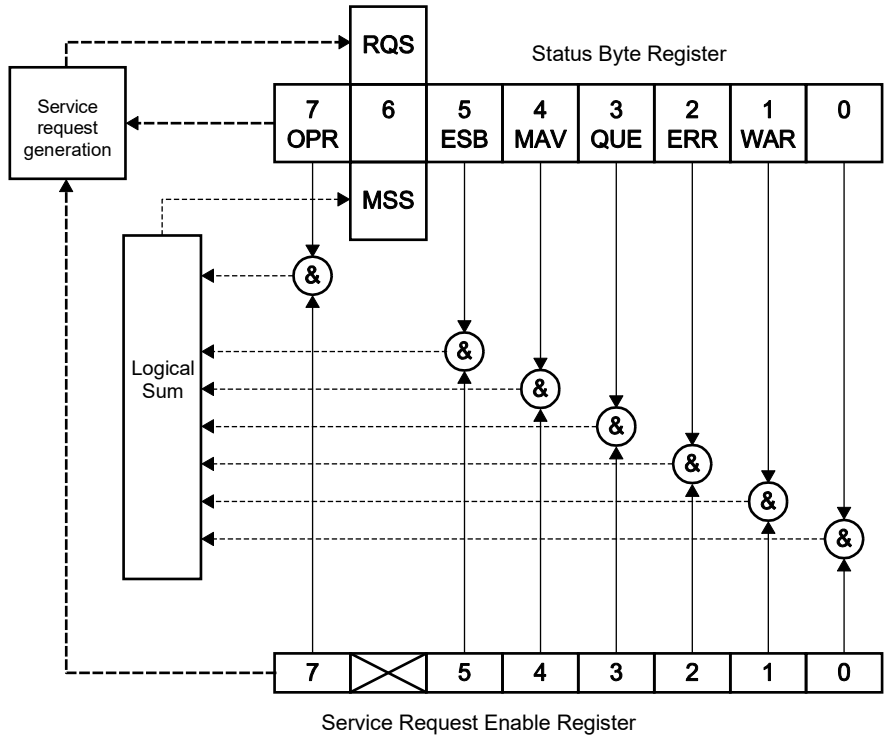


Figure 3.1 Status Byte Register and Service Request Enable Register

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	1	-	(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.

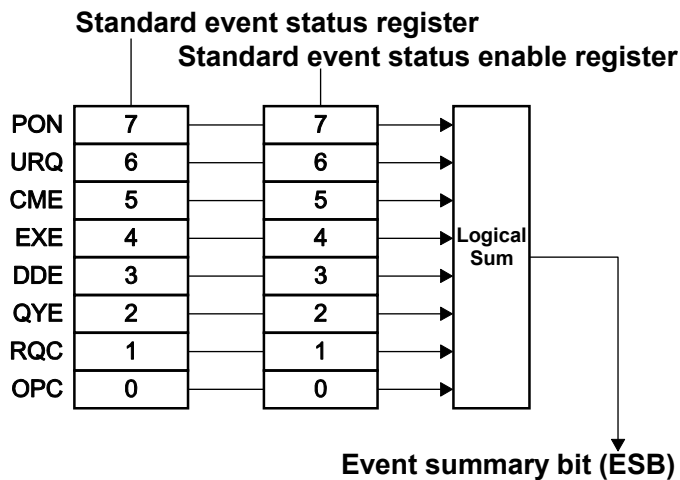


Figure 3.2 Standard Event Status Register Group

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.

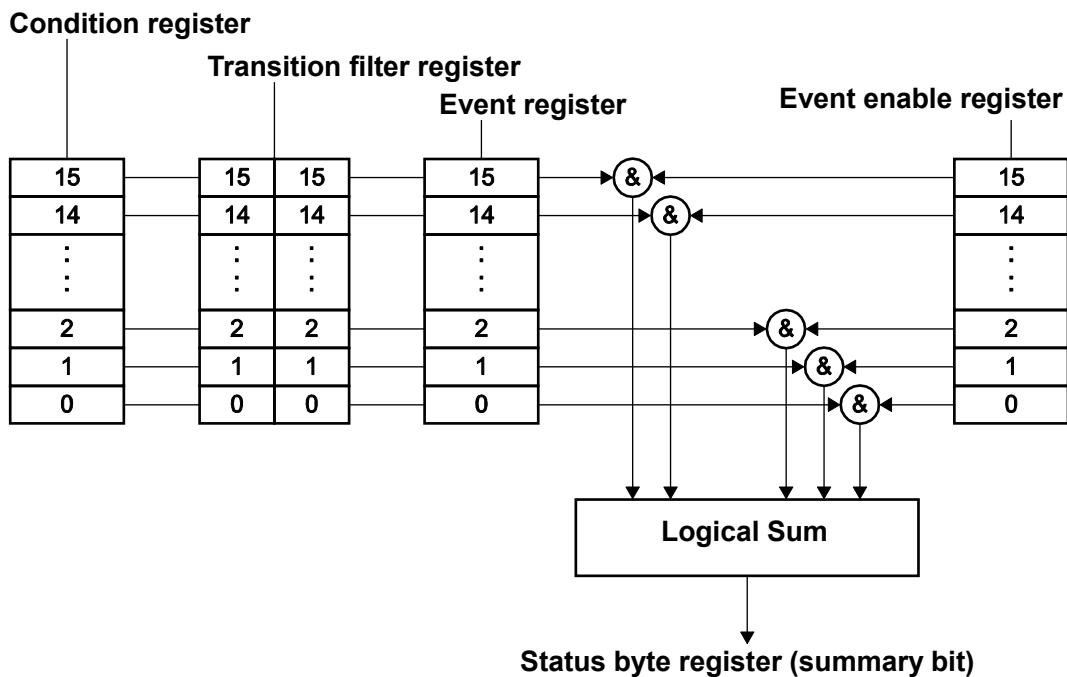


Figure 3.3 Operation Status Register Group/Questionable Data Status Register Group

3.3.1 Overview of Registers

3.3.1.1 Condition Register

The condition register shows the current status of WF198x series. 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 to 1.

The transition filter register is cleared when “:STATus:PRESet” command is received or when the power is turned on with the power-on status clear flag (set in *PSC) 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.

3.3.1.5 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 for summarize their sets. Content of each operation status register is described in Table 3.4 and Table 3.5.

Table 3.4 Common Operation Status Register

Bit	Weight	Description
0		(Unused)
1		(Unused)
2		(Unused)
3		(Unused)
4		(Unused)
5		(Unused)
6		(Unused)
7		(Unused)
8		(Unused)
9	512	CH1 operation status register summary
10	1024	CH2 operation status register summary
11		(Unused)
12		(Unused)
13		(Reserved)
14		(Reserved)
15		Always 0

Table 3.5 CH1, CH2 Operation Status Register

Bit	Weight	Description
0	1	Sequence: EDIT
1	2	Sequence: READY
2	4	Sequence: RUN
3	8	Sequence: HOLD
4		(Unused)
5		(Unused)
6	64	Modulation: RUN
7	128	Modulation/sweep/burst: STOP
8	256	Continuous oscillation/modulation/sweep/burst: RUN
9	512	Sweep: HOLD
10	1024	Sweep/burst: TRIGGER WAIT
11	2048	Modulation/sweep/burst: CONFLICT
12	4096	Synchlator: UnLock
13		(Unused)
14	16384	Waveform updating
15		(Unused)

3.3.1.5.1 Example of Resister State

As a example, the state of the output waveform and the state of the operation status register (Table 3.5) at that time are shown below.

3.3.1.5.1.1 Continuous oscillation

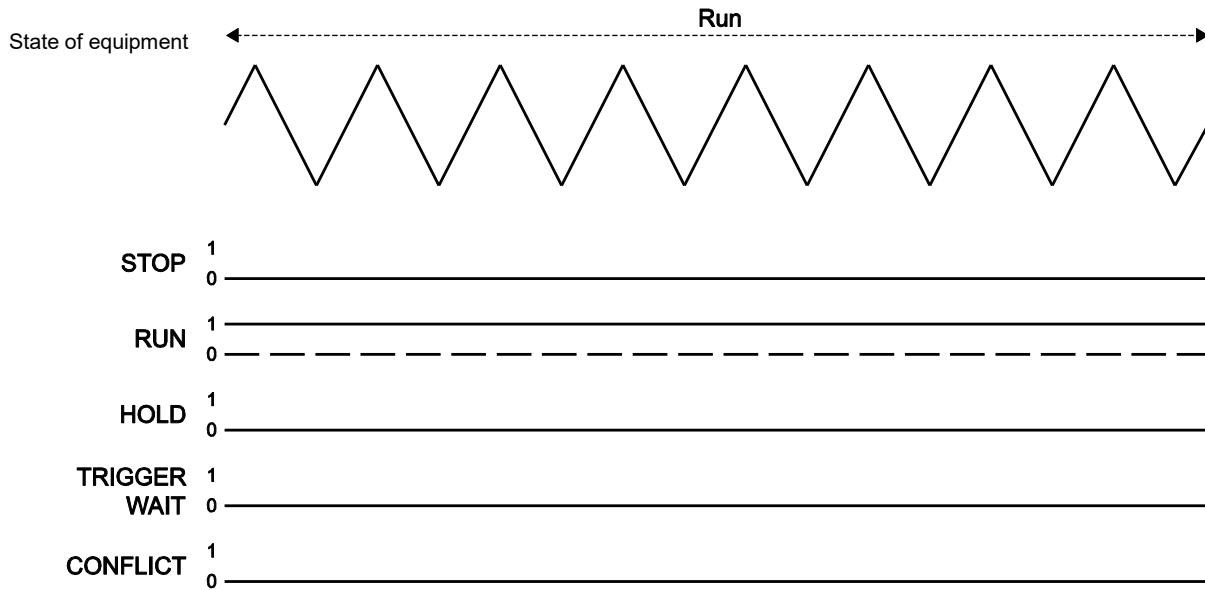


Figure 3.4 Relationship between Output and Operation Status Register (Bit 7-11)

3.3.1.5.1.2 Modulation

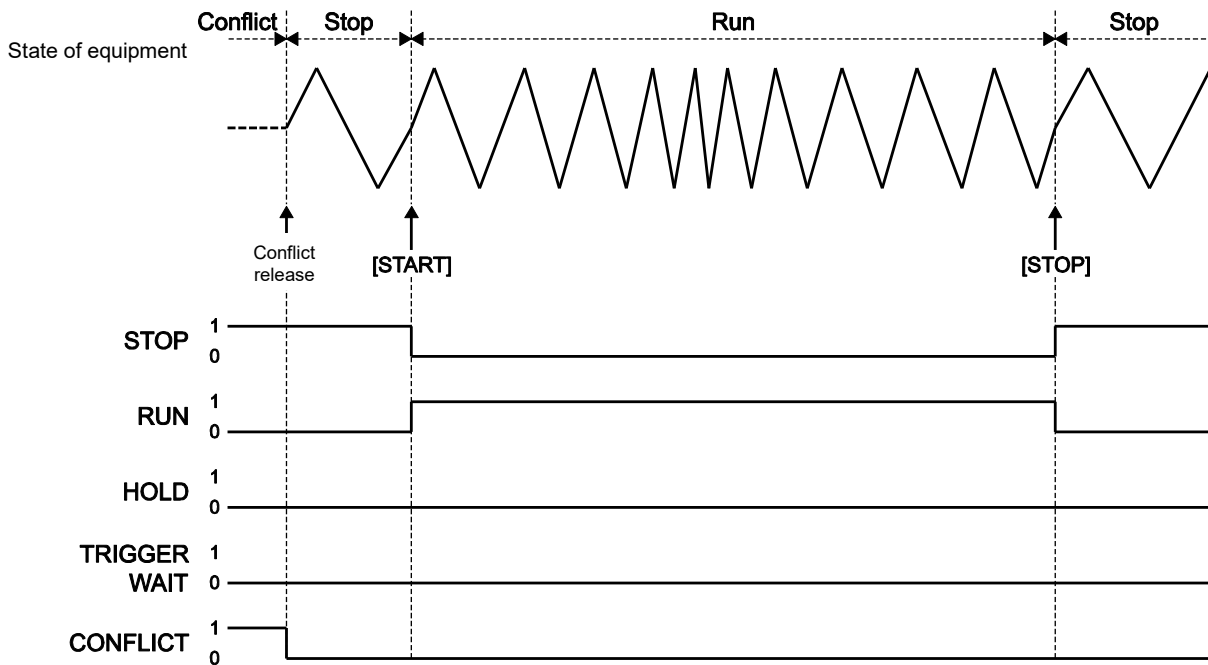


Figure 3.5 Relationship between Output and Operation Status Register (Bit 7-11)

3.3.1.5.1.3 Sweep

○ Sweep oscillation (Single, Gated)

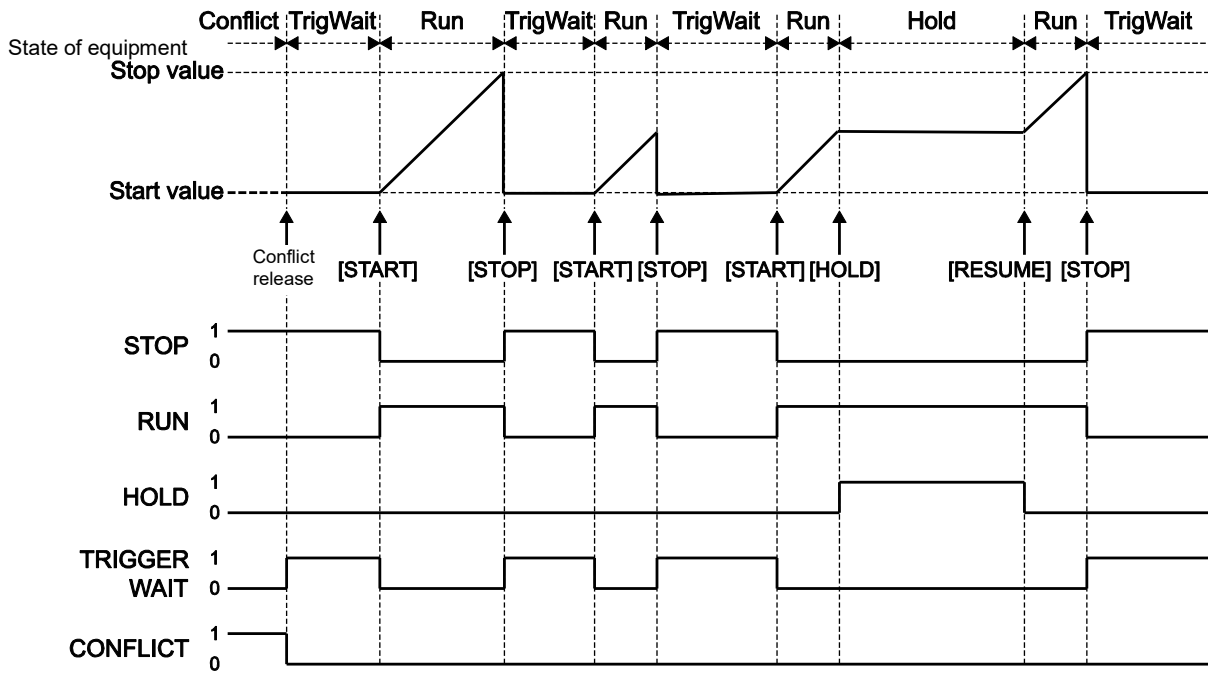


Figure 3.6 Relationship between Output and Operation Status Register (Bit 7 to 11)

○ Sweep oscillation (Continuous)

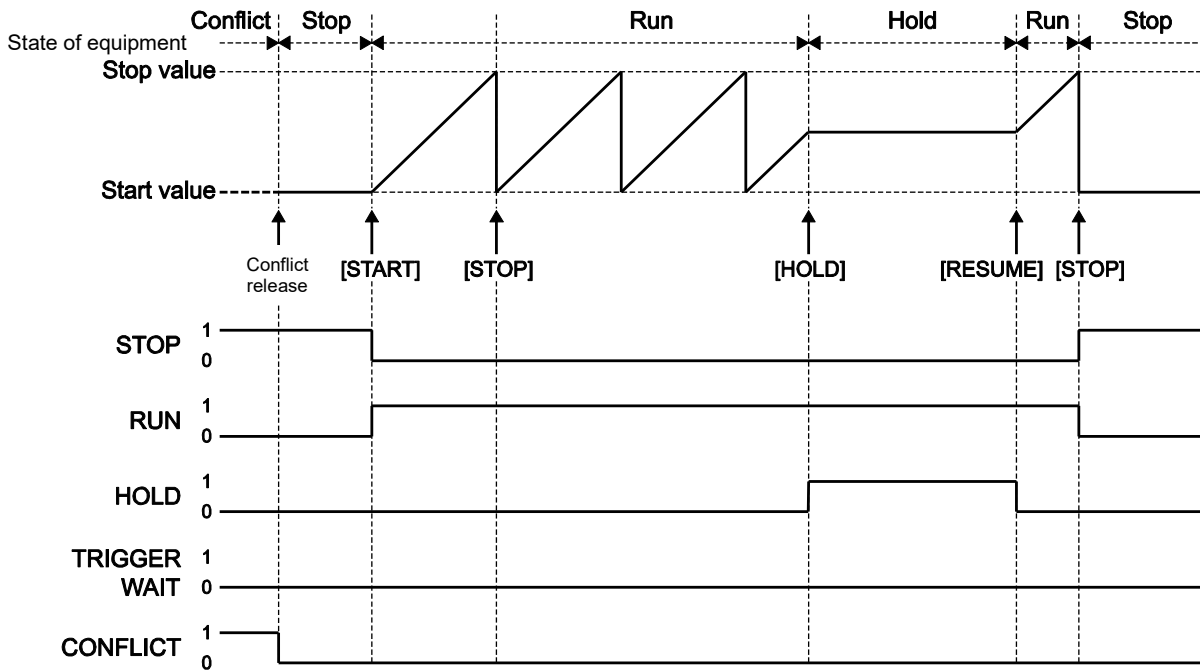


Figure 3.7 Relationship between Output and Operation Status Register (Bit 7-11)

3.3.1.5.1.4 Burst

○ Burst oscillation (Auto burst)

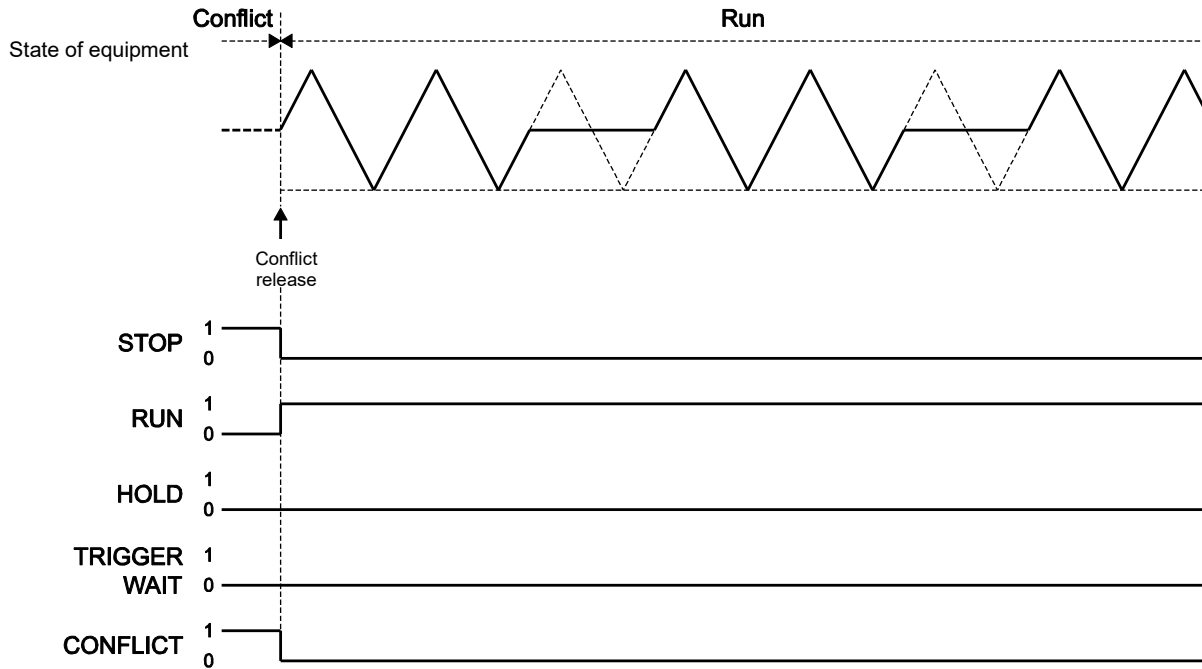


Figure 3.8 Relationship between Output and Operation Status Register (Bit 7-11)

○ Burst oscillation (Trigger burst)

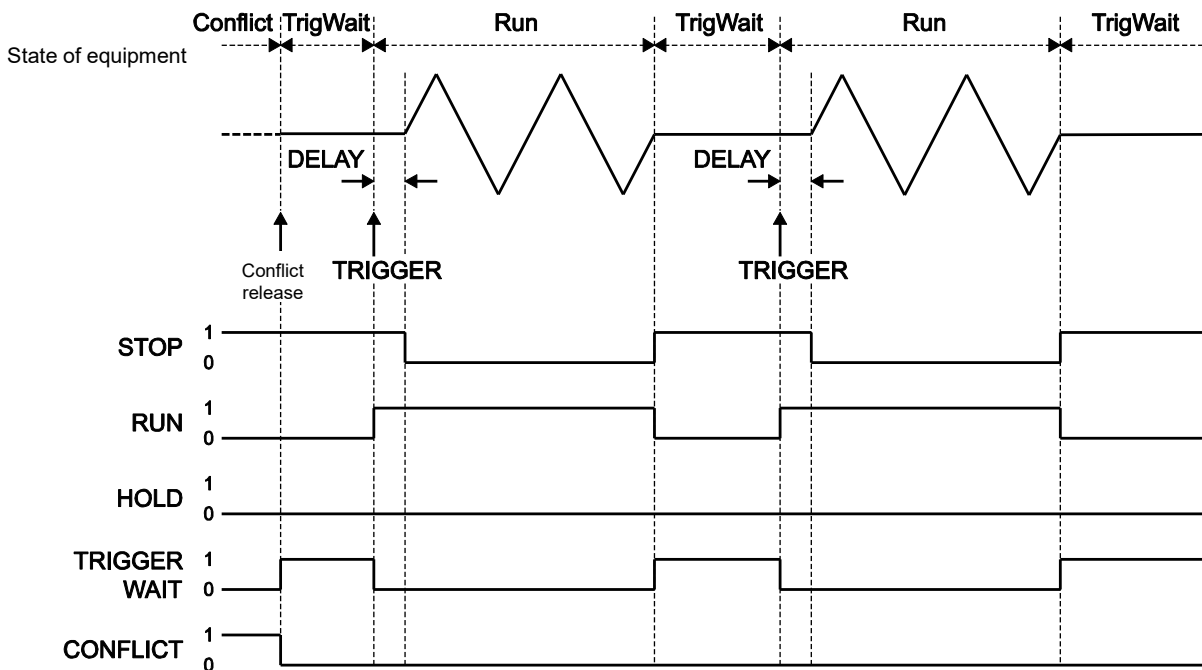


Figure 3.9 Relationship between Output and Operation Status Register (Bit 7-11)

○ Burst oscillation (Gate)

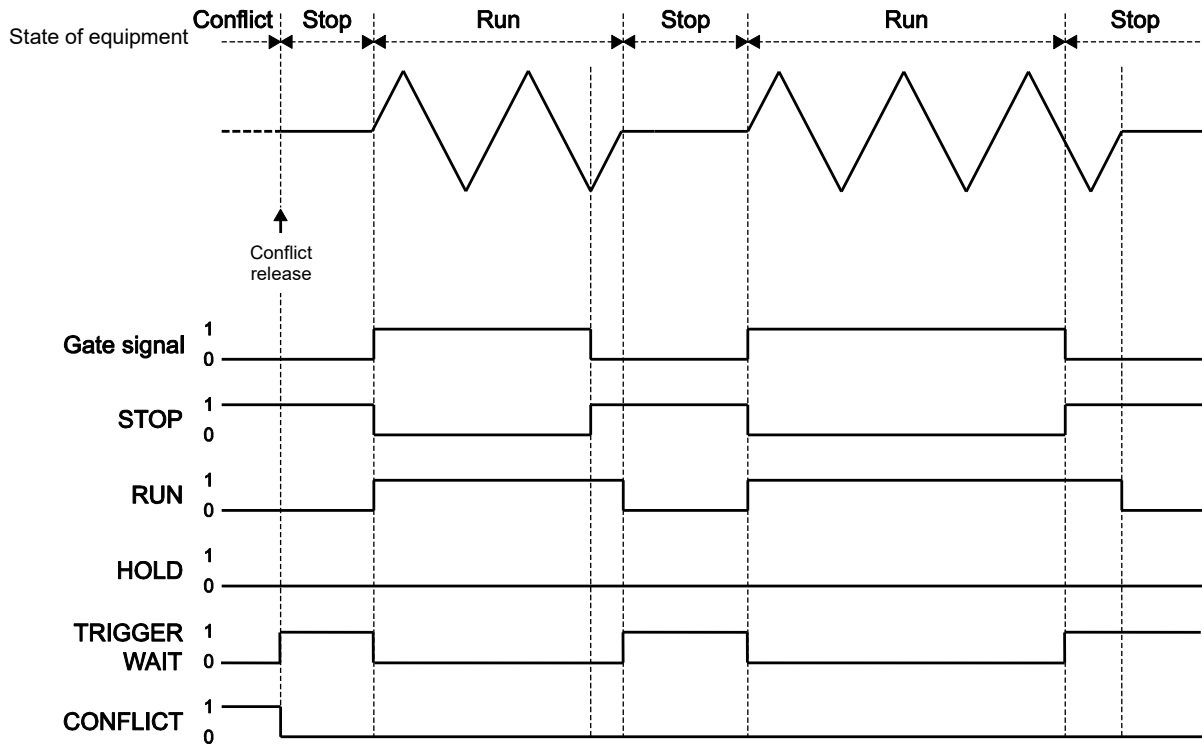


Figure 3.10 Relationship between Output and Operation Status Register (Bit 7 to 11)

○ Burst oscillation (Triggered gate)

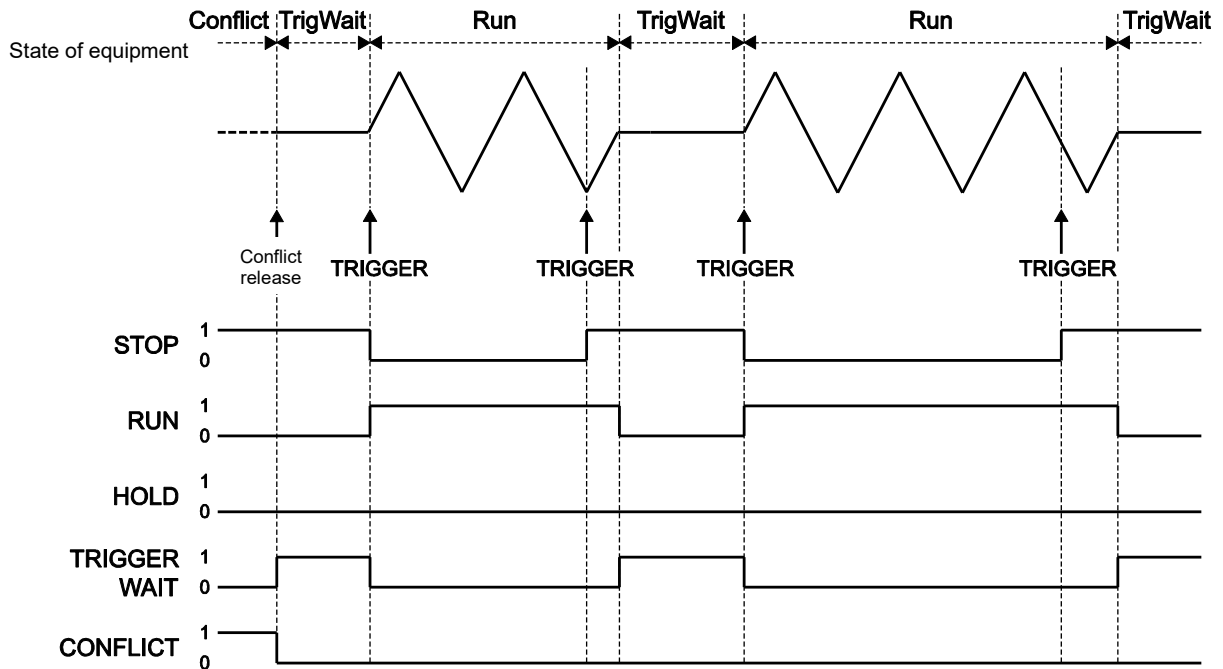


Figure 3.11 Relationship between Output and Operation Status Register (Bit 7 to 11)

3.3.1.5.1.5 Sequence

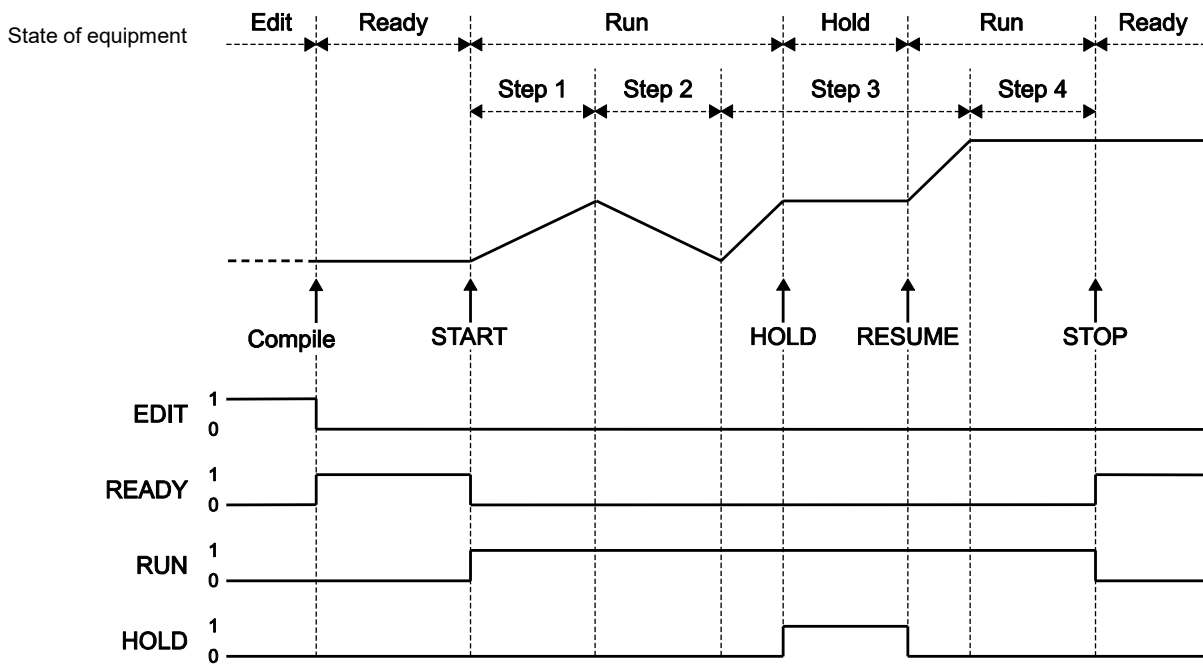


Figure 3.12 Relationship between Output and Operation Status Register (Bit 0 to 3)

3.3.1.6 Questionable Data Status Register Group

The questionable status register group is shown in Figure 3.3.

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 questionable status register summary
1		(Unused)
2		(Unused)
3		(Unused)
4	16	Overheat detection
5		(Unused)
6	64	No external reference clock
7		(Unused)
8	256	Un-calibration
9		(Unused)
10	1024	CH2 questionable status register summary
11		(Unused)
12		(Unused)
13		(Unused)
14		(Unused)
15		Always 0

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		(Unused)

3.4 Warning Event Register Group

The warning event register group is shown in Figure 3.13. This register group configures three register sets: one register set for each channel and one register set to summarize their sets.

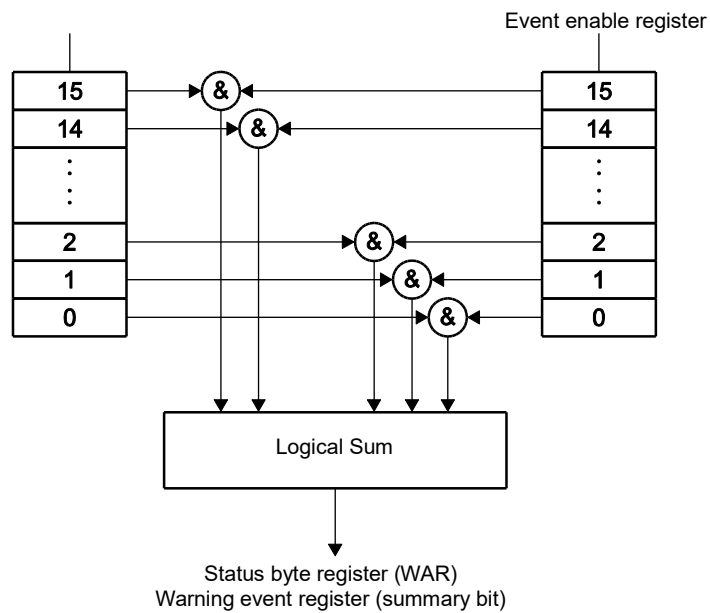


Figure 3.13 Warning Event Status Register Group Model

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 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.

The event register is cleared upon reception of a query addressed to the event register or the *CLS command.

Table 3.8 Common 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 parameter.
3	8	Other parameters are changed due to the change of channel mode or channel mode parameter.
4	16	The channel mode parameter is changed due to the change of waveform or waveform parameter.
5	32	The basic parameter is changed due to the change of waveform or waveform parameter.
6	64	The oscillation mode is changed due to the change of waveform or waveform parameter.
7	128	Other parameters are changed due to the change of waveform or waveform parameter.
8	256	Waveform parameters are changed due to the change of basic parameters.
9	512	LE, TE parameters are changed due to the change of waveform parameters.
10	1024	(Unused).
11	2048	Other parameters are changed due to the change of basic parameters.
12	4096	(Unused)
13	8192	(Unused)
14	16384	Other parameters are changed.
15	32768	(Unused)

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, phase, amplitude, DC offset, high level, low level, duty, pulse width, and rising/falling time.

Other parameters:

Means the parameters other than the channel mode, channel mode parameter, waveform, waveform parameter, basic parameter.

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

WF198x series provide the error queue and error message queue.

4. Error messages

If an error occurs when the remote control, 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 (The number in () is the error code displayed in the screen.)
0	No error	No invalid
-101	Invalid character	The string data contains invalid.
-102	Syntax error	The received string data contains an incorrect syntax.
-103	Invalid separator	There is an error in the command separator.
-104	Data type error	There is an error in the parameter format.
-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.
-123	Exponent too large	The specified exponent is too large. (Exponent value exceeds 32000)
-124	Too many digits	Digit too large. (Digit value exceeds 255)
-130	Suffix error	There is an error in the suffix of the numerical parameter.
-134	Suffix too long	There are too many SI prefix and unit characters. (more than 7 characters)
-140	Character data error	There is an error in the discrete parameter.
-144	Character data too long	The string data is too long.
-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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> - When the total amount of waveform exceeds 64Mi words - When the sequence setting is too complicated and cannot be checked

Error No.	Message	Contents (The number in () is the error code 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.
-222	Data out of range	The correct syntax parameter is received but the command cannot be executed due to the value out of range.
-224	Illegal parameter value	The parameter is invalid.
-225	Out of memory	Memory required for execution is insufficient. The relevant error occurs in the following cases: <ul style="list-style-type: none"> · 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: <ul style="list-style-type: none"> · 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 waveform is deleted (32004)
-291	Out of memory	Specified memory does not exist. The relevant error occurs in the following cases: <ul style="list-style-type: none"> · When a value other than 0 to 4096 is specified for the arbitrary waveform number · When a value other than 0 to 99 is specified for the sequence number
-310	System error	This is a failure of this instrument.
-350	Queue overflow	An error occurs but the error is discarded because the error cannot be entered in the error queue.
-363	Input buffer overrun	Input buffer overflow.
-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.
-430	Query DEADLOCKED	The buffer is full and processing cannot continue. Clear the output buffer.
-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.....	5-2
5.2 Response to Interface Message.....	5-3
5.3 Multi-Line Interface Message	5-4

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
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	<ul style="list-style-type: none">• Initialize the interface.• Release the specified listener or talker.
DCL and SDC	<ul style="list-style-type: none">• Clear the I/O buffer.• Clear the error.• Release the SRQ send and reset the error factor bits.• Disable the SRQ send.
LLO	<ul style="list-style-type: none">• Disable the LOCAL key (software key) operation of the panel.
GTL	<ul style="list-style-type: none">• Selects the local state.
GET	<ul style="list-style-type: none">• Execute trigger on CH1.

In LAN, you can not use these features.

5.3 Multi-Line Interface Message

*2					b7	0	*1	0	0	0	0	1	0	1	1	1	1							
					b6	0	MSG	0	MSG	1	MSG	0	MSG	0	MSG	1	MSG							
					b5	0		1		0		0		1		1								
b4	b3	b2	b1	Column	0		1	2		3		4		5		6		7						
					Low																			
0	0	0	0	0	NUL		DLE		SP	↑	0	@	↑	P	↑	,	↑	p	↑					
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1	A	↑	Q	↑	a	↑	q	↑					
0	0	1	0	2	STX		DC2		"	↑	2	B	↑	R	↑	b	↑	r	↑					
0	0	1	1	3	ETX		DC3		#	↑	3	C	↑	S	↑	c	↑	s	↑					
0	1	0	0	4	EOT	SDC	DC4	DCL	\$	↑	4	D	↑	T	↑	d	↑	t	↑					
0	1	0	1	5	ENQ	PPC	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	↑	_	↑	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	DCL	: Device Clear
SDC	: Selected Device Clear	PPU	: Parallel Poll Unconfigure
PPC	: Parallel Poll Configure	SPE	: Serial Poll Enable
GET	: Group Execute Trigger	SPD	: Serial Poll Disable
TCT	: Take Control	UNL	: Unlisten
LLO	: Local Lockout	UNT	: Untalk

Notes

- Reproduction of the contents of this manual is forbidden by applicable laws.
- The contents of this manual may be revised without notice.
- Information provided in this manual is intended to be accurate and reliable.
However, we assume no responsibility for any damage regarding the contents of this manual.

Should you notice anything suspicious, error, or erroneous omission, please contact us or our agent from whom you purchased the product.

We assume no responsibility for influences resulting from the operations in this manual.

WF198x series Instruction Manual (Remote Control) NF Corporation

6-3-20 Tsunashima Higashi, Kohoku-ku, Yokohama 223-8508, JAPAN
Phone: +81-45-545-8128
<http://www.nfcorp.co.jp/>

